
Photovoltaic Module User Manual

Table of Contents:

1. General information.....	2-5
1.1 Overview	
1.2 Applicable Products	
1.3 Warning	
1.4 Fire prevention	
2. Installation.....	5-11
2.1 Installation safety	
2.2 Installation condition	
2.2.1 Operation condition	
2.2.2 Site selection	
2.2.3 Tilt angle selection	
2.3 Mechanical Installation introduction	
2.3.1 Fixation with screw	
2.3.2 Fixation with clamps	
3. Wiring and connection.....	12-14
4. Maintenance and care.....	14
5. Electrical specification.....	16-37
6. Disclaimer of liability.....	38
7. Contact us.....	38

1. General Information

1.1 Overview

Thanks for choosing Econess Energy PV modules. In order to ensure the PV modules to be installed correctly, please read the following operation instructions carefully before installing and using the modules.

Please remember that the products would generate electricity and certain safety measures need to be taken to avoid danger.

1.2 Applicable Products

This document is applicable to the series of solar module as listed below:

PV Modules with 6" Poly-crystalline Silicon Solar Cells:

72 cells: EN156P-72-xxx (xxx = 300 - 350, in increments of 5)

60 cells: EN156P-60-xxx (xxx = 250 - 290, in increments of 5)

54 cells: EN156P-54-xxx (xxx = 225 - 260, in increments of 5)

48 cells: EN156P-48-xxx (xxx = 200 - 230, in increments of 5)

36 cells: EN156P-36-xxx (xxx = 150 - 175, in increments of 5)

PV Modules with 6" Mono-crystalline Silicon Solar Cells:

72 cells: EN156M-72-xxx (xxx = 330 - 370, in increments of 5)

60 cells: EN156M-60-xxx (xxx = 275 - 305, in increments of 5)

54 cells: EN156M-54-xxx (xxx = 245 - 275, in increments of 5)

48 cells: EN156M-48-xxx (xxx = 220 - 245, in increments of 5)

36 cells: EN156M-36-xxx (xxx = 165 - 185, in increments of 5)

PV Modules with 6" Half-cut Poly-crystalline Silicon Solar Cells:

144 cells: EN156P-144-xxx (xxx = 300 - 355, in increments of 5)

120 cells: EN156P-120-xxx (xxx = 250 - 295, in increments of 5)

144 cells: EN158P-144-xxx (xxx = 300 - 355, in increments of 5)

120 cells: EN158P-120-xxx (xxx = 250 - 295, in increments of 5)

PV Modules with 6" Half-cut Mono-crystalline Silicon Solar Cells:

144 cells: EN156M-144-xxx (xxx = 345 - 395, in increments of 5)

120 cells: EN156M-120-xxx (xxx = 290 - 330, in increments of 5)

144 cells: EN158M-144-xxx (xxx = 370 - 415, in increments of 5)

120 cells: EN158M-120-xxx (xxx = 310 - 345, in increments of 5)

144 cells: EN166M-144-xxx (xxx = 405 - 460, in increments of 5)

120 cells: EN166M-120-xxx (xxx = 335 - 380, in increments of 5)

144 cells: EN166M-144D-xxx (xxx = 405 - 460, in increments of 5)

120 cells: EN166M-120D-xxx (xxx = 335 - 380, in increments of 5)

Make sure the array of modules installed with the Maximum permitted system voltage and the rating current and voltage of the sub-equipments such as regulators and inverters. The maximum permitted system voltage (DC) of the modules sold in Europe is 1000V/1500V

The modules are qualified for application class A, and modules qualified for safety through IEC61730 within this application class are considered to meet the requirements of Safety Class II


1.3 WARNING

PV modules generate DC electrical energy when exposed to sunlight or other light sources. Active parts of module such as terminals can result in burns, sparks, and lethal shock

- Artificially concentrated sunlight shall not be directed on the module or panel.



- Solar modules have a protective glass front. Broken solar module glass is an electrical safety hazard (electric shock and fire). These modules cannot be repaired and should be replaced immediately.

 warning	<ul style="list-style-type: none"> ◆ Electric Shock and Burn Hazard ◆ This photovoltaic module produces ◆ Electricity when exposed to the sun
--	--

- To reduce the risk of electrical shocks or burns, modules may be covered with an opaque material during installation to avoid shocks or burns.
- All installations must be performed in compliance with the National Electrical Code (NEC) and modules installed in Canada need to follow Canadian electric code.
- The installation work of the PV array can only be done under the protection of sun-sheltering covers or sunshades and only qualified person can install or perform maintenance work on this module.
- Follow the battery manufacture's recommendations if batteries are used with module
- Do not use this module to replace or partly replace roofs and walls of living buildings.

- Do not install modules where flammable gas may be present.
- Do not touch live terminals with bare hands. Use insulated tools for electrical connections.



- Do not remove any part installed by Econess Solar or disassemble the module.
- All instructions should be read and understood before attempting to install, wire, operate and maintain the module.
- Please don't lift up PV modules using the attached cables or the junction box.
- All PV systems must be earthed. If there is no special regulation, please follow the National Electrical Code or other national code.
- 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 value of I_{sc} and V_{oc} marked on this module should be multiplied by 1.25 when determining component voltage ratings, conductor current ratings, fuse sizes, and size of controls connected to the PV output.
- Once the PV module has been shipped to the installation site, all of the parts should be unpacked properly with care.
- Do not stand or step on the PV module like below pictures show, this is prohibited and there is a risk of damage the module and cause injury for you.



- Only PV modules with the same cell size should be connected in series.
- During all transportation situations, please make sure no huge shock for

the vehicle or the modules, as this may damage the module or lead the cell to be crack.

- During all transportation situation, never let the module fall down from the vehicle, house or hands. This will break the cells of the modules.
- Do not clean the glass with chemicals.
- Do not disconnect any of the module when it is under load.

1.4 Fire prevention

The modules are rated fire Class C, and are suitable for mounting over a Class C roof. To maintain the corresponding fire prevention level, the tilt angle should be no less than 5 in/ft (127 mm/305 mm) when the modules are mounted on the roof.

2. Installation

2.1 Installation safety

- Always wear protective head gear, insulating gloves and safety shoes (with rubber soles).
- Keep the PV module packed in the carton until installation.
- 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 rain, snow or windy conditions.
- Due to the risk of electrical shock, do not perform any work if the terminals of the PV module are wet.
- Use insulated tools and do not use wet tools.
- When installing PV modules, do not drop any objects (e.g., PV modules or tools).
- Make sure flammable gasses are not generated or present near the installation site.
- Insert interconnect connectors fully and correctly. Check all connections. The interconnect cable should be securely fastened to the module frame, Cable support should be done in a way to avoid the connector from scratching or impacting the back sheet of the module.
- Do not touch the terminal box and the end of the interconnect cables (connectors) with bare hands during installation or under sunlight, regardless of whether the PV module is connected to or disconnect from the system.
- Do not expose the PV module to excessive loads on the surface of the PV module or twist the frame.
- Do not hit or put excessive load on the glass or back sheet, this may break the Cells or cause micro crack.
- During the operation, don't use sharp tools to wipe the back sheet and

glass, it would leave scratch on the module.

- Do not drill holes on the frame, it may cause corrosion of the frame.
- For BIPV or roof mounting structure, when install the modules, please try to follow the “from top to bottom” and/or “from left to right” principle, and don’t step on the module, that will damage the module and would be dangerous for personal safety. The roof installation of modules may affect the fireproof performance of building structure.

2.2 Installation Condition

2.2.1 Climate condition

Please install the modules in the following conditions:

- a) Operating temperature: within $-40^{\circ}\text{C}(-40^{\circ}\text{F})$ to $85^{\circ}\text{C}(185^{\circ}\text{F})$
- b) Relative humidity: within 45% to 95%.

* **Note:** The mechanical load bearing (include wind and snow loads) of the module is based on the mounting methods. The professional system installer must be responsible for mechanical load calculation according to the system design.

