



Risen Energy Co., Ltd.

Crystal Silicon Solar Module Installation Manual

Meet Standards of IEC61215 (Second Version) & IEC61730

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1. Company Profile

Risen Energy CO., Ltd is a high-tech photovoltaic enterprise in Zhejiang Province, mainly engaged in R&D, production, sales of PV products, such as PV grid-connected power generation, independent PV power supply system, solar modules, and solar lamps etc. and successfully launched IPO in Shenzhen stock exchange market in 2010.

Risen Energy CO., Ltd has a complete and vertically integrated production line, including silicon, solar cells, mono and poly solar modules, among which the PV products have a good sale in domestic and abroad. Rely on excellent technology innovation ability and management team; Risen has become one of the leading in the international solar energy field, supplying excellent quality solar modules for domestic and global solar module users, providing green and clean energy for the world.

2. Solar Modules

Solar modules produced by Risen Energy are series connected of crystal silicon solar cells, being permanently encapsulated between glass and back sheet by hot melt adhesive, and installed around the modules the aluminum alloy frames which are oxidized by anodic oxidation, this structure can ensure that the solar cells can safely and normally operate in most harsh environment.

3. Application

Solar PV module produced by Risen is charged by DC power supply which have high reliability almost maintenance free when under the light. The modules can be ideally applied in remote areas power system, home power system, renewable energy, hydropower station, automobile water pump, communication system or directly compose solar pv plant, these systems can be with storage battery, or directly grid-connected without storage battery.

4. Installation Permits

Before the installation of solar PV power generation system, please contact the local relevant authorities to determine the installation methods is comply with the requirements of the local installation permits and installation inspection requirements.

5. Responsibility Declaration

(1) Due to the installation, operation, application are beyond company control. Those

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losses or expenses caused by wrong installation, operation, application and maintenance, solar modules damages, people casualties or any other extral expenses, which Risen will not responsible for.

(2) The patent infringement of third party rights or any other rights arising from the application solar modules, which Risen will not responsible for.

(3) Risen remain the rights to update the products, product specifications and installation manual specification or document rights, without prior statement.

6. safety precautions

1. The installation of solar modules requires qualified professionals to install.
2. Before installation, wiring, operation or maintenance, need a comprehensive understanding of solar modules or system's installation, operation or maintenance requirements.
3. Use properly insulated tools and appropriate protective equipment to reduce risk of electric shock.
4. Do not stand or step on the module.
5. Do not damage the back or front of the solar module.
6. Do not use solar module with broken glass or backsheet. Broken Modules can not be repaired, once contact with the module surface or frame can lead to electrical shock.
7. Do not disassemble the module or remove any part of the module.
8. Do not use unsafe solar module.
9. Prevent connector contamination; don't make any connection terminal plug dirty.
10. Install fire protection layer on the roof, when solar module is installed on the roof.
11. Do not handle or install modules when they are wet or during periods of high wind.

7. Climate Condition

Install Risen Energy solar modules in the following conditions:

No.	Environmental Condition	Range
1	Environmental Temperature	-40°C to +40°C.
2	Work Temperature:	-40°C to +85°C
3	Storage Temperature	-40°C to +40°C
4	Humidity	Below 85RH%
5	Mechanical Load Pressure	Below 5400Pa

Sheet 1: Environmental condition for Solar module working

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Note: Mechanical load bearing of each module is based on mounting methods. Professional solar system installers must be responsible for calculating mechanical loads when system design.

8. Site Selection

1. In most applications, Risen Energy PV modules should be installed in a location where they will receive maximum sunlight throughout the year. If in the northern hemisphere, usually choose solar modules to be installed facing the south; While in the southern hemisphere, usually choose solar modules to be installed facing the North.
2. Modules should be free from shaded at any time of the day because of buildings, trees, chimney, etc. Due to these objects will form shadow on modules, especially when sun is in the lowest horizontal position in winter. Shadow will cause loss of power output of solar system. Do not ignore the factor of shadow although by-pass diode can reduce loss in certain limit.
3. Do not install PV modules near fire or inflammable & explosive goods, etc.
4. Do not install PV modules in a location where it would be immersed in water or continually exposed to water from a sprinkler or fountain, etc.
5. Do not install PV modules in corrosive salt areas within proximity of the ocean
6. Do not install PV modules in environment subject to corrosion, such as costal areas, or sulfurous areas, etc.

4.1. Module Tilt Angle

1. Risen Energy PV modules connected in series should be installed at the same orientation and angle. Differing orientations or angles may cause a loss of power output due to installation of modules will lead to mismatch of current and voltage caused by the total differences of light absorption, thereby reduce the system efficiency.

2. Maximum power generated when sunlight directly to the solar modules, for those solar modules installed in the permanent support, the power output of modules in winter should be considered when it selects the optimum installation angle. If the angle can ensure enough power output in the winter, it will make the entire solar

module system can have sufficient power output in the rest of time in a year.

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Tilt angle refers to angle between solar modules and ground (Figure 1).

