

# INSTALLATION MANUAL

[ UL1703 ]



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Please read the installation manual before using or installing Wattpower modules. This photovoltaic module produces electricity when exposed to sun light. Follow all applicable electrical safety precautions. Only qualified personnel should install or perform maintenance work on this module. Do not damage or scratch the rear surface of the module. Do not handle modules when they are wet, this condition may increase the risk of electric shock.

## 1 Safety Precautions

**1.1.** Photovoltaic modules have no on/off switch. Modules can be rendered inoperative only by removing them from sunlight, or by fully covering their front surface with cloth, cardboard, or other completely opaque material, or by working with modules face down on a smooth, flat surface.

**1.2.** Photovoltaic modules produce DC electricity when exposed to light and therefore can produce an electrical shock or burn. Modules produce voltage even when not connected to an electrical circuit or load. Modules produce nearly full voltage when exposed to as little as 5% of full sunlight and both current and power increase with light intensity. Use insulated tools and rubber gloves when working with modules in sunlight. It would be best by covering their front surface fully with completely opaque materials when operating on the modules. Artificially concentrated sunlight shall not be directed on the module.

**1.3.** Modules may produce higher output than the rated specifications. Industry standard ratings are made at conditions of 1000 watts/m<sup>2</sup> and 25 °C cell temperature, AM 1.5. Reflection from snow or water can increase sunlight and therefore boost current and power. In addition, temperature below 25 °C can substantially increase voltage and power.

**1.4.** Wattpower modules are constructed with tempered glass, but still must be handled with care, If the front glass is broken or if the polymer back-skin is torn, contact with any module surface or the frame can produce electrical shock, particularly when the module is wet. Broken or damaged modules must be disposed of properly.

**1.5.** Wattpower modules are intended for use in terrestrial applications only, thus excluding aerospace or maritime conditions or use with sunlight concentration. Excluded applications include, but are not limited to, installations where modules are likely to come in contact with any salt water or where likely to become partially or wholly submerged in fresh or salt water, we suggested that the modules should installed at least 500m away from the sea.

## 2 Codes and Regulations

The mechanical and electrical installation of Module systems should be performed in accordance with all applicable codes, including electrical codes, building codes, and electric utility interconnect requirements. Such requirements may vary for

mounting location, such as building rooftop or motor vehicle applications.

Requirements may also vary with system voltage, and for DC or AC application. Contact local authorities for governing regulations.

## 3 Mechanical Installation

The module is considered to be in compliance with UL 1703 only when the module is mounted in the manner specified by the mounting instructions below.

The modules when used with a Listed mounting system that has been rated as a Class C System when installed with type 1 modules, is suitable to maintain the System Class C Fire Rating.

### 3.1. Selecting the location

Select a suitable location for installation of the module.

The module should be facing true south in northern latitudes and true north in southern latitudes for best power production.

For detailed information on the best elevation tilt angle for the installation, refer to standard solar photovoltaic installation guides or a reputable solar installer or systems integrator.

Do not install the PV module in a location where it would be immersed in water or continually exposed to water from a sprinkler or fountain etc

### 3.2. Mechanical Installation Instruction

Solar PV module can be mounted by using the following methods: bolts or clamps.

General indication:

(1) The mounting with bolts or clamps on the long side of frames could meet a maximum downward pressure of 3600Pa and upward pressure of 1600Pa. While mounting with clamps on the short side of the frames could meet a maximum downward & upward pressure of 1600Pa, with a 1.5 times safety factor.

(2) The recommended standoff height is 100 mm. If other mounting means are employed this may affect the UL Listing.

#### 3.2.1 Mounting with bolts

The frame of each module has 4 inner or 8 holes used to secure the module to the supporting structure. Bolts method with 4 inner or 8 holes use only M8 screw with applied torque value of 12.5~18Nm with following mounting hardwares listed in Table 1.