2.2.2 Site selection

In most applications, Econess solar PV modules should be installed in a location where they will receive maximum sunlight throughout the year. In the Northern Hemisphere, the module should typically face south, and in the Southern Hemisphere, the modules should typically face north. Modules facing 30 degrees away from true South (or North) will lose approximately 10 to 15 percent of their power output. If the module faces 60 degrees away from true South (or North), the power loss will be 20 to 30 percent.

When choosing a site, avoid trees, buildings or obstructions, which could cast shadows on the solar photovoltaic modules especially during the winter months when the arc of the sun is lowest over the horizon. Shading causes loss of output, even though the factory fitted bypass diodes of the PV module will minimize any such loss.

Do not install the PV module near naked flame or flammable materials. The spacing between the PV modules and the installation flat should be at least 15cm.

When solar modules are used to charge batteries, the battery must be installed in a manner, which will protect the performance of the system and the safety of its users. Follow the battery manufacturer’s guidelines concerning installation, operation and maintenance recommendations. In general, the battery (or battery bank) should be away from the main flow of people and animal traffic. Select a battery site that is protected from sunlight, rain, snow, debris, and is well ventilated. Most batteries generate hydrogen gas when charging, which

can be explosive. Do not light matches or create sparks near the battery bank. When a battery is installed outdoors, it should be placed in an insulated and ventilated battery case specifically designed for the purpose.

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.

2.2.3 Tilt angle selection

The tilt angle of the PV module is measured between the surface of the PV module and a horizontal ground surface (Figure 1). The PV module generates maximum output power when it faces the sun directly.

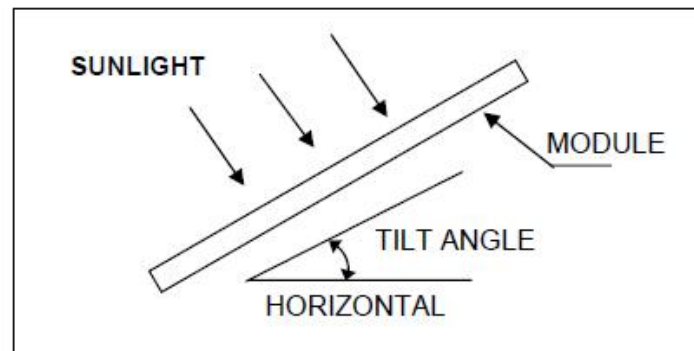


Figure1: PV module title angle

For standalone systems with batteries where the PV modules are attached to a permanent structure, the tilt angle of the PV modules should be selected to optimize the performance based on seasonal load and sunlight. In general, if the PV output is adequate when irradiance is low (e.g., winter), then the angle chosen should be adequate during the rest of the year. For grid-connected installations where the PV modules are attached to a permanent structure, PV modules should be tilted so that the energy production from the PV modules will be maximized on an annual basis.

2.3 Mechanical Installation introduction

Solar PV modules can be mounted using the following methods:

*** Note:** All installation methods herein are only for reference, and Econess solar will not provide related mounting components, the system installer or trained professional personnel must be responsible for the PV system's design, installation, and mechanical load calculation and security of the system.

*** Note:** before installing, you should confirm below important things:

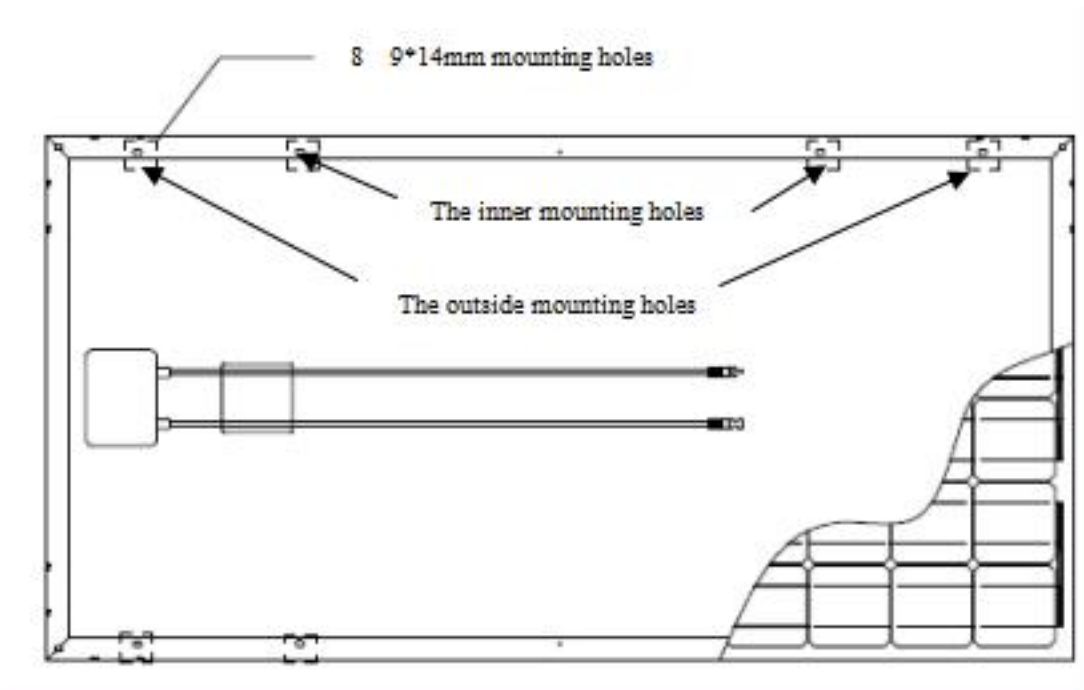
1) Visual check before installation, to make sure there is no bug in the packing and junction box as well as the surface of module, If have , remove and clean it .

2) Check the series number is right or not.

*** Note:** for UL 1703 , Econess modules are designed to meet a maximum positive (or upward) and negative (or downward,) pressure of 30 lb/ft², for IEC 61730-2 , the module has passed Mechanical loading test 5400Pa (for mono series) , 2400Pa (for poly series) . When mounting modules in snow-prone or high-wind environments, Special care should be taken to mount the modules in a manner that provides sufficient design strength while meeting local code requirements

2.3.1 Screw fitting:

The frame of each module has 8 mounting holes (Length* Width: 14mm*9mm) used to secure the modules to support structure. you can use the four symmetry holes close to the inside on module frame, if excessive wind or snow load are expected, you must use all the eight mounting holes. the mechanical load of the PV modules mounted through the inside mounting holes is 2400 Pa, if the outside mounting holes are further used, the mechanical load is 5400 Pa. The module frame must be attached to a mounting rail using M8 corrosion-proof screws together with spring washers and flat washers in eight symmetrical locations on the PV module. The applied torque should be big enough to fix it steadily. Please find detailed mounting information in the below illustration,