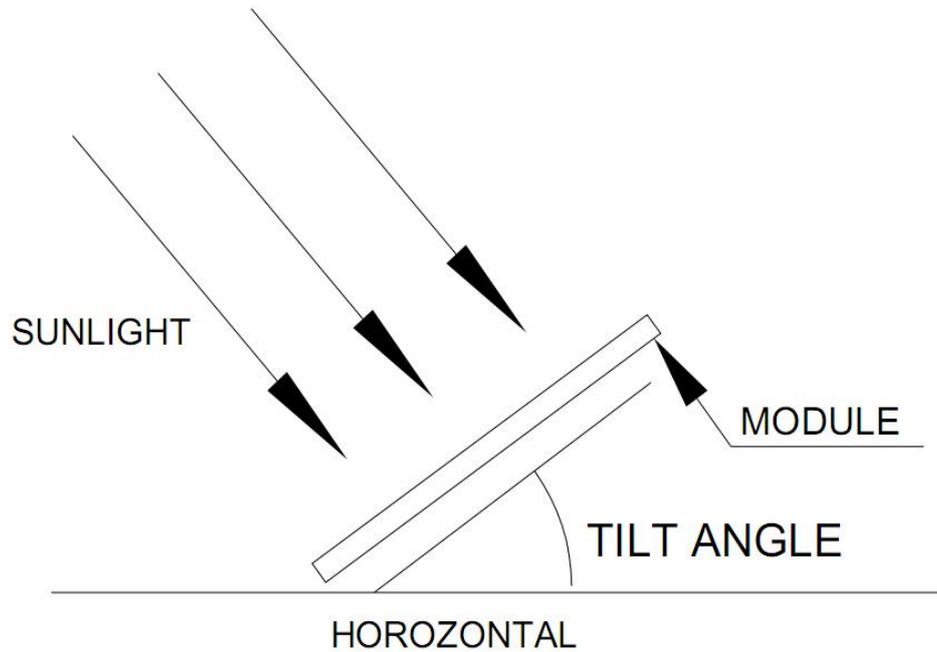


Figure:Module Tilt angle

Note: If it is just a simple estimate, the optimal tilt for a PV module is roughly the same as the latitude of installation location.

10. Solar Module Parameters

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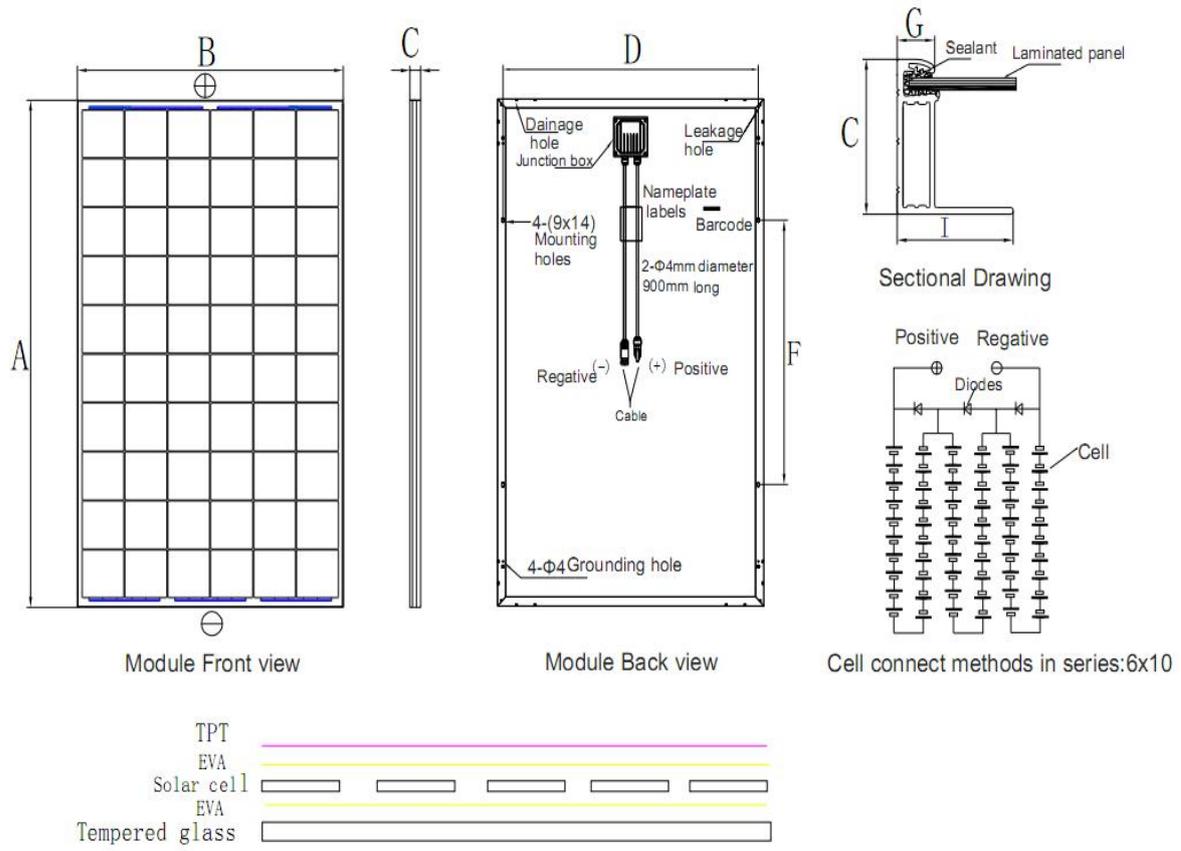