Module Series	Hardware	Material	Size	Number Provided (per hole)	Size (holes)	
All	Screw Bolt	Stainless Steel	M8	1	9*14mm	1600Pa Upward&Downward for Inner 4 holes used or 3600Pa Downward & 1600Pa Upward for 8 holes used
	Flat Washer			2		
	Spring Washer			1		
	Screw Nut			1		

Table 1: Mounting Hardware

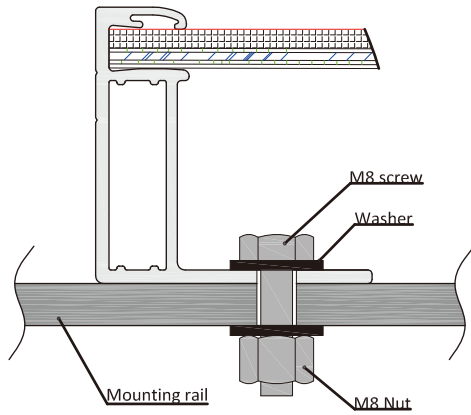


Figure 1: Details on Bolt Mounting

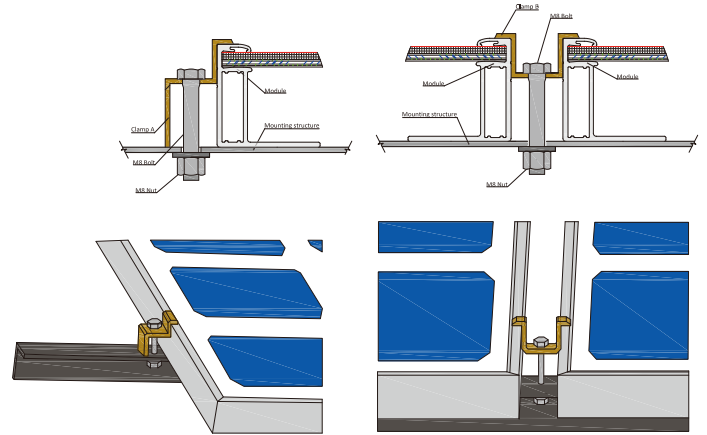


Figure 3: Module installed with Clamps

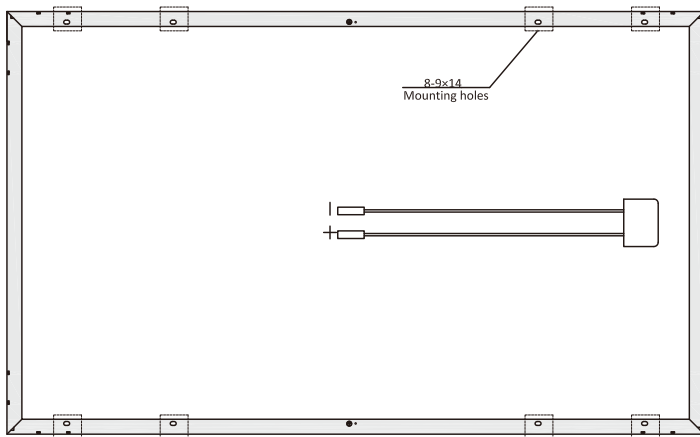


Figure 2: Bolt Installation Method

Mounting on the long or short sides is allowed under the following conditions.

Method	Installed Frame (L)	Clamp Position (S)	Rated Load
Clamp Installation	Long Frame	$0 < S \leq 1/4L$	3600Pa (Downward) & 1600Pa (Upward)
		$(1/4L - 50\text{mm}) < S \leq (1/4L + 50\text{mm})$	1600Pa (Downward) & 1600Pa (Upward)
	Short Frame	$0 < S \leq 1/4W$	1600Pa (Downward) & 1600Pa (Upward)