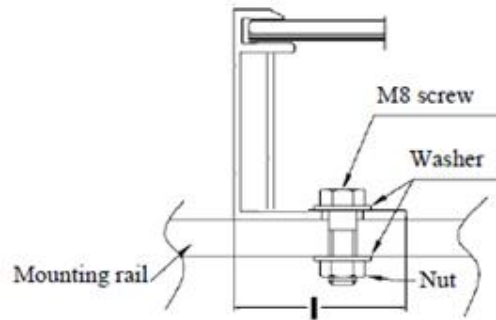


Figure 2 above: PV module installed with Screw fitting method*

2.3.2 Independent installation of Z-type clamp single module

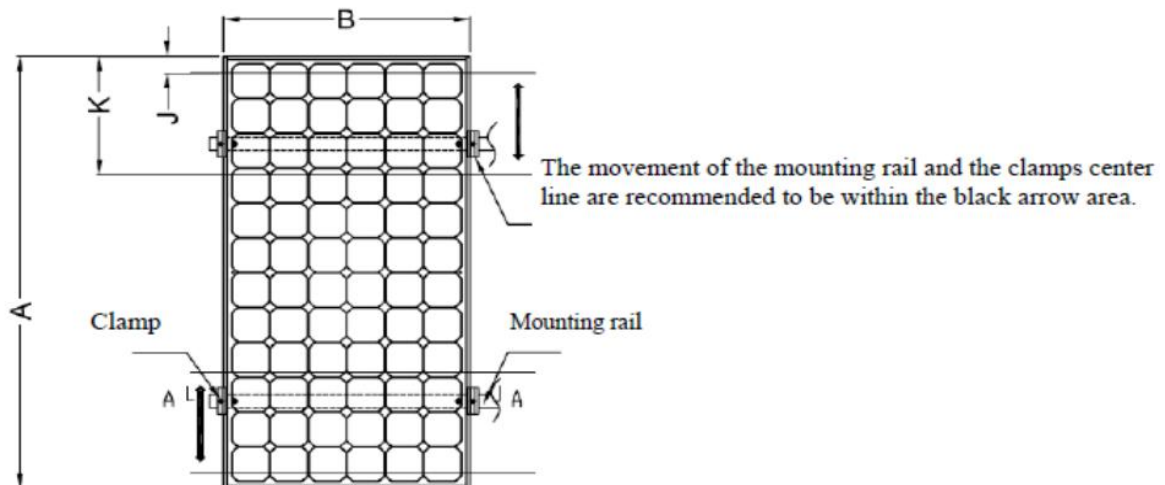
The module clamps should not come into contact with the front glass and must not deform the frame. Be sure to avoid shadowing effects from the module clamps.

The installation adopts Z-type clamp to ensure that each single module installation frame can bear the mechanical load test includes wind load 2400Pa and snow load 5400Pa independently.

The 2400Pa takes the inside mounting hole position as benchmark, and fix clamp transverse bar

The 5400Pa takes the inside installation hole position as benchmark, and fix clamp transverse bar.

The detailed installation method shall be seen in the following sketch:



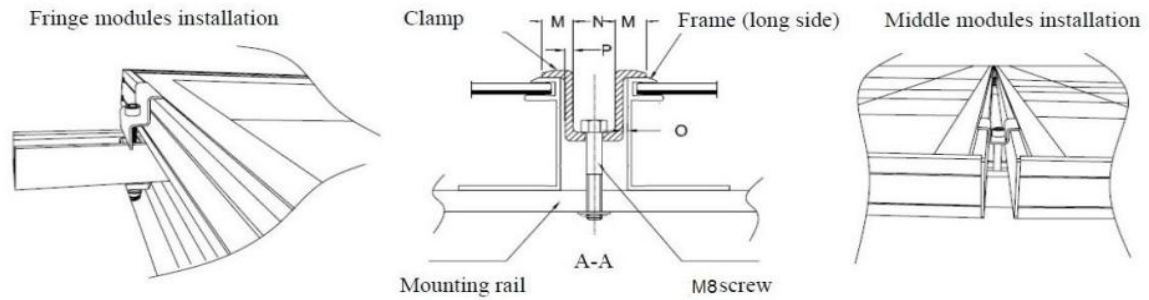


Figure3 above: PV module installed at long side with Clamp fitting method

Module type	Cell type	Cell quantity	Dimensions (mm)						
			A*B	J	K	M	O	N	P
EN125M-72-xxx	Mono	6*12	1580*808	300	400	5~10	0.5~2mm	≥14	>2mm
EN125M-96-xxx	Mono	8*12	1580*1064	280	400	5~10	0.5~2mm	≥14	>2mm
EN156P-60-xxx	poly	6*10	1640*992	280	420	5~10	0.5~2mm	≥14	>2mm
EN156M-60-xxx	Mono	6*10	1640*992	280	420	5~10	0.5~2mm	≥14	>2mm
EN156P-60-xxx	poly	6*10	1650*992	280	420	5~10	0.5~2mm	≥14	>2mm
EN156M-60-xxx	Mono	6*10	1650*992	280	420	5~10	0.5~2mm	≥14	>2mm
EN156P-72-xxx	poly	6*12	1956*992	280	480	5~11	0.5~2mm	≥14	>2mm
EN156M-72-xxx	Mono	6*12	1956*992	280	480	5~11	0.5~2mm	≥14	>2mm
EN156P-72-xxx	poly	6*12	1960*992	280	480	5~11	0.5~2mm	≥14	>2mm
EN156M-72-xxx	Mono	6*12	1960*992	280	480	5~11	0.5~2mm	≥14	>2mm
EN156M-120-xxx	Mono	6*10*2	1675*992	280	420	5~11	0.5~2mm	≥14	>2mm
EN156P-120-xxx	poly	6*10*2	1675*992	280	420	5~11	0.5~2mm	≥14	>2mm
EN156P-144-xxx	poly	6*12*2	2000*992	280	480	5~11	0.5~2mm	≥14	>2mm
EN156M-144-xxx	Mono	6*12*2	2000*992	280	480	5~11	0.5~2mm	≥14	>2mm
EN158P-120-XXX	poly	6*10*2	1684*1002	280	420	5~11	0.5~2mm	≥14	>2mm
EN158M-120-XXX	Mono	6*10*2	1684*1002	280	420	5~11	0.5~2mm	≥14	>2mm
EN158P-144-XXX	poly	6*12*2	2008*1002	280	480	5~11	0.5~2mm	≥14	>2mm
EN158M-144-XXX	Mono	6*12*2	2008*1002	280	480	5~11	0.5~2mm	≥14	>2mm
EN166M-120-XXX	Mono	6*10*2	1765*1048	280	420	5~11	0.5~2mm	≥14	>2mm
EN166M-144-XXX	Mono	6*12*2	2108*1048	280	480	5~11	0.5~2mm	≥14	>2mm
EN166M-120D-XX	Mono	6*10*2	1791*1052	280	420	5~11	0.5~2mm	≥14	>2mm
EN166M-144D-XX	Mono	6*12*2	2131*1052	280	480	5~11	0.5~2mm	≥14	>2mm

Table 1 above: Mechanical dimensions when modules installed at long side with Clamp fitting method