Figure2:1650 Solar Module Mechanical Drawing

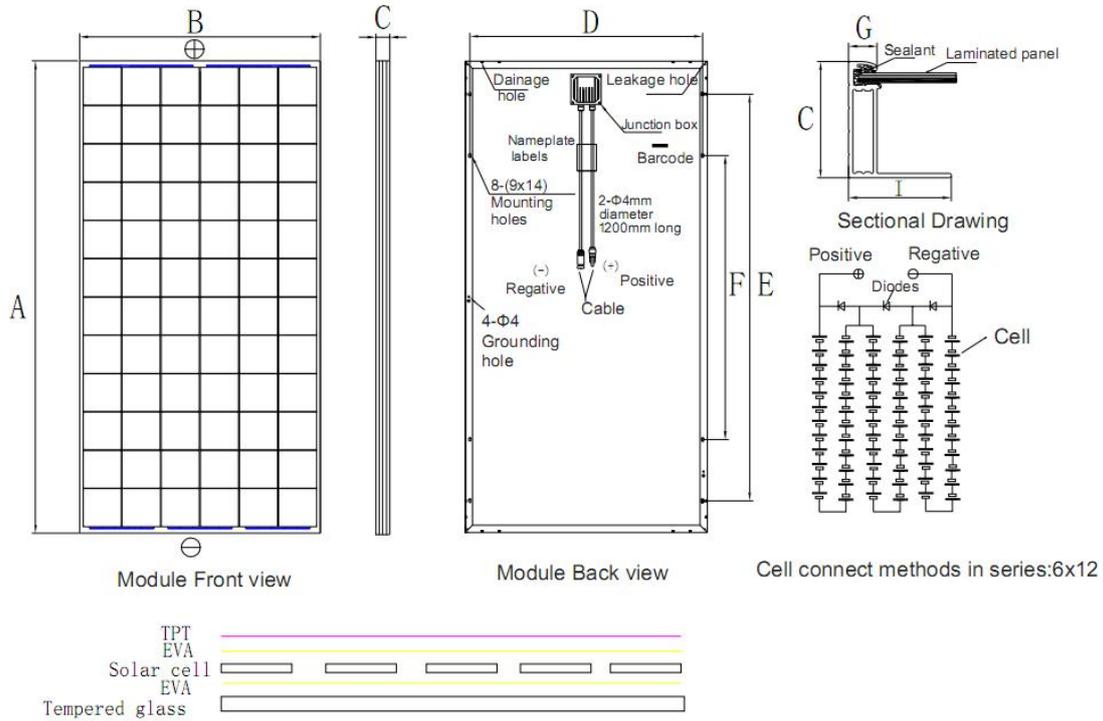


Figure3:1956 Solar Module Mechanical Drawing

	Module Type	Cells Type	Cells QTY	Module Dimension A*B*C (mm)	Mounting Hole D*E/D*F (mm)	Cable Length (mm)	Frame Dimensions C*I*G (mm)
Figure 2	SYP60-6(XX X)S	Poly	60	1650*992*35	952*870*	900mm	35*30*9.7
	RSM60-6(X XX)M	Mon o	60	1650*992*35	952*870	900mm	35*30*9.7
Figure 3	RSM72-6(X XX)M	Mon o	72	1956*992*40	942*1676/942*1176	1200m m	40*35*9.7
	RSM72-6(X XX)P	Poly	72	1956*992*40	942*1676/942*1176	1200m m	40*35*9.7

Table 2: Solar Module Dimensions

For Risen Energy’s Solar Modules we can use follow methods to fix and install:

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1. Tools: screwdriver, wrench, stainless steel screw, nut and washer
2. According to the local climate conditions the system engineer make system load calculation and design and select the right mounting systems.
- 3、 Installation: :
- 4、 Fixing with Bolt: using corrosion proof bolts (M8) fixed on the solar module through the mounting holes on the aluminum frames.
- 5、 Fixing with clamp fixing: using correct clamps to fix the long frame side or short frame side of the solar modules.

(Note: The mechanical load bearing include wind and snow loades of the modules is based on the mounting methods. The professional system installer or skill person through professional trainings must be responsible for mechanical load calculation according to the system design.

1. Fixing with Bolts

The frame of each module has 8 or 4 mounting holes on the aluminum frames (Length X Width: 14mm*9mm), can use M8 corrosion proof nut and configured nut cap, then with spring washer and flat washer to fasten the modules on the mounting racks.

The torque should be 20nm. **The frame with 8 mounting holes fits for 72 pcs and 60 pcs modules, but with 4 mounting holes only fits for 60 pcs modules.**

About the details please refer to the following figure for installation.