Table 3: Specification on Mounting Area with respective load

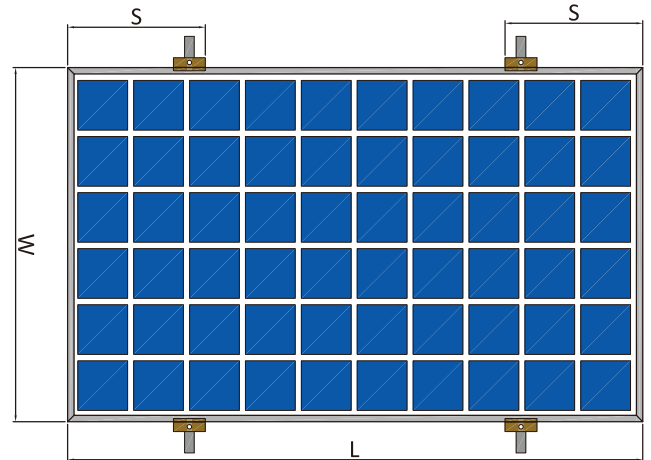


Figure 4: Installed on Long Frame with Clamp

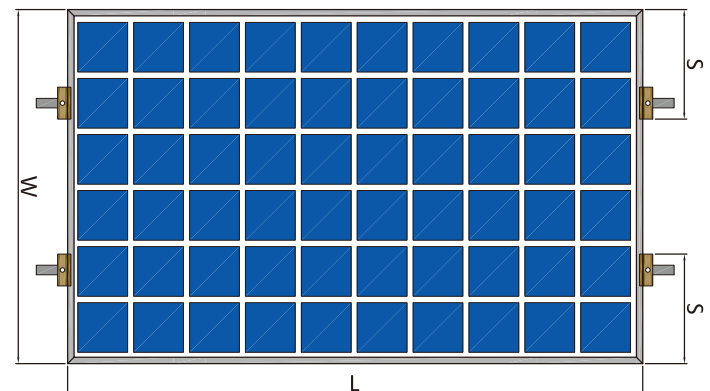


Figure 5: Installed on Short Frame with Clamp

### 3.2.2 Mounting with clamps

When choosing this type of mounting method, please be sure using at least 4 clamps on each module and no module clamps shall contact or make any shading on the modules glass.

Find the detailed mounting information and specification of clamp method as illustrated below. An integrated M8 hex head cap screw tightens down to the frame with a torque between 12.5-18 Nm

Clamp Type	Dimension(mm)	Material Composition
End Clamp (40mm Height Frame)	45*38*43	Aluminum
End Clamp (35mm Height Frame)	40*38*43	
Middle Clamp	51*38*30	

Table 2 : Specification of Clamps

Series	Module Type	Dimension (mm)	Frame Height (mm)	1/4L (mm)	1/4W (mm)	1/4L-50 (mm)	1/4L+50 (mm)
W.Power G2 Series	WP-XXXM/G2-60-V	1640*992	35	410	248	360	460
	WP-XXXM/G2-60B-V						
	WP-XXXM/G2-60H-V	1675*992	35	418.75	248	368.75	468.75
	WP-XXXM/G2-60HB-V						
	WP-XXXM/G2-72H-V						
W.Power G3 Series	WP-XXXM/G3-60H-V	1684*1002	35	421	250.5	371	471
	WP-XXXM/G3-60HB-V						
	WP-XXXM/G3-72H-V	2008*1002	40	502	250.5	452	552

Table 4: Mechanical Dimensions of Modules Installed with Clamps on Long or Short Side of Frame

## 4 Electrical Installation

The electrical characteristics are within  $\pm 3\%$  of the indicated values of  $I_{sc}$ ,  $V_{oc}$ , and  $P_{max}$  under standard test conditions (irradiance is  $100 \text{ mW/cm}^2$ , AM 1.5 spectrum, and a cell temperature of  $25^\circ\text{C}$  ( $77^\circ\text{F}$ ))

A module with exposed conductive parts is considered to be in compliance with UL 1703 only when it is electrically grounded in accordance with the instructions presented below and the requirements of the National Electrical Code.

Installation shall be in accordance with CSA C22.1, Safety Standard for Electrical Installations, Canadian Electrical Code, Part 1.

