



# SOLAR MODULE INSTALLATION AND USER MANUAL

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This manual applies to photovoltaic modules ("PV modules", also commonly known as solar panels) manufactured by Thaisun Green Energy Co. Ltd. ("Thaisun"), and is explicitly written for qualified professionals ("Installer" or "Installers"), including without limitation licensed electricians and RAL Certified PV Installers.

## 1. GENERAL INTRODUCTION

Solar modules produce electricity when light shines on their front surface. The DC voltage may exceed 30v. If modules are connected in series, the total voltage is equal to the sum of the individual module voltages. If modules are connected in parallel, the total current is equal to the sum of individual module currents. Standard Test Conditions are: irradiance of 1 kW/m<sup>2</sup>, air mass (AM) spectrum of 1.5, and cell temperature of 25°C. The electrical characteristics are respectively within ±10 percent or [0; +5 W] of the indicated values for I<sub>sc</sub>, V<sub>oc</sub> and P<sub>max</sub>. Specifications are subject to change without notice.

Under normal conditions, a photovoltaic module is likely to experience conditions that produce more current and/or voltage than reported at standard test conditions. Accordingly, the values of I<sub>sc</sub> and V<sub>oc</sub> marked on this module should be multiplied by a factor

of 1.25 when determining component voltage ratings, conductor current ratings, fuse sizes and size of controls connect to the PV output.

## 2. APPLICATION

Thaisun modules are a highly reliable, virtually maintenance-free direct current (DC) power source, designed to operate most efficiently in sunlight. Thaisun modules are ideal to power remote homes, recreational vehicles, water pumps, tele communication systems and many other applications either with or without the use of storage batteries.

## 3. SITE SELECTION

Modules can be used on land except for corrosive salt area and sulfurous area. When choosing a site, avoid trees, buildings or obstructions. Modules should be mounted to maximize direct exposure to sunlight and to eliminate or minimize shadowing. Even partial shadowing can substantially reduce module and system output. Furthermore, partial shadowing can elevate the shaded portions internal temperature, which may lower output and shorten module life.

## 4. ORIENTATION OF INSTALLATIONS

Modules may be mounted at any angle from a

vertical orientation to a horizontal one. The appropriate fixed tilt angle and azimuth orientation should be used in order to maximize the exposure to sunlight.

Incorrect orientation of modules installation will result in loss of power output. Modules connected in series should be installed at same orientation and angle. Different orientation or angle may cause loss of power output due to difference of amount of sunlight exposed to the modules.

In the Northern Hemisphere, modules should face south, and in the Southern Hemisphere, modules should face north.

## 5. MODULE TILT ANGLE

Modules produce the most power when they are pointed directly at the sun. For installations where modules are mounted to a permanent structure, modules should be tilted for optimum winter performance. As a rule, if the PV system power production is adequate in the winter, it will be satisfactory during the rest of the year. The module tilt angle is measured between the modules and the ground.

## 6. MAINTENANCE

### General

THAISUN recommends that PV systems be periodically inspected by the installer, or other qualified person.

The purpose of the PV system inspection is to ensure that all system components are functioning properly. At a minimum, this inspection should confirm the following:

- All cables and connector are undamaged and properly secured
- No sharp objects are in contact with the PV module surfaces
- PV modules are not shaded by unwanted

obstacles and/or foreign material

- Mounting and grounding components are tightly secured with no corrosion
- Defects should be addressed immediately.

### Cleaning

Over time, dirt and dust can accumulate on the glass surface of the module, reducing its power output. THAISUN recommends periodic cleaning of PV modules to ensure maximum power output, especially in regions with low precipitation.

In order to reduce the potential for electrical and thermal shock, THAISUN recommends cleaning PV modules during early morning or late afternoon hours when solar radiation is low and the modules are cooler, especially in regions with hotter temperatures.

Never attempt to clean a PV module with broken glass or other signs of exposed wiring, as this presents a shock hazard.

Clean the glass surface of the PV modules with a soft brush using soft, clean water with a recommended pressure less than 690kPa, which is typical of most municipal water systems. Water with high mineral content may leave deposits on the glass surface and is not recommended.

THAISUN PV modules may contain a hydrophobic anti-reflective coating on the glass surface to enhance power output and reduce dirt and dust buildup. In order to avoid module damage, do not clean PV modules with a power washer or pressure washer. Do not use steam or corrosive chemicals to facilitate the cleaning of modules. Do not use aggressive tools or abrasive materials that could scratch or damage the glass surface. Failure to comply with these requirements may adversely affect the PV module performance.