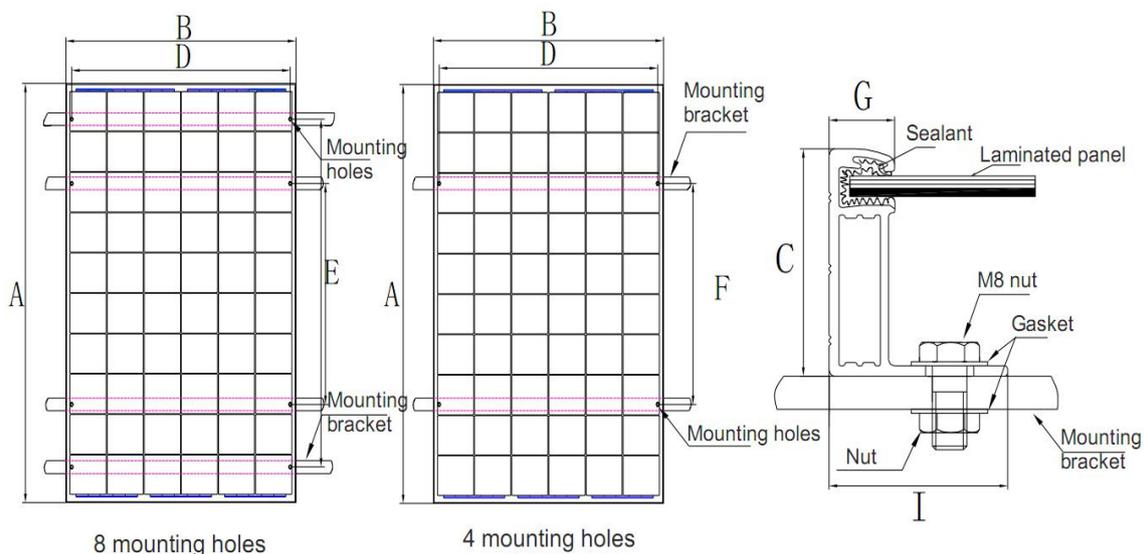


Figure4:Solar Module Installation with Bolts Fixing

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Table 4	MODULE TYPE	CELL TYPE	QUANTITY OF CELL	Demension A*B (mm)	Mounting D*E/D*F (m)
	SYP60-6(XXX)S	poly	60	1650*992	952*870*
	RSM60-6(XXX)M	mono	60	1650*992	952*870
	RSM72-6(XXX)P	mono	72	1956*992	942*1676/942*1176
	RSM72-6(XXX)M	poly	72	1956*992	942*1676/942*1176

Table 3, solar PV modules mounted bolt size

2. Clamping fixed manner: make the panel on the mounting rack by using the certain clamping and M8 nut. The clamping can not touch the front of glass, also can not make the aluminum frame deformed, and try to avoid the shadow to the panel. If choose this fixation manner, every panel need at least 4 clamping to fix. According to actual situation of local wind load and snow load, can add the extra clamping number to make the panel and system to support the load. The application torque is around 20Nm.

1) The clamping fixing attachment to the long frame should be in the position from corner to the 1/4 module length, 2 clampings each length, please see the details in the follow form

2) The clamping fixing attachment to the short frame should be in the position from corner to the 1/4 module width, 2 clampings each width, please see the details in the follow form

3) According to actual situation of local wind load and snow load, can add extra the clamping number to make the panel and system to support the load. Extra clamping can be fixed in the position between the length and width clamping, strengthen by using installing hole.

Remark: the above installation way just be for reference, the system installer or the professors should be responsible to the design, load, installation, maintenance and safety.