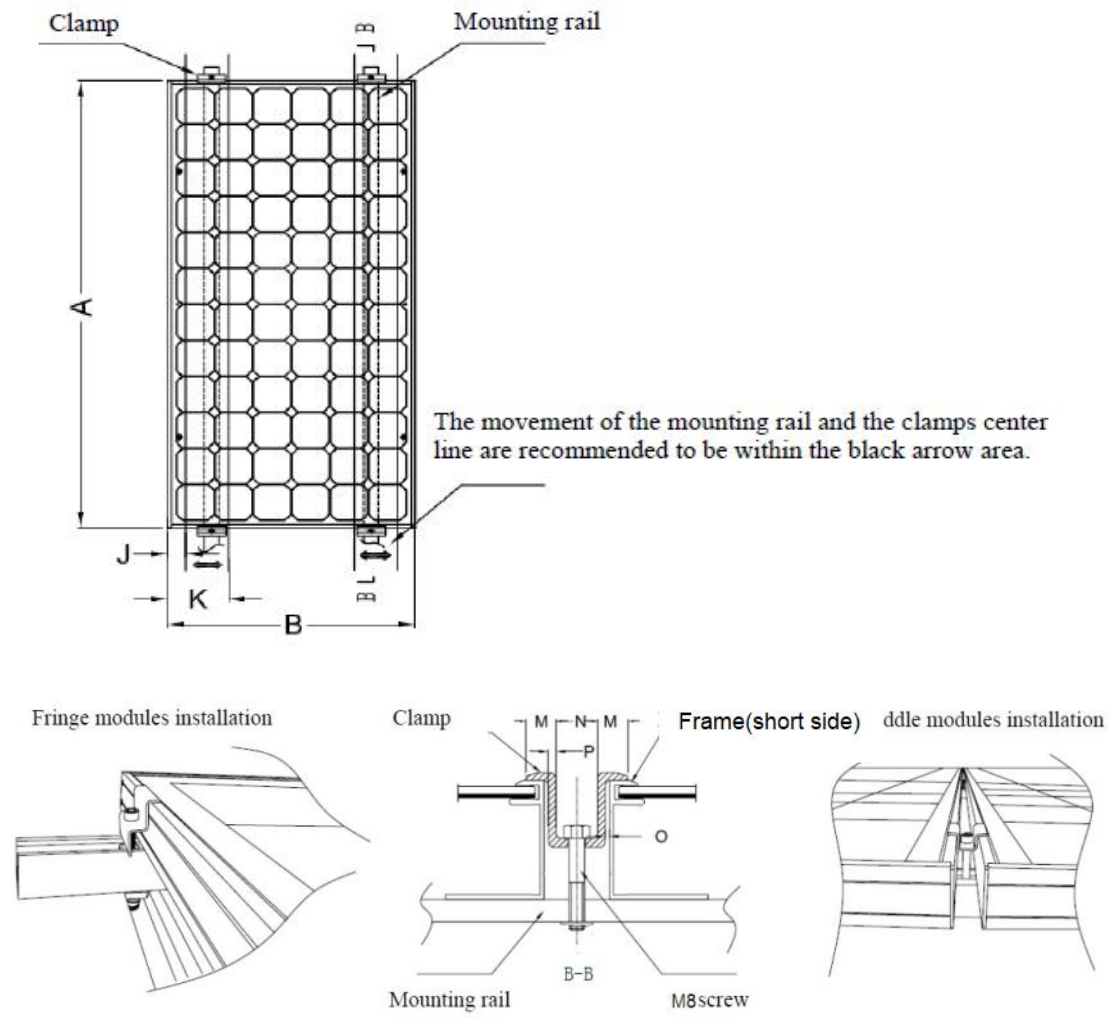


Figure 4 above: PV module installed at short side with Clamp fitting method

Module type	Cell type	Cell quantity	Dimensions (mm)						
			A*B	J	K	M	O	N	P
EN125M-72-xxx	Mono	6*12	1580*808	50	200	5~10	0.5~2mm	≥14	>2mm
EN125M-96-xxx	Mono	8*12	1580*1064	50	260	5~10	0.5~2mm	≥14	>2mm
EN156P-60-xxx	poly	6*10	1640*992	50	240	5~10	0.5~2mm	≥14	>2mm
EN156M-60-xxx	Mono	6*10	1640*992	50	240	5~10	0.5~2mm	≥14	>2mm
EN156P-60-xxx	poly	6*10	1650*992	50	240	5~10	0.5~2mm	≥14	>2mm
EN156M-60-xxx	Mono	6*10	1650*992	50	240	5~10	0.5~2mm	≥14	>2mm
EN156P-72-xxx	poly	6*12	1956*992	50	240	5~11	0.5~2mm	≥14	>2mm
EN156M-72-xxx	Mono	6*12	1956*992	50	240	5~11	0.5~2mm	≥14	>2mm
EN156P-72-xxx	poly	6*12	1960*992	50	240	5~11	0.5~2mm	≥14	>2mm
EN156M-72-xxx	Mono	6*12	1960*992	50	240	5~11	0.5~2mm	≥14	>2mm
EN156P-120-xxx	poly	6*10*2	1675*992	50	240	5~10	0.5~2mm	≥14	>2mm
EN156M-120-xxx	Mono	6*10*2	1675*992	50	240	5~10	0.5~2mm	≥14	>2mm
EN156P-144-xxx	poly	6*12*2	2000*992	50	240	5~11	0.5~2mm	≥14	>2mm
EN156M-144-xxx	Mono	6*12*2	2000*992	50	240	5~11	0.5~2mm	≥14	>2mm
EN158P-120-XXX	poly	6*10*2	1684*1002	50	240	5~10	0.5~2mm	≥14	>2mm
EN158M-120-XXX	Mono	6*10*2	1684*1002	50	240	5~10	0.5~2mm	≥14	>2mm
EN158P-144-XXX	poly	6*12*2	2008*1002	50	240	5~11	0.5~2mm	≥14	>2mm
EN158M-144-XXX	Mono	6*12*2	2008*1002	50	240	5~11	0.5~2mm	≥14	>2mm
EN166M-120-XXX	poly	6*10*2	1765*1048	50	240	5~10	0.5~2mm	≥14	>2mm
EN166M-144-XXX	Mono	6*12*2	2108*1048	50	240	5~11	0.5~2mm	≥14	>2mm
EN166M-120D-XXX	Mono	6*10*2	1791*1052	50	240	5~10	0.5~2mm	≥14	>2mm
EN166M-144D-XXX	Mono	6*12*2	2131*1052	50	240	5~11	0.5~2mm	≥14	>2mm

Table 2 above: Mechanical dimensions when modules installed at short side with Clamp

fitting method

3. Wiring and connection

a) Before this procedure, please read the operation instructions of the PV system carefully. Make wiring by Multi-connecting cables between the PV modules in series or parallel connection, which is determined by user's configuration requirement for system power, current and voltage.

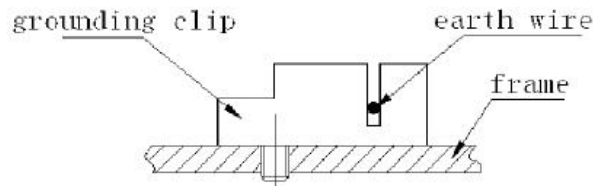
b) PV module connected in series should have similar current. Modules must not be connected together to create a voltage higher than the permitted system voltage(1000VDC), as reference the maximum number of modules in series (N) can be easily calculated by dividing the Maximum System Voltage of the modules by the respective Voc value of the module. Any more please always take into consideration the variation of the voltage under different temperatures, the Voc of the modules will be rise when the temperature drops.

For example: with EN125M-72 – 190 modules (Max. System voltage is 1000V) the maximum series modules configuration number should NEVER can exceed $N=17$ ($1000V DC / (1.25 * Voc) = 1000 / (1.25 * 45.2) = 17.6$)

c) PV module connect in parallel should have similar voltage. As reference the maximum number of modules in parallel (M) can be easily calculated by dividing the maximum rated current (indicated in the electrical specification below) by Isc value of the module, and then plus 1. Any more please always take into consideration the variation of the current under different temperatures, the Isc of the modules will be rise when the temperature goes up.

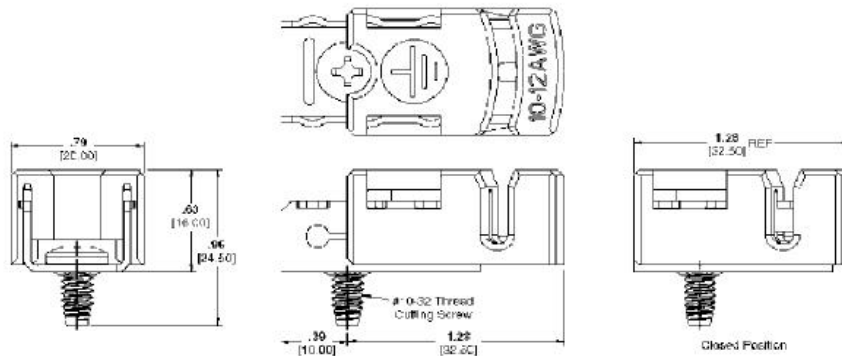
d) Open the connection box of the control system and connect the cabled from the PV arrays to the connection box in accordance with the installation indication of the PV control systems. The cross-sectional area and cable connector capacity must satisfy the maximum short-circuit of PV system (For a single component, we recommended the cross-sectional area of cables is 4mm^2 and the rated current of connectors is more than 10A), otherwise cables and connectors will become overheating for large current. Please pay attention: the temperature limit of cables is 90°C and the temperature limit of connector 85°C .For field connection , we recommended the cross-sectional area of cables is 4mm^2 and the rated current of connectors is more than 10A)

e) All module frames and mounting racks must be properly grounded in accordance with local and national electrical codes. Please refer to the below drawing. It is recommended that the applied torque is 2.3 to 2.8N.m.