**4.1.** 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 portion’s internal temperature, which may lower output and shorten module life. Bypass diodes are factory installed. Blocking diodes should be installed in series with each module or series string to prevent possible back flow of energy through the modules when modules or strings are connected in parallel or used in conjunction with a battery.

**4.2.** Whenever necessary to comply with local codes, use a listed fuse or circuit breaker, rated for the maximum series fuse rating of the module and the system voltage.

**4.3.** All electrical components should have ratings equal or greater to the system rating. Do not exceed the maximum allowable system voltage as listed on the module label. All module frames should be grounded for safety.

**4.4.** Under normal conditions, a photovoltaic module may experience conditions that produce more current and/or voltage than reported at Standard Test Conditions. Accordingly, the values of short circuit current, and open circuit voltage, marked on modules should be multiplied by a factor of more than 1.25 when determining component voltage ratings, conductor capacities, fuse sizes, and size of controls connected to the module output.

**4.5.** Wattpower modules are equipped with factory-installed wires and quick connectors. These modules have been designed to be easily interconnected in series. Each module has two single-conductor wires, one positive and one negative, that are pre-wired inside the junction box. The connectors at the opposite end of these wires allow easy series connection of adjacent modules by firmly inserting the male connector of a module into the female connector of an adjacent module until the connector is fully seated. For more information, please See module literature for appropriate mating connectors.

**4.6.** A separate return wire or wires may be required to run the positive and negative terminations of the series string of modules to the load. Male and/or female connectors pre-attached to wires may be used at the string terminations for return wire connections and/or for source circuit box terminations.

**4.7.** All modules also have bypass diodes installed.

**4.8.** Grounding.

Common grounding hardware (nuts, bolts, star washers, spilt-ring lock washers, flat washers and the like) is used to attach a listed grounding/bonding device, the attachment must be made in conformance with the grounding device manufacturer’s instructions. Details for wiring in accordance with the NEC, and that the grounding method of the frame of arrays shall comply with the NEC, article 250

Common hardware items such as nuts, bolts, star washers, lock washers and the like have not been evaluated for electrical conductivity or for use as grounding devices and should be used only for maintaining mechanical connections and holding electrical grounding devices in the proper position for electrical conductivity. Such devices, where supplied with the module and evaluated through the requirements in UL 1703, may be used for grounding connections in accordance with the instructions provided with the module. All the PV modules frame and installing support must be earthed rightly accord to electrician laws of local, right ways of grounding is using suitable grounding wires to connect PV modules and frame supports. Grounding wires’ materials can be copper, cooper alloy or other conductors which correspond with electrician laws. Grounding wires must be connected with earth with suitable grounding electrode. Use Bolt M4, cup washer, grounding wires, flat washer, tooth washer, screw nut M4 and install like the photo below, torque should be 2 -3N·m.

Module	Mounting Hardware Configuration			
	Hardware	Material	Size	Number Provided
All	Screw Nut	Stainless Steel	M4	1
	Tooth Washer	Stainless Steel	M4	1
	Flat Washer	Stainless Steel	M4	1
	Cup Washer	Stainless Steel	M4	1
	Bolt	Stainless Steel	M4	1