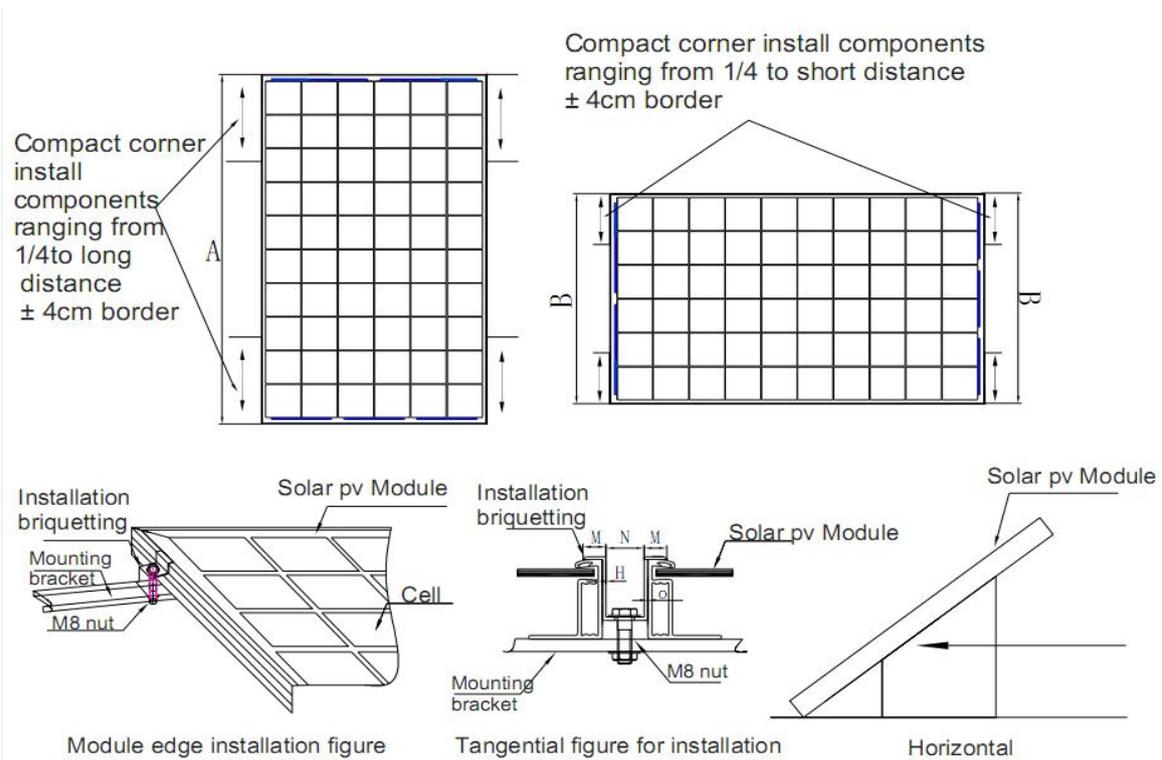


Figure5:Solar PV module clamps fixed way

Serial number	Module type	Cell type	Cell quantity	Demension A*B (mm)	M (mm)	N (mm)	H (mm)	O (mm)
1	SYP60-6(XXX)S	poly	60	1650*992	9.7	20	3~3.5	0.5~2
2	RSM60-6(XXX)P	poly	60	1650*992	9.7	20	3~3.5	0.5~2
3	RSM60-6(XXX)M	mono	60	1650*992	9.7	20	3~3.5	0.5~2
4	SYP72-6(XXX)S	poly	72	1956*992	9.7	20	3~3.5	0.5~2
5	SYP72-6(XXX)M	mono	72	1956*992	9.7	20	3~3.5	0.5~2
6	RSM72-6(XXX)M	mono	72	1956*992	9.7	20	3~3.5	0.5~2
7	RSM72-6(XXX)P	poly	72	1956*992	9.7	20	3~3.5	0.5~2

Table 4: Solar modules (fixing clamp mounting dimensions)

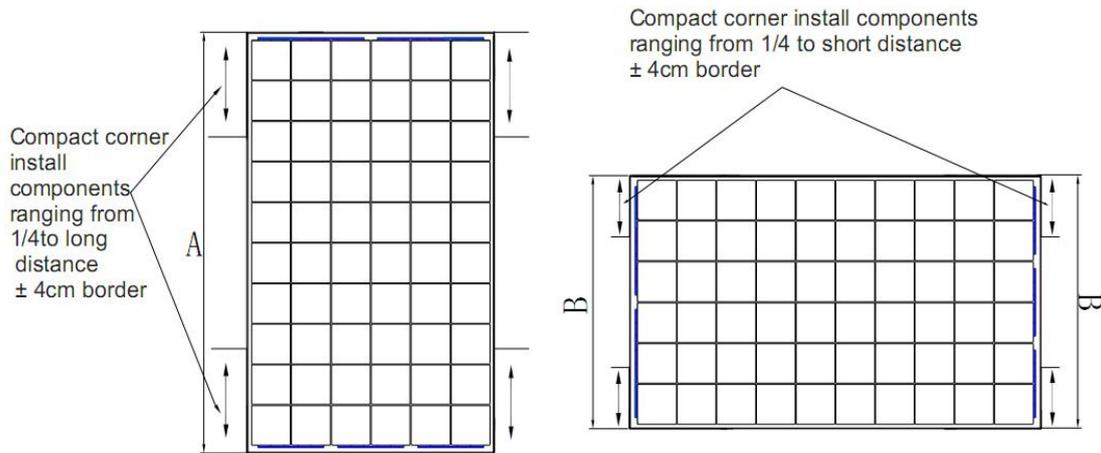
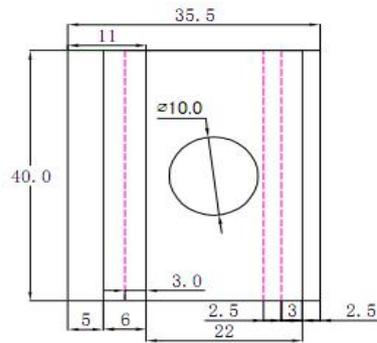
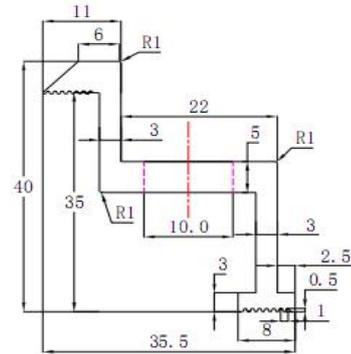


Figure6: Shuangbo components and solar PV installation position range briquetting schematic

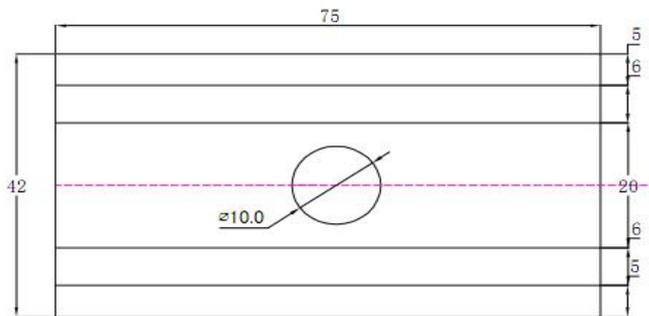
A B marked the length and width of modules, including the sizes of 1650*992mm、1956*992mm etc.