THAISUN PV modules are designed to withstand high snow loads. However, if removing snow is desired to enhance production, use a brush to gently remove snow. Do not try to remove frozen snow or ice from PV modules.

## DECOMMISSIONING

The dismantling of PV systems must be performed with the same care and safety precautions used during the initial installation. The PV system can generate hazardous voltage even after the system has been disconnected. Follow safety regulations for working with live electrical equipment.

## 7.WARNINGS



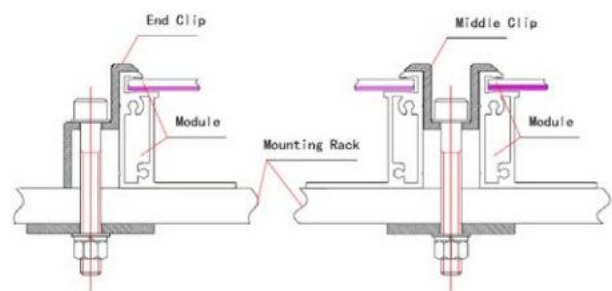
- Solar module produces electricity when exposed to sunlight.
- Follow all applicable electrical safety precautions.
- Modules must be installed by licensed electricians.
- Do not handle modules when they are wet.
- Do not attempt to disassemble the modules, and do not remove any attached nameplates or components from the modules.
- Do not apply paint or adhesive to module top surface.
- Keep children away from the system while transporting and installing mechanical and electrical components.

## 8.Mechanical Installation

Systems should be installed by qualified personnel only. It involves electricity, and can be dangerous if the personnel are not familiar with the appropriate safety procedures.

The Module frame is made of anodized aluminum, and therefore corrosion can occur if the Module is subject to a salt water

environment with contact to a rack of another type of metal (Electrolysis Corrosion). If required, PVC or stainless steel washers can be placed between the Module frame and support structure to prevent this type of corrosion. Module support structures that are to be used to support Modules at correct tilt angles should be wind and snow load rated for use by the appropriate local and civil codes prior to installation. Installation method can be as below:



The module frame must be attached to supporting rack using M8 stainless steel hardware together with corrosion-proof clamps in four places on the PV module.

### NOTES:

- (1) The Module clamps must not come into contact with the front glass and must not deform the frame. Avoid shadowing effects from the Module clamps and the insertion systems. It is not permitted to modify the Module frame under any circumstances. Recommended distance between 2 Solar Modules is 5mm considering linear thermal expansion of the Module frames.
- (2) Clearance between the Module frame and mounting surface may be required to prevent the junction box from touching the surface, and to circulate cooling air around the back of the Module.
- (3) The Modules are not designed for integral mounting as part of a roof or wall. The mounting design may have an impact on the fire resistance. If the Modules are to be

installed on the roof or wall of a building, the fire resistance of roof covering or wall should be rated for the application. Here the standoff method or the rack method is recommended. The Modules are supported parallel to surface of the building wall or roof. Clearance between the Module frames and surface of the wall or roof is required to prevent wiring damage and to allow air to circulate behind the Module. The recommended stand-off height is 115mm. Any slope less than 5in/ft (127mm/305mm) required to maintain a fire class rating. Do not mount PV Module in such way that the drain holes of PV Module are intended to block up.

- (4) Do not step on the Module, although PV Modules are quite rugged, the glass can be broken (and the Module will no longer work properly) if it is dropped or hit by tools or other objects.

## 9. MODULE GROUNDING

Proper equipment grounding are required for all modules in compliance with all local electrical codes and regulations.

The frame of each module is grounded by fixing an appropriate grounding cable (solid copper wire with a minimum of 14AWG-2.5mm<sup>2</sup> to a maximum of 10AWG-6.0mm<sup>2</sup>) to one of the 4mm diameter grounding holes on the module frame using a screw, nut, and a serrated washer.

## 10. BYPASS DIODES

If removing the bypass diodes is needed, then it should be done only by a competent PV technician and after the module has been disconnected from the system.

Partial shading of an individual Module can cause a reverse voltage across the shaded PV

Module. Current is then forced through the shaded area by the other Modules.

When a bypass diode is wired in parallel with the series string, the forced current will flow through the diode and bypass the shaded PV Module, thereby minimizing Module heating and array current losses.

In system utilizing a battery, blocking diodes are typically placed between the battery and the PV Module output to prevent battery discharge at night.

## 11. DISCLAIMER OF LIABILITY

Because the use of this manual and the conditions or methods of installation, operation, use and maintenance of photovoltaic (PV) product are beyond our control, THAISUN does not accept responsibility and expressly disclaims liability for loss, damage, or expense arising out of or in any way connected with such installation, operation, use or maintenance.

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