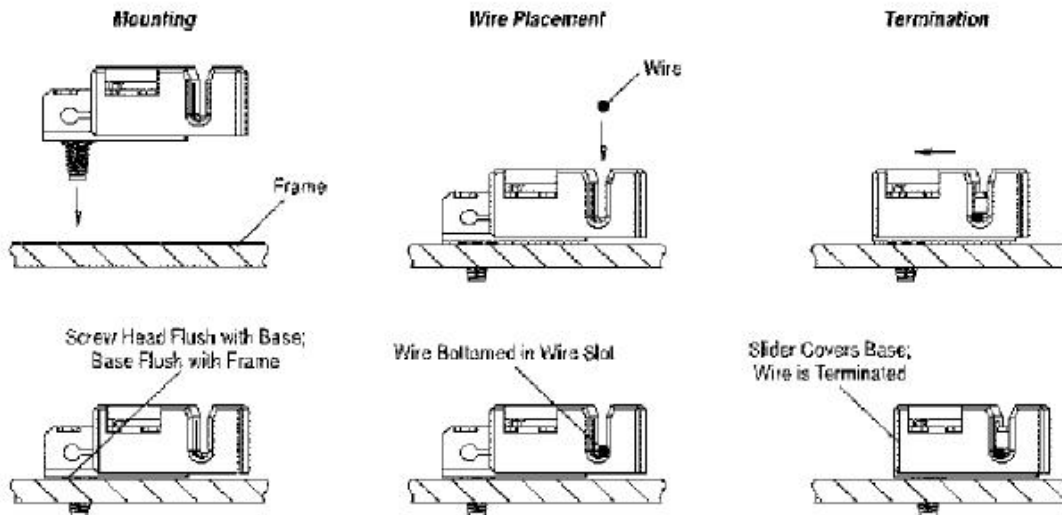


N100631039

Grounding Clip:



Notice: Use TYCO. 195/381-1 (UL Certificate No. E69905)



Econess modules can also be grounded using third party ground washers or clip devices as long as the products are approved for grounding metallic frames of PV modules.

Alternate grounding options built into the racking system are acceptable so long as they have been UL approved

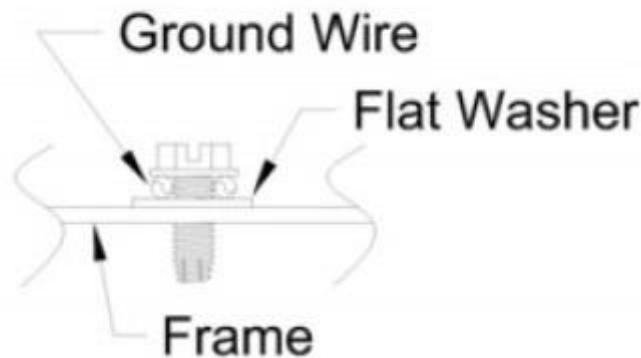
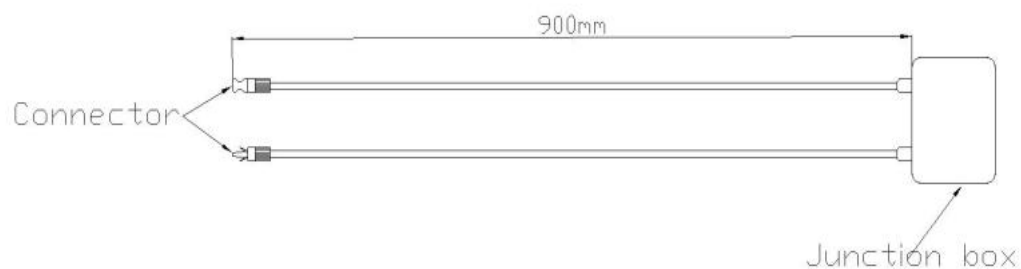
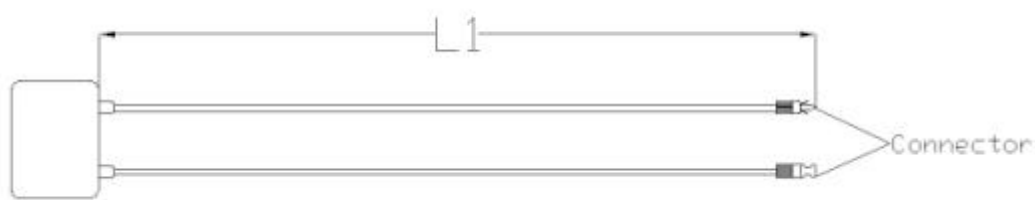


Figure 5: The graph of Grounding

- f) Follow the requirements of applicable local and national electrical codes.
- g) These modules contain factory installed bypass diode .if these modules are incorrectly connected to each other, the bypass diodes, cable or junction box may be damaged.
- h) The module shall wire in accordance with the NEC, the grounding method of the frame of arrays shall comply with the NEC, article 250
- i) It is recommended that the screw be tightened to a torque of 2.3 and 2.8NM
- j) The cable of the junction box is defined as L1, as showed below. For Econess Energy standard module, L1 is 900 mm; and for customized module, L1 can be 1000mm. Please base on your condition, take the cable length into consideration before designing the wiring layout.



4. Maintenance and care

- a) A built up of dust or dirt on the module(s) front face will result in a decreased energy output. Clean the panel(s) preferably once per annum if possible (depend on site conditions) using a soft cloth dry or damp, as necessary.
- b) Never use abrasive material under any circumstances.
- c) Examine the PV module(s) for signs of deterioration. Check all wiring for possible rodent damage, weathering and that all connections are tight and corrosion free. Check electrical leakage to ground.
- d) Check fixing screws and mounting brackets are tight, adjust and tighten as necessary.
- e) When clean the modules, it is not allowed to stand on the module or the likes. Like below pictures show, this it prohibited.



5. Electrical specification

The module electrical rating are measured under Standard Test Conditions, which are 1000W/m², irradiance with AM 1.5 spectrum and 25 deg (77°F) ambient temperature. The module might produce more or less voltage or current than rating value in uncertainty condition. Accordingly, the values of I_{sc} and V_{oc} 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 connected to the PV output. Tables below are electrical characteristics of PV products at STC and the tolerance of I_{sc}, V_{oc}, V_{mp} and I_{mp} is ±5%.

5.1.Electrical specifications of EN156P-72- xxx (xxx=300-350) Series Poly-crystalline solar modules

Module Type	EN156P-72-300	EN156P-72-305	EN156P-72-310	EN156P-72-315	EN156P-72-320	EN156P-72-325	EN156P-72-330	EN156P-72-335	EN156P-72-340	EN156P-72-345	EN156P-72-350
Maximum Power (Pmax)	300	305	310	315	320	325	330	335	340	345	350
Maximum Power Voltage (Vmp)	35.85	36.19	36.48	36.80	37.11	37.43	37.73	38.04	38.31	38.55	38.81
Maximum Power Current (Imp)	8.37	8.43	8.50	8.56	8.63	8.69	8.75	8.81	8.88	8.95	9.02
Open-circuit Voltage (Voc)	44.40	44.71	44.97	45.24	45.52	45.71	45.90	46.23	46.44	46.68	46.93
Short-circuit Current (Isc)	8.86	8.94	9.02	9.09	9.16	9.23	9.29	9.33	9.40	9.48	9.55
Maximum system voltage	600V (UL) /1000V (IEC) DC/1500V (IEC) DC										
Maximum rated current series	15A										
Dimensions	1956×992×H mm (H=35、40、45、50.mm) 1960×992×H mm (H=35、40、45、50.mm)										

5.2.Electrical specifications of EN156P-60- xxx (xxx=250-290)Series Poly-crystalline solar modules