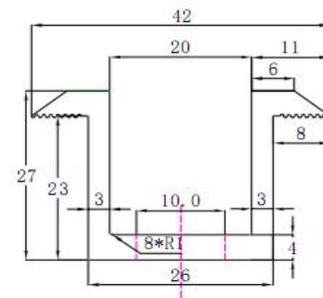
Vertical view of clamp on the edge



Left view of clamp on the edge



Vertical view of central clamp



Left view of central clamp

Figure7: Clamp Drawings

11. Installation and Precautions

1. Solar photovoltaic power generation system shall be installed by qualified professionals, for solar PV modules generating DC power under light conditions; otherwise, non-professionals may suffer electric shock as they are not familiar with the safety regulations.

2. We do not recommend the use of different types of solar modules in the same solar photovoltaic system. When the solar PV modules connect in series, each string voltage should not exceed the maximum system voltage. As a reference, the largest number of tandem solar PV modules (N) can be easily calculated by the maximum system voltage dividing related solar PV module open-circuit voltage. But in the design of solar photovoltaic systems, it must be taken into account that the voltage of the solar PV modules changes with temperature variation (Please refer to the PV module temperature coefficient, the open circuit voltage of the solar PV modules decreases as the temperature rises); For example, in a particular place, taking into account the voltage fluctuations resulted from temperature drops in winter

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(minimum temperature of -40°C), solar photovoltaic modules SYP/RSM60-6(XXX)S, SYP/RSM72-6(XXX)M series (maximum system voltage of 1000V)

3. When solar PV modules are in series, the output voltage of the entire string is equal to the sum of per PV module voltage; When the solar PV modules are in parallel, the output current of the whole string is equal to the sum of each branch of solar PV modules or solar PV module string current. We recommend that each string of PV modules string should be fused, then connected with other strings. Meanwhile, please refer to the criterion of the country or region or local to determine the fuse application requirements. When necessary, please install blocking diode to prevent solar photovoltaic modules or solar PV module strings against the effect and damage of reverse current.

12. Grounding

1. All PV module frame and mounting bracket must be properly grounded in accordance with the national laws and regulations related to the electrician, proper grounding method is to use a suitable ground wire to connect solar PV modules and stand together. Ground wire may be copper, copper alloy or other materials which can be used as wires and are in line with the corresponding electrical engineering regulation. Grounding wires also must be connected to ground via a suitable grounding electrode.

2. On the ground of $\phi 4\text{mm}$ diameter hole, use a separate ground wire and related accessories to connect the solar photovoltaic module aluminum frame and connect the ground wire to ground, use M4 earth stud bolts with a M4 nut, tooth washer and cup washer, so as to ensure the modules are firmly grounded.

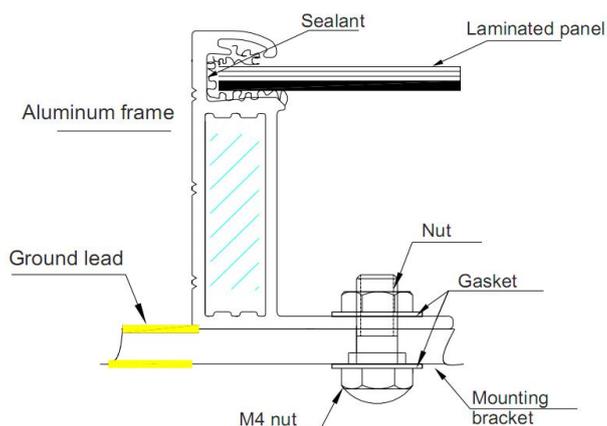


Figure8:Ground installation diagram

13. Diode

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1. Bypass Diode

1).If one part of the solar panel is blocked by the shadow, it will lead to the related solar cells to form reverse voltage. The current from other unaffected cell string of the solar panel or from other solar panels will forced through the occlusion due to loss of power and heating the affected solar panels. When the current of system in parallel with the bypass diode in solar panels,it will through the diode directly,thereby bypassing the occluded part of the solar panel,and reduce the fever and power loss of solar panel to the minimum.

2).Current East Risen solar panels are equipped with bypass diodes in the junction box. Diode model,such as 15QS045/20SQ045 (PV-RS001junctionbox) or (PV-CY1202junctionbox)。 Please don't try to open the box to replace diode, even when the diode appears problem, this work needs to be done by professionals.

2.count-attack diodes must meet the following performance:

1).For the solar photovoltaic system using the battery, you need to install an count-attack diode between solar panels and batteries, to prevent the battery discharge during the night.

2).The average rated forward current $I_F(AV)$ is greater than the maximum system current when the the solar panel operating temperature is maximum.

3).The rated repetitive peak reverse voltage V_{RRM} is greater than the maximum system current when the the solar panel operating temperature is minimum.

14. Warning and cautions

- When solar PV modules exposed under the sun, it will generate currency. The electricity generated by solar PV system can cause deadly shock or fire danger. Only those who have been trained professionally or authorized can access to solar PV modules.
- In order to avoid electric shock or fire danger, opaque materials can be flocked on the solar PV modules when install.
- During installation, no electric terminal or component can be touched, and isolated tool will be used for electrical connections.
- Proper method will be used for the system's installation, a falling solar PV module from high place will cause casualty and property damage.
- Each solar PV module has a pair of male and female water-proof connection terminals. When electrical connect in series, the connection terminal with positive electrode of the first solar PV module should be connected to the next

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module's negative electrode connection terminal.