Table 5: Mounting Parts for Grounding

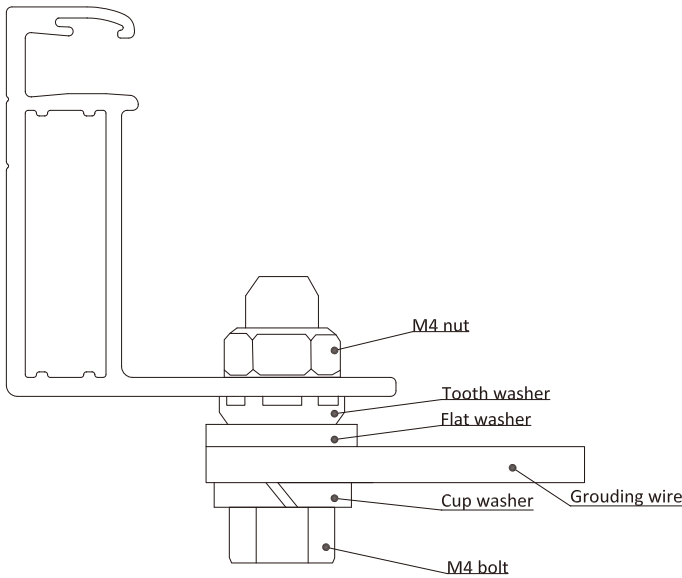


Figure 6: Specification on Grounding

**4.9 Ways of connecting.** Every modules with 2 connectors and they are respectively positive electrode and negative electrode. When modules are installed in series, the first positive connector should connect with the negative connective of the next module.

The modules are equipped with PV wiring connectors that comply with the Standard for Connectors for Use in Photovoltaic Systems, UL 6703, the specific allowable mating connector manufacturer(s) and model number(s) are listed as below, different model connectors couldn't be mated with each other to use:

Connector model name	Allowable mating connector model name
PV-ZH202-SBN	PV-ZH202-SBN
TL-Cable01	TL-Cable01
PV-JM601	PV-JM601
PV-ZH202B Series	PV-ZH202B Series
TL-CABLE01S-FM	TL-CABLE01S-FF
PV-JM601A	PV-JM601A
PV-JM608	PV-JM608
PV-KST4-EVO2/6II-UR	PV-KBT4-EV02/6II-UR
PV-KST4/6II-UR	PV-KBT4/6II-UR
UTXCFA4AI	UTXCMA4AI

Table 6: Mounting Parts for Grounding

## 5 Operation and Maintenance

**5.1.** No routine maintenance is required. However it is advisable to perform periodic inspection of the modules for damage to glass, back-skin, or frame. Check electrical connections for loose connections and corrosion.

**5.2.** Photovoltaic modules can operate effectively without ever being washed, although removal of dirt from the front glass can increase output. The glass can be washed with a wet sponge or cloth. Wear rubber gloves for electrical insulation.

## 6 Transporting, Storing Modules

**6.1.** Modules should be put vertically when transport.

**6.2.** When move the module, use both hands to catch the module frame, not directly pull the cable on the junction box by hands.

**6.3.** It's prohibition to tear at the modules.

**6.4.** Do not put any other goods on the modules.

**6.5.** Do not make the modules to impacted, and stand on the module is also prohibition.

**6.6.** Do not scratch the rear surface of the modules.

**6.7.** To keep all of the electrical contact working in a dry and un-contaminated condition.

**6.8.** If a temporary storage is needed, the storage space must be under a dry, ventilated condition.

## 7 Module Information

Module Type	WP-280M/G2-60-V	WP-285M/G2-60-V	WP-290M/G2-60-V	WP-295M/G2-60-V	WP-300M/G2-60-V	WP-305M/G2-60-V	WP-310M/G2-60-V
	WP-280M/G2-60B-V	WP-285M/G2-60B-V	WP-290M/G2-60B-V	WP-295M/G2-60B-V	WP-300M/G2-60B-V	WP-305M/G2-60B-V	WP-310M/G2-60B-V
Rated Maximum Power at STC(W)	280	285	290	295	300	305	310
Open Circuit Voltage(Voc/V)	39.05	39.24	39.42	39.56	39.72	39.81	39.9
Maximum Power Voltage(Vmp/V)	31.68	31.81	32.01	32.25	32.37	32.41	32.46
Short Circuit Current(Isc/A)	9.36	9.43	9.54	9.67	9.74	9.83	9.92
Maximum Power Current(Imp/A)	8.84	8.96	9.06	9.15	9.27	9.41	9.55
Maximum system Voltage	1500V DC						
Dimensions	1640x992x35mm(156.75cell)						
Maximum Series Fuse	20A						