Module Type	EN156P-60-250	EN156P-60-255	EN156P-60-260	EN156P-60-265	EN156P-60-270	EN156P-60-275	EN156P-60-280	EN156P-60-285	EN156P-60-290
Maximum Power (Pmax)	250	255	260	265	270	275	280	285	290
Maximum Power Voltage (Vmp)	30.16	30.45	30.72	31.04	31.35	31.71	32.05	32.33	32.64
Maximum Power Current (Imp)	8.30	8.38	8.47	8.55	8.62	8.68	8.75	8.82	8.89
Open-circuit Voltage (Voc)	37.35	37.63	37.92	38.22	38.51	38.69	39.02	39.31	39.60
Short-circuit Current (Isc)	8.87	8.93	8.98	9.04	9.09	9.16	9.24	9.30	9.36
Module Efficiency(%)	15.27%	15.58%	15.88%	16.19%	16.50%	16.80%	17.11%	17.41%	17.72%
Maximum system voltage	600V (UL) /1000V (IEC) DC/1500V (IEC) DC								
Maximum rated current series	15A								
Dimensions	1640×992×H mm (H=35、40、45mm) 1650×992×H mm (H=35、40、45mm)								

5.3.Electrical specifications of EN156P-54- xxx (xxx = 225 - 260) Series Poly-crystalline solar modules

Module Type	EN-156M-54-225	EN-156M-54-230	EN-156M-54-235	EN-156M-54-240	EN-156M-54-245	EN-156M-54-250	EN-156M-54-255	EN-156M-54-260
Maximum Power at STC(Pmax)	225Wp	230Wp	235Wp	240Wp	245Wp	250Wp	255Wp	260Wp
Maximum Power Voltage (Vmp)	27.4V	27.49V	27.63V	27.78V	28V	28.22V	28.37V	28.55V
Maximum Power Current (Imp)	8.21A	8.36A	8.51A	8.63A	8.75A	8.87A	8.99A	9.11A
Open-circuit Voltage (Voc)	33.62V	33.74V	33.91V	34.09V	34.36V	34.63V	34.81V	35.02V
Short-circuit Current (Isc)	8.69A	8.85A	9.01A	9.14A	9.26A	9.38A	9.51A	9.63A
Maximum system Voltage	1000VDC/1500VDC							
Dimensions	1482x992x35mm							
Maximum rated current series(A)	15A							

5.4.Electrical specifications of EN156P-48-xxx (xxx=200-230) Series Poly-crystalline solar modules

Module Type	EN-156M-48-200	EN-156M-48-205	EN-156M-48-210	EN-156M-48-215	EN-156M-48-220	EN-156M-48-225	EN-156M-48-230
Maximum Power at STC(Pmax)	200Wp	205Wp	210Wp	215Wp	220Wp	225Wp	230Wp
Maximum Power Voltage (Vmp)	24.73V	24.85V	24.97V	25.09V	25.26V	25.43V	25.59V
Maximum Power Current (Imp)	8.09A	8.25A	8.41A	8.57A	8.71A	8.85A	8.99A
Open-circuit Voltage (Voc)	30.35V	30.5V	30.64v	30.79V	31V	31.21V	31.39V
Short-circuit Current (Isc)	8.57A	8.74A	8.9A	9.07A	9.22A	9.37A	9.53A
Maximum system Voltage	1000VDC/1500VDC						
Dimensions	1325x992x35mm						
Maximum rated current series(A)	15A						

5.5.Electrical specifications of EN156P-36 xxx(xxx=150-175) Series Poly-crystalline solar modules

Module Type	EN-156M-36-150	EN-156M-36-155	EN-156M-36-160	EN-156M-36-165	EN-156M-36-170	EN-156M-36-175
Maximum Power at STC(Pmax)	150Wp	155Wp	160Wp	165Wp	170Wp	175Wp
Maximum Power Voltage (Vmp)	19V	19.23V	19.38V	19.53V	19.70V	19.86V
Maximum Power Current (Imp)	7.89A	8.08A	8.27A	8.46A	8.61A	8.81A
Open-circuit Voltage (Voc)	23.32V	23.6V	23.78V	23.97V	24.08V	24.25V
Short-circuit Current (Isc)	8.35A	8.56A	8.76A	8.96A	9.16A	9.33A
Maximum system Voltage	1000VDC/1500VDC					
Dimensions	1008x992x35mm					
Maximum rated current series(A)	15A					

5.6. Electrical specifications of EN156M-72- xxx (xxx=300-370)Series Mono crystalline solar modules

Module Type	EN156M-72-330	EN156M-72-335	EN156M-72-340	EN156M-72-345	EN156M-72-350	EN156M-72-355	EN156M-72-360	EN156M-72-365	EN156M-72-370
Maximum Power (Pmax)	330	335	340	345	350	355	360	365	370
Maximum Power Voltage (Vmp)	37.65	37.93	38.21	38.51	38.7	38.94	39.14	39.32	39.62
Maximum Power Current (Imp)	8.77	8.84	8.9	8.97	9.05	9.12	9.2	9.29	9.34
Open-circuit Voltage (Voc)	46.35	46.57	46.8	47.02	47.33	47.61	47.84	48.04	48.31
Short-circuit Current (Isc)	9.43	9.47	9.5	9.54	9.59	9.64	9.69	9.77	9.84
Maximum system voltage	600V (UL) /1000V (IEC) DC/1500V (IEC) DC								
Maximum rated current series	15A								
Dimensions	1956×992×H mm (H=40、45、50.mm) 1960×992×H mm (H=40、45、50.mm)								

5.7. Electrical specifications of EN156M-60- xxx (xxx=275-305)Series Mono crystalline solar modules

Module Type	EN156M-60-275	EN156M-60-280	EN156M-60-285	EN156M-60-290	EN156M-60-295	EN156M-60-300	EN156M-60-305
Maximum Power (Pmax)	275	280	285	290	295	300	305
Maximum Power Voltage (Vmp)	31.52	31.81	32.14	32.42	32.61	32.9	33.22
Maximum Power Current (Imp)	8.73	8.81	8.87	8.95	9.05	9.12	9.19
Open-circuit Voltage (Voc)	38.70	38.94	39.12	39.33	39.52	39.71	39.90
Short-circuit Current (Isc)	9.31	9.34	9.39	9.44	9.49	9.57	9.64
Maximum system voltage	600V (UL) /1000V (IEC) DC/1500V (IEC) DC						
Maximum rated current series	15A						
Dimensions	1640×992×H mm (H=35、40、45mm) 1650×992×H mm (H=35、40、45mm)						

5.8. Electrical specifications of EN156M-54- xxx (xxx=245-275)Series Mono crystalline solar modules

Module Type	EN-156P-54-245	EN-156P-54-250	EN-156P-54-255	EN-156P-54-260	EN-156P-54-265	EN-156P-54-270	EN-156P-54-275
Maximum Power at STC(Pmax)	245Wp	250Wp	255Wp	260Wp	265Wp	270Wp	275Wp
Maximum Power Voltage (Vmp)	29.91V	30.14V	30.33V	30.54V	30.75V	30.93V	31.11V
Maximum Power Current (Imp)	8.2A	8.31A	8.42A	8.52A	8.62A	8.73A	8.84A
Open-circuit Voltage (Voc)	36.26V	36.54V	36.78V	36.93V	37.11V	37.29V	37.57V
Short-circuit Current (Isc)	8.87A	9.00A	9.12A	9.21A	9.3A	9.41A	9.49A
Maximum system Voltage	1000VDC/1500VDC						
Dimensions	1482x992x35mm						
Maximum rated current series(A)	15A						

5.9. Electrical specifications of EN156M-48- xxx (xxx=220-245)Series Mono crystalline solar modules

Module Type	EN-156P-48-220	EN-156P-48-225	EN-156P-48-230	EN-156P-48-235	EN-156P-48-240	EN-156P-48-245
Maximum Power at STC(Pmax)	220Wp	225Wp	230Wp	235Wp	240Wp	245Wp
Maximum Power Voltage (Vmp)	26.01V	26.17V	26.35V	26.53V	26.73V	26.89V
Maximum Power Current (Imp)	8.47A	8.60A	8.73A	8.86A	8.98A	9.11A
Open-circuit Voltage (Voc)	31.53V	31.77V	31.94V	32.12V	32.31V	32.48V
Short-circuit Current (Isc)	9.16A	9.32A	9.44A	9.56A	9.68A	9.77A
Maximum system Voltage	1000VDC/1500VDC					
Dimensions	1325x992x35mm					
Maximum rated current series(A)	15A					