- The positive and negative electrodes of the solar PV module cannot be short-circuit connected, and cannot be disconnected when the module is under loading. Make sure there is no gap between the insulators of connection terminals, or fire or short-circuit or electric shock will be caused.
- Sunlight cannot be manmade gathered on the solar PV modules. The peak power P_{max} of the solar PV module is tested under standard testing circumstance (STC: 1000W/ m² ; AM 1.5; temperature 25° C)
- Under normal sunlight, current or voltage generated by solar PV module will be much more than under STC. The rated voltage, rated current in connectors, size of fuse and connected to the PV output controller should be calculated by the rated number of I_{sc} and V_{oc} multiplied by a coefficient 0.8. Pls refer to each country's electrician formulation to confirm other applicable coefficient.

15. Wiring of solar PV module

1. Each module has two 4mm² diameter standard 90° C, sunlight resistant output cables each terminated with plug & play connectors. This cable is suitable for applications where wiring is exposed to the direct sunlight. Wiring and electrical connections need to comply with the appropriate national electrical code.
2. For field connections, use the minimum 4mm² diameter copper wires insulated for a minimum of 90° C and sunlight resistance as well. The outer diameter of wires should be 5mm-7mm.

16. Maintenance

1. Under most circumstances, normal rain fall will be enough to keep the glass surface of the solar PV module clean. If too much dirt, soft cloth with soft detergent and water will be used to get it clean. Do not use cold water to clean the solar PV module when it has higher temperature in a day, in case the heat exchange will damage the solar PV module.
2. When cleaning the back surface of the module, take care to avoid penetrating the substrate material. Modules that are mounted flat (0° tilt angle) should be cleaned more often, as they will not "self clean" as effectively as modules mounted at a 15° tilt or greater. Maintenance should be carried out at least once a year by trained personnel.
3. Replacement modules must be of same type. Do not touch live parts of cables and

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connectors. Use appropriate safety equipment (insulated tools, insulating gloves, etc.) when handling modules.

4. Cover the front surface of modules by an opaque material when repairing. Modules when exposed to sunlight generate high voltage and are dangerous.

5. If the measured voltage only half of the rated value, that means the bypass diode was broken.

6. In the case of normal irradiance, if the terminal voltage is more or less 5% than rated value that means the contacts of panel is not good.

7. Electrical inspect and Mechanical inspect should be carried out every six months.

8. Any questions, pls ask trained personnel to check.

9. Kindly note, please observe maintenance instruction of all the parts.

WARNING: For any electrical maintenance, the PV system must first be shut down. Improper maintenance can cause lethal electric shock and/or burns.

17. Product Identification.

1. Every module is all have labels which including below info:

1). Rating place: Model, Power rating, Rated current, Rated Voltage, Voc, Isc, Weight, Size and Maximum voltage.

2). Bar code: Every module is all have only one bar code, it is permanently fixed in the internal of module.

18. Solar model as below:

- (1) SYP60-6(250W~285W)P (2) RSM60—6(250W~290W)M
(3) SYP72-6(250W~345W)p (4) RSM72—6(250W~350W)M

19. This manual is applied to the following product specifications

Module type	RSM/SY P-250W	RSM/SY P-255W	RSM/SY P-260W	RSM/SY P-265W	RSM/SY P-270W	RSM/SY P-275W	RSM/SY P-290W	RSM/SY P-295W	RSM/SY P-300W	RSM/SY P-305W	RSM/SY P-310W	RSM/SY P-315W	RSM/SY P-320W	RSM/SY P-330
electrical property(standard conditions of STC test: sunlight intensity 1000w/m² , temperature: 25℃、 air mass: AM1.5)														
maximum power output (Pmax)	250W	255W	260W	265W	270W	275W	290W	295W	300W	305w	310W	315W	320W	330W
solar cell type	poly	poly												
Quantity(pcs)	60	60	60	60	60	60	72	72	72	72	72	72	72	72
maximum working voltage (V)	30.00	30.30	30.60	30.90	31.20	31.50	35.00	35.40	35.80	36.10	36.50	36.90	37.30	38.10
maximum operating current (A)	8.34	8.42	8.50	8.58	8.66	8.74	8.30	8.35	8.40	8.45	8.50	8.55	8.60	8.70
open-circuit voltagevoc (V)	37.40	37.60	37.80	38.00	38.20	38.40	43.90	44.20	44.50	44.80	45.10	45.40	45.70	46.30
short-circuit currentIsc (A)	8.88	8.96	9.04	9.12	9.20	9.28	8.85	8.90	8.95	9.00	9.05	9.10	9.15	9.25
Max tolerance of output power%	0~+3%													
Max system voltage (V)	1000V/1500V													
NOCT	45±2℃													
温度系数 temperature coefficientVoc ℃	-0.33%/	-0.33%/	-0.33%/	-0.33%/	-0.33%/	-0.33%/	-0.32%/	-0.32%/	-0.32%/	-0.32%/	-0.32%/	-0.32%/	-0.32%/	-0.32%/
Isc	+0.033	+0.033	+0.033	+0.033	+0.033	+0.033	+0.034	+0.034	+0.034	+0.034	+0.033	+0.034	+0.034	+0.034

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	%/°C	%/°C	%/°C	%/°C	%/°C	%/°C	%/°C	%/°C	%/°C	%/°C	%/°C	%/°C	%/°C	%/°C
max	-0.39%/ °C	-0.39%/ °C	-0.39%/ °C	-0.39%/ °C	-0.39%/ °C	-0.39%/ °C	-0.40%/ °C							
module working temp°C	-40°C~+85°C													
mechanical properties														
module size	1650x9	1650x9	1650x9	1650x9	1650x9	1650x9	1956x9							
(2)	92x35	92x35	92x35	92x35	92x35	92x35	92x40							
weight (kg)	18kg	18kg	18kg	18kg	18kg	18kg	25kg							
The surface maximum load capacity (pa)	5400Pa (IEC61215)													
the power of resisting hailstone	maximum diameter 25mm, impact speed 23m/s.													