Module Type	WP-355M/G2-72H-V	WP-360M/G2-72H-V	WP-365M/G2-72H-V	WP-370M/G2-72H-V	WP-375M/G2-72H-V	WP-380M/G2-72H-V	WP-385M/G2-72H-V
	Rated Maximum Power at STC(W)	355	360	365	370	375	380
Open Circuit Voltage(Voc/V)	46.82	47.01	47.21	47.4	47.61	47.8	48
Maximum Power Voltage(Vmp/V)	39.01	39.2	39.39	39.6	39.81	40.02	40.21
Short Circuit Current(Isc/A)	9.6	9.69	9.77	9.85	9.93	10.01	10.08
Maximum Power Current(Imp/A)	9.1	9.18	9.27	9.35	9.43	9.5	9.58
Maximum system Voltage	1500V DC						
Dimensions	2000x992x40mm(156.75cell)						
Maximum Series Fuse	20A						

Module Type	WP-390M/G3-72H-V	WP-395M/G3-72H-V	WP-400M/G3-72H-V	WP-405M/G3-72H-V	WP-410M/G3-72H-V
	Rated Maximum Power at STC(W)	390	395	400	405
Open Circuit Voltage(Voc/V)	48.18	48.37	48.55	48.73	48.91
Maximum Power Voltage(Vmp/V)	40.37	40.55	40.77	40.95	41.12
Short Circuit Current(Isc/A)	10.48	10.56	10.64	10.71	10.79
Maximum Power Current(Imp/A)	9.66	9.74	9.81	9.89	9.97
Maximum system Voltage	1500V DC				
Dimensions	2008x1002x40mm(158.75cell)				
Maximum Series Fuse	20A				

Module Type	WP-315M/G3-60H-V	WP-320M/G3-60H-V	WP-325M/G3-60H-V	WP-330M/G3-60H-V	WP-335M/G3-60H-V	WP-340M/G3-60H-V
	WP-315M/G3-60HB-V	WP-320M/G3-60HB-V	WP-325M/G3-60HB-V	WP-330M/G3-60HB-V	WP-335M/G3-60HB-V	WP-340M/G3-60HB-V
Rated Maximum Power at STC(W)	315	320	325	330	335	340
Open Circuit Voltage(Voc/V)	39.74	39.92	40.1	40.27	40.44	40.62
Maximum Power Voltage(Vmp/V)	32.79	33.01	32.71	32.91	33.11	33.31
Short Circuit Current(Isc/A)	10.04	10.13	10.43	10.51	10.6	10.69
Maximum Power Current(Imp/A)	9.6	9.69	9.93	10.02	10.11	10.21
Maximum system Voltage	1500V DC					
Dimensions	1684x1002x35mm(158.75cell)					
Maximum Series Fuse	20A					

Module Type	WP-290M/G2-60H-V	WP-295M/G2-60H-V	WP-300M/G2-60H-V	WP-305M/G2-60H-V	WP-310M/G2-60H-V	WP-315M/G2-60H-V	WP-320M/G2-60H-V
	WP-290M/G2-60HB-V	WP-295M/G2-60HB-V	WP-300M/G2-60HB-V	WP-305M/G2-60HB-V	WP-310M/G2-60HB-V	WP-315M/G2-60HB-V	WP-320M/G2-60HB-V
Rated Maximum Power at STC(W)	290	295	300	305	310	315	320
Open Circuit Voltage(Voc/V)	38.87	39.05	39.23	39.42	39.58	39.74	39.92
Maximum Power Voltage(Vmp/V)	31.7	31.93	32.15	32.37	32.58	32.79	33.01
Short Circuit Current(Isc/A)	9.59	9.68	9.77	9.86	9.95	10.04	10.13
Maximum Power Current(Imp/A)	9.15	9.24	9.33	9.42	9.51	9.6	9.69
Maximum system Voltage	1500V DC						
Dimensions	1675x992x35mm(156.75cell)						
Maximum Series Fuse	20A						



Wattpower Technology Co., Ltd

[www.wattpower.de](http://www.wattpower.de) [info@wattpower.de](mailto:info@wattpower.de)

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