5.10. Electrical specifications of EN156M-36- xxx (xxx=165-185)Series Mono crystalline solar modules

Module Type	EN-156P-36-165	EN-156P-36-170	EN-156P-36-175	EN-156P-36-180	EN-156P-36-185	
Maximum Power at STC(Pmax)	165Wp	170Wp	175Wp	180Wp	185Wp	
Maximum Power Voltage (Vmp)	19.45V	19.69V	19.91V	20.12V	20.29V	
Maximum Power Current (Imp)	8.47A	8.63A	8.79A	8.95A	9.12A	
Open-circuit Voltage (Voc)	23.58V	23.82V	24.06V	24.27V	24.43V	
Short-circuit Current (Isc)	9.16A	9.31A	9.45A	9.61A	9.76A	
Maximum system Voltage	1000VDC/1500VDC					
Dimensions	1008x992x35mm					
Maximum rated current series(A)	15A					

5.11. Electrical specifications of EN156P-144- xxx (xxx=300-355)Series Poly crystalline solar modules

Module Type	EN156P-144-300	EN156P-144-305	EN156P-144-310	EN156P-144-315	EN156P-144-320	EN156P-144-325	EN156P-144-330	EN156P-144-335	EN156P-144-340	EN156P-144-345	EN156P-144-350	EN156P-144-355
Maximum Power (Pmax)	300	305	310	315	320	325	330	335	340	345	350	355
Maximum Power Voltage (Vmp)	35.85	36.19	36.48	36.80	37.11	37.43	37.73	38.04	38.31	38.55	38.81	39.10
Maximum Power Current (Imp)	8.37	8.43	8.50	8.56	8.63	8.69	8.75	8.81	8.88	8.95	9.02	9.08
Open-circuit Voltage (Voc)	44.40	44.71	44.97	45.24	45.52	45.71	45.90	46.23	46.44	46.68	46.93	47.20
Short-circuit Current (Isc)	8.86	8.94	9.02	9.09	9.16	9.23	9.29	9.33	9.40	9.48	9.55	9.62
Maximum system voltage	1000V (IEC) DC/1500V (IEC) DC											
Maximum rated current series	15A											
Dimensions	2000*992*40/35mm											

5.12. Electrical specifications of EN156P-120- xxx (xxx=250-295) Series Poly crystalline solar modules

Module Type	EN156P-1 20-250	EN156P-1 20-255	EN156P-1 20-260	EN156P-1 20-265	EN156P-1 20-270	EN156P-1 20-275	EN156P-1 20-280	EN156P-1 20-285	EN156P-1 20-290	EN156P-1 20-295
Maximum Power (Pmax)	250	255	260	265	270	275	280	285	290	295
Maximum Power Voltage (Vmp)	30.16	30.45	30.72	31.04	31.35	31.71	32.05	32.33	32.64	32.91
Maximum Power Current (Imp)	8.30	8.38	8.47	8.55	8.62	8.68	8.75	8.82	8.89	8.97
Open-circuit Voltage (Voc)	37.35	37.63	37.92	38.22	38.51	38.69	39.02	39.31	39.60	39.89
Short-circuit Current (Isc)	8.87	8.93	8.98	9.04	9.09	9.16	9.24	9.30	9.36	9.44
Maximum system voltage	1000V (IEC) DC/1500V (IEC) DC									
Maximum rated current series	15A									
Dimensions	1675×992×40/35mm									

5.13. Electrical specifications of EN158P-144- xxx (xxx=300-355)Series Poly crystalline solar modules

Module Type	EN158P-144-300	EN158P-144-305	EN158P-144-310	EN158P-144-315	EN158P-144-320	EN158P-144-325	EN158P-144-330	EN158P-144-335	EN158P-144-340	EN158P-144-345	EN158P-144-350	EN158P-144-355
Maximum Power (Pmax)	300	305	310	315	320	325	330	335	340	345	350	355
Maximum Power Voltage (Vmp)	35.85	36.19	36.48	36.80	37.11	37.43	37.73	38.04	38.31	38.55	38.81	39.10
Maximum Power Current (Imp)	8.37	8.43	8.50	8.56	8.63	8.69	8.75	8.81	8.88	8.95	9.02	9.08
Open-circuit Voltage (Voc)	44.40	44.71	44.97	45.24	45.52	45.71	45.90	46.23	46.44	46.68	46.93	47.20
Short-circuit Current (Isc)	8.86	8.94	9.02	9.09	9.16	9.23	9.29	9.33	9.40	9.48	9.55	9.62
Maximum system voltage	1000V (IEC) DC/1500V (IEC) DC											
Maximum rated current series	15A											
Dimensions	2008*1002*40/35mm 2018*1002*40*35mm											

5.14. Electrical specifications of EN158P-120- xxx (xxx=250-295) Series Poly crystalline solar modules

Module Type	EN158P-1 20-250	EN158P-1 20-255	EN158P-1 20-260	EN158P-1 20-265	EN158P-1 20-270	EN158P-1 20-275	EN158P-1 20-280	EN158P-1 20-285	EN158P-1 20-290	EN158P-1 20-295
Maximum Power (Pmax)	250	255	260	265	270	275	280	285	290	295
Maximum Power Voltage (Vmp)	30.16	30.45	30.72	31.04	31.35	31.71	32.05	32.33	32.64	32.91
Maximum Power Current (Imp)	8.30	8.38	8.47	8.55	8.62	8.68	8.75	8.82	8.89	8.97
Open-circuit Voltage (Voc)	37.35	37.63	37.92	38.22	38.51	38.69	39.02	39.31	39.60	39.89
Short-circuit Current (Isc)	8.87	8.93	8.98	9.04	9.09	9.16	9.24	9.30	9.36	9.44
Maximum system voltage	1000V (IEC) DC/1500V (IEC) DC									
Maximum rated current series	15A									
Dimensions	1684*1002*40/35 1692*1002*40/35									

5.15. Electrical specifications of EN156M-144- xxx (xxx=345-395) Series Mono crystalline solar modules

Module Type	EN156M-144-345	EN156M-144-350	EN156M-144-355	EN156M-144-360	EN156M-144-365	EN156M-144-370	EN156M-144-375	EN156M-144-380	EN156M-144-385	EN156M-144-390	EN156M-144-395
Maximum Power (Pmax)	345	350	355	360	365	370	375	380	385	390	395
Maximum Power Voltage (Vmp)	38.51	38.70	38.94	39.14	39.32	39.62	39.89	40.15	40.43	40.69	40.94
Maximum Power Current (Imp)	8.97	9.05	9.12	9.20	9.29	9.34	9.41	9.47	9.53	9.59	9.66
Open-circuit Voltage (Voc)	47.02	47.33	47.61	47.84	48.04	48.31	48.59	48.81	49.11	49.34	49.55
Short-circuit Current (Isc)	9.54	9.59	9.64	9.69	9.77	9.84	9.91	9.99	10.07	10.15	10.22
Module Efficiency(%)	17.39%	17.64%	17.89%	18.15%	18.40%	18.65%	18.90%	19.15%	19.41%	19.66%	19.91%
Maximum system voltage	1000V (IEC) DC/1500V (IEC) DC										
Maximum rated current series	15A										
Dimensions	2000*992*40mm										

5.16. Electrical specifications of EN156M-120- xxx (xxx=290-300)Series Mono crystalline solar modules

Module Type	EN156M-120-290	EN156M-120-295	EN156M-120-300	EN156M-120-305	EN156M-120-310	EN156M-120-315	EN156M-120-320	EN156M-120-325	EN156M-120-330
Maximum Power (Pmax)	290	295	300	305	310	315	320	325	330
Maximum Power Voltage (Vmp)	32.42	32.61	32.90	33.22	33.53	33.85	34.16	34.45	34.76
Maximum Power Current (Imp)	8.95	9.05	9.12	9.19	9.25	9.31	9.37	9.42	9.48
Open-circuit Voltage (Voc)	39.33	39.52	39.71	39.9	40.12	40.34	40.55	40.75	40.96
Short-circuit Current (Isc)	9.44	9.49	9.57	9.64	9.71	9.78	9.86	9.92	9.99
Maximum system voltage	1000V (IEC) DC/1500V (IEC) DC								
Maximum rated current series	15A								
Dimensions	1675*992*35mm								