Remark: standard of STC testing conditions: heliometric index 1000 w/m² ,25 °C ,air mass AM1.5.

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20. To develop solar cell module power current four sort standard as follows

2	Sort standard of current 4	stand	module	Current	Current	Current	Current
		ard of panels	s type	Classificati on 1	Classification 2	Classification 3	Classificatio n 4
	125 Mono	260		$I_m < 5.4$	$5.4 \leq I_m < 5.5$	$5.5 \leq I_m < 5.6$	$I_m \geq 5.6$
		265		$I_m < 5.5$	$5.5 \leq I_m < 5.6$	$5.6 \leq I_m < 5.7$	$I_m \geq 5.7$
		270		$I_m < 5.6$	$5.6 \leq I_m < 5.7$	$5.7 \leq I_m < 5.8$	$I_m \geq 5.8$
	156 Poly	245		$I_m < 8.1$	$8.1 \leq I_m < 8.2$	$8.2 \leq I_m < 8.3$	$I_m \geq 8.3$
		250		$I_m < 8.2$	$8.2 \leq I_m < 8.3$	$8.3 \leq I_m < 8.4$	$I_m \geq 8.4$
		255		$I_m < 8.3$	$8.3 \leq I_m < 8.4$	$8.4 \leq I_m < 8.5$	$I_m \geq 8.5$
		260		$I_m < 8.4$	$8.4 \leq I_m < 8.5$	$8.5 \leq I_m < 8.6$	$I_m \geq 8.6$
		265		$I_m \leq 8.5$	$8.5 \leq I_m < 8.6$	$8.6 \leq I_m < 8.7$	$I_m \geq 8.7$
		280		$I_m < 7.9$	$7.9 \leq I_m < 8.0$	$8.0 \leq I_m < 8.1$	$I_m \geq 8.1$
		285		$I_m < 8.0$	$8.0 \leq I_m < 8.1$	$8.1 \leq I_m < 8.2$	$I_m \geq 8.2$
		290		$I_m < 8.1$	$8.1 \leq I_m < 8.2$	$8.2 \leq I_m < 8.3$	$I_m \geq 8.3$
		295		$I_m < 8.2$	$8.2 \leq I_m < 8.3$	$8.3 \leq I_m < 8.4$	$I_m \geq 8.4$
		300		$I_m < 8.3$	$8.3 \leq I_m < 8.4$	$8.4 \leq I_m < 8.5$	$I_m \geq 8.5$
		305		$I_m < 8.4$	$8.4 \leq I_m < 8.5$	$8.5 \leq I_m < 8.6$	$I_m \geq 8.6$
		310		$I_m \leq 8.5$	$8.5 \leq I_m < 8.6$	$8.6 \leq I_m < 8.7$	$I_m \geq 8.7$
	315		$I_m \leq 8.6$	$8.6 \leq I_m < 8.7$	$8.7 \leq I_m < 8.8$	$I_m \geq 8.8$	
	156 Mono	250		$I_m < 8.4$	$8.4 \leq I_m < 8.5$	$8.5 \leq I_m < 8.6$	$I_m \geq 8.6$
		255		$I_m \leq 8.5$	$8.5 \leq I_m < 8.6$	$8.6 \leq I_m < 8.7$	$I_m \geq 8.7$
		260		$I_m \leq 8.6$	$8.6 \leq I_m < 8.7$	$8.7 \leq I_m < 8.8$	$I_m \geq 8.8$
		265		$I_m \leq 8.6$	$8.6 \leq I_m < 8.7$	$8.7 \leq I_m < 8.8$	$I_m \geq 8.8$
		270		$I_m \leq 8.7$	$8.7 \leq I_m < 8.8$	$8.8 \leq I_m < 8.9$	$I_m \geq 8.9$
		300		$I_m < 8.4$	$8.4 \leq I_m < 8.5$	$8.5 \leq I_m < 8.6$	$I_m \geq 8.6$
		305		$I_m \leq 8.5$	$8.5 \leq I_m < 8.6$	$8.6 \leq I_m < 8.7$	$I_m \geq 8.7$
	310		$I_m \leq 8.6$	$8.6 \leq I_m < 8.7$	$8.7 \leq I_m < 8.8$	$I_m \geq 8.8$	

Expecting to the special requirement.

According to the rules of sort load, Array or matrix components are installed by the cell modules power level four standard as reference. Providing clear information of the most efficient solar cell modules components for customers.

Current Classification 1 Current Classification 2

Current Classification 3 Current Classification 4

The sort code on the modules must keep same as outer box.

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