5.17. Electrical specifications of EN158M-144- xxx (xxx=370-415)Series Mono crystalline solar modules

Module Type	EN158M-144-370	EN158M-144-375	EN158M-144-380	EN158M-144-385	EN158M-144-390	EN158M-144-395	EN158M-144-400	EN158M-144-405	EN158M-144-410	EN158M-144-415
Maximum Power (Pmax)	370	375	380	385	390	395	400	405	410	415
Maximum Power Voltage (Vmp)	39.62	39.89	40.15	40.43	40.69	40.94	41.20	41.47	41.72	41.98
Maximum Power Current (Imp)	9.34	9.41	9.47	9.53	9.59	9.66	9.72	9.78	9.87	9.93
Open-circuit Voltage (Voc)	48.31	48.59	48.81	49.11	49.34	49.55	49.79	50.04	50.31	50.55
Short-circuit Current (Isc)	9.84	9.91	9.99	10.07	10.15	10.22	10.31	10.39	10.47	10.55
Maximum system voltage	1000V (IEC) DC/1500V (IEC) DC									
Maximum rated current series	15A									
Dimensions	2008*1002*40/35 2018*1002*40/35									

5.18. Electrical specifications of EN158M-120- xxx (xxx=310-345)Series Mono crystalline solar modules

Module Type	EN158M-120-310	EN158M-120-315	EN158M-120-320	EN158M-120-325	EN158M-120-330	EN158M-120-335	EN158M-120-340	EN158M-120-345
Maximum Power (Pmax)	310	315	320	325	330	335	340	345
Maximum Power Voltage (Vmp)	33.53	33.85	34.16	34.45	34.76	35.04	35.31	35.59
Maximum Power Current (Imp)	9.25	9.31	9.37	9.42	9.48	9.54	9.61	9.66
Open-circuit Voltage (Voc)	40.12	40.34	40.55	40.75	40.96	41.16	41.37	41.55
Short-circuit Current (Isc)	9.71	9.78	9.86	9.92	9.99	10.05	10.12	10.19
Maximum system voltage	1000V (IEC) DC/1500V (IEC) DC							
Maximum rated current series	15A							
Dimensions	1684*1002*40/35 1692*1002*40/35							

5.19. Electrical specifications of EN166M-144- xxx (xxx=405-460)Series Mono crystalline solar modules

Module Type	EN166M-144-405	EN166M-144-410	EN166M-144-415	EN166M-144-420	EN166M-144-425	EN166M-144-430	EN166M-144-435	EN166M-144-440	EN166M-144-445	EN166M-144-450	EN166M-144-455	EN166M-144-460
Maximum Power (Pmax)	405	410	415	420	425	430	435	440	445	450	455	460
Maximum Power Voltage (Vmp)	41.47	41.72	41.97	42.19	42.44	42.69	42.94	43.19	43.44	43.69	43.94	44.19
Maximum Power Current (Imp)	9.78	9.84	9.90	9.96	10.02	10.08	10.14	10.20	10.26	10.32	10.37	10.43
Open-circuit Voltage (Voc)	50.04	50.31	50.59	50.87	51.15	51.43	51.71	51.99	52.27	52.55	52.83	53.11
Short-circuit Current (Isc)	10.39	10.45	10.51	10.57	10.63	10.69	10.75	10.81	10.87	10.93	10.99	11.05
Maximum system voltage	1000V (IEC) DC/1500V (IEC) DC											
Maximum rated current series	20A											
Dimensions	2108*1048*H mm (H=35、40mm)											

5.20. Electrical specifications of EN166M-120- xxx (xxx=335-380)Series Mono crystalline solar modules

Module Type	EN166M-120-335	EN166M-120-340	EN166M-120-345	EN166M-120-350	EN166M-120-355	EN166M-120-360	EN166M-120-365	EN166M-120-370
Maximum Power (Pmax)	335	340	345	350	355	360	365	370
Maximum Power Voltage (Vmp)	35.04	35.31	35.59	35.92	36.21	36.52	36.80	37.07
Maximum Power Current (Imp)	9.54	9.61	9.66	9.73	9.80	9.86	9.92	9.99
Open-circuit Voltage (Voc)	41.16	41.37	41.55	41.74	41.89	42.04	42.18	42.33
Short-circuit Current (Isc)	10.05	10.12	10.19	10.26	10.34	10.40	10.47	10.53
Maximum system voltage	1000V (IEC) DC/1500V (IEC) DC							
Maximum rated current series	20A							
Dimensions	1765*1048*H mm (H=35、40mm)							

5.21. Electrical specifications of EN166M-144D- xxx (xxx=405-460)Series Mono crystalline solar modules

Module Type	EN166M-144D-405	EN166M-144D-410	EN166M-144D-415	EN166M-144D-420	EN166M-144D-425	EN166M-144D-430	EN166M-144D-435	EN166M-144D-440	EN166M-144D-445	EN166M-144D-450	EN166M-144D-455	EN166M-144D-460
Maximum Power (Pmax)	405	410	415	420	425	430	435	440	445	450	455	460
Maximum Power Voltage (Vmp)	41.47	41.72	41.97	42.19	42.44	42.69	42.94	43.19	43.44	43.69	43.94	44.19
Maximum Power Current (Imp)	9.78	9.84	9.90	9.96	10.02	10.08	10.14	10.20	10.26	10.32	10.37	10.43
Open-circuit Voltage (Voc)	50.04	50.31	50.59	50.87	51.15	51.43	51.71	51.99	52.27	52.55	52.83	53.11
Short-circuit Current (Isc)	10.39	10.45	10.51	10.57	10.63	10.69	10.75	10.81	10.87	10.93	10.99	11.05
Maximum system voltage	1000V (IEC) DC/1500V (IEC) DC											
Maximum rated current series	20A											
Dimensions	2131*1052*30mm											

5.22. Electrical specifications of EN166M-120D- xxx (xxx=335-380)Series Mono crystalline solar modules

Module Type	EN166M-120 D-335	EN166M-120 D-340	EN166M-120 D-345	EN166M-120 D-350	EN166M-120 D-355	EN166M-120 D-360	EN166M-120 D-365	EN166M-120 D-370
Maximum Power (Pmax)	335	340	345	350	355	360	365	370
Maximum Power Voltage (Vmp)	35.04	35.31	35.59	35.92	36.21	36.52	36.80	37.07
Maximum Power Current (Imp)	9.54	9.61	9.66	9.73	9.80	9.86	9.92	9.99
Open-circuit Voltage (Voc)	41.16	41.37	41.55	41.74	41.89	42.04	42.18	42.33
Short-circuit Current (Isc)	10.05	10.12	10.19	10.26	10.34	10.40	10.47	10.53
Maximum system voltage	1000V (IEC) DC/1500V (IEC) DC							
Maximum rated current series	20A							
Dimensions	1791*1052*30mm							

6.Disclaimer of Liability

Because the use of the manual and the conditions or methods of installation, operation, use and maintenance of photovoltaic (pv) product are beyond Econess's control, Econess 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.

No responsibility is assumed by Econess for any infringement of patents or other rights of third parties, which may result from 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 Econess'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, expresses or implied . Econess reserve the right to change the manual, the PV produce, the specifications, or product information sheets without prior notice.

7. Contact us

Econess Energy Co., Ltd.

N0.58 Haida Road, Huashi Town, Jiangyin, Jiangsu Province, China,

Postcode: 214421

Tel:(86)-0510-86076868

Fax:(86)-0510-86076878

Customer Service: sales@econess-energy.com