合大太阳能
HEDA SOLAR

Version No.：A

20W FLAT SOLAR ROOF TILE ON-GRID POWER GENERATION SYSTEM

MANUAL

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2013-5-10

Contents

I. Precautions before use

1. Shall not have any objects attached to the PV module, or shadowed live cells.
2. In order to make a better waterproof roofing system performance, flat solar tile must be installed staggered joint.
3. Please according to roof structure, area, orientation to choose the appropriate standard system.
4. Please check the system BOM (bill of material) and tooling list complete or not, before installing.
5. System must be performed by qualified personnel with professional or trained personnel for installation, commissioning.
6. During installation, do not to bring solar array circuit the positive and negative.
7. Solar PV tile strictly prohibit to gravity trample, collision, hard hitting.

II. Introduction

2.1 Brief Instruction of PV tile power generation system

PV tile on-grid system consists of PV tile, on-grid inverter, protection of electrical switches and other components. During installation, do not to bring solar array circuit the positive and negative. Solar PV tile can convert solar radiation into direct current, then through on-grid inverter converts direct current to alternating current for the use of loading or into the public electricity grid.

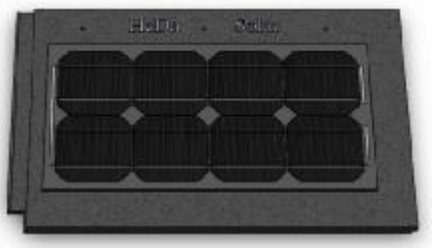
2.2 20W Flat PV tile and match tile

Electrical Characteristic for 20W flat PV tile

Type	HDSF20M-8
Max-Power Pm	20W
Open-Circuit Voltage	4.82V
Short-Circuit Current	5.47A
Max-Power Voltage	4.02V
Max-Power Current	5.25A

Cell Size	125*125mm
Number of Cells	2*4 (8pcs)

Mechanical Characteristics for 20W flat tile and match tile

Mechanical Characteristics for 20W flat PV tile and match tile				
20W flat PV tile			Match tile	
Dimension	PV tile	665*420*30mm		
	Match tile	420*330*30mm		
Effective size	PV tile	345*635mm（up and down*right and left）		
	Match tile	345*300mm（up and down*right and left）		
lap length up and down	75mm	lap length right and left	30mm	
Weight	PV tile	Around 6.5kg/pcs		
	Match tile	Around 4.9kg/pcs		
Standard	PV tile	Up to IEC61215、IEC61730 standard		
	Match tile	Up to JC/T746-2007standard		
anti-permeability	Up to JC/T746-2007 standard			
Water absorption	PV tile	＜1%		
	Match tile	＜5%		
Endurance Life	PV tile	＞5000N/㎡		
	Match tile	＞1800N/㎡		
Fire Index	Anti flaming			
Lap Method	Straight seam lap			
Frost Freezing	Up to JC/T746-2007 standard; after soaking saturated freeze 2 hours in water under -15℃, melted 1 hour in 15 ℃ -30 ℃， after 25 freeze-thaw cycles, appearance quality, anti-permeability, endurance qualified.			
Min. Installation of slope	If the slope roof less than 15° , for the leakproof considerations, it is not recommended.			
Max. Installation of slope	90°			
Amount per unit area	PV tile	4.6pcs /㎡		
	Match tile	9.7pcs /㎡		
roof batten size	30mm*20mm			
Amount for roof batten	2.9 m/m²			

2.3 光伏并网逆变器

Electrical Characteristic	HNS1500TL-1	HNS2000TL-1	HNS2500TL-1	HNS3000TL-1	HNS4000TL-1	HNS5000TL-1	HNS6000TL-1
Input Characteristics							
Max. Input DC power (W)	1600	2200	2700	3200	4200	5600	6200
Max. Input DC voltage (V)	450	500	500	550	550	550	550
MPPT Voltage range (V)	120-360	120-400	120-400	120-450	120-450	120-450	120-450
Max. DC (A)	8	11	13	10+10	13+13	15+15	16+16
MPPT Tracking Channels/ Each road can be connected to the	1/1	1/1	1/1	2/1	2/1	2/1	2/1
Output Characteristics							
Power Connecter	Single Phase	Single Phase	Single Phase	Single Phase	Single Phase	Single Phase	Single Phase
Rated Output Power (V)	1500	2000	2500	3000	4000	5000	6000
Rated Voltage Output Range (V)	230/ AU:200-270 IT:196-253 UK:207-264	230/ AU:200-270 IT:196-253 UK:207-264	230/ AU:200-270 IT:196-253 UK:207-264	230/ AU:200-270 IT:196-253 UK:207-264	230/ AU:200-270 IT:196-253 UK:200-253	230/ AU:200-270 IT:196-253 UK:207-264	230/ AU:200-270 IT:196-253 UK:200-253

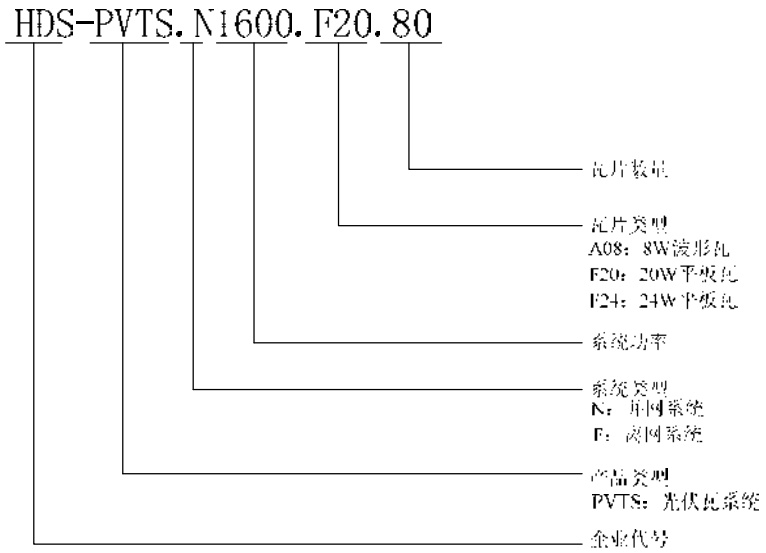
Output frequency range(Hz)	50/ AU:48.5-51.5 IT:47.5-51.5 UK:47.0-50.5	50/ AU:48.5-51.5 IT:47.5-51.5 UK:47.0-50.5	50/ AU:48.5-51.5 IT:47.5-51.5 UK:47.0-50.5	50/ AU:48.5-51.5 IT:47.5-51.5 UK:47.0-50.5	50/ AU:48.5-51.5 IT:47.5-51.5 UK:47.0-51.5	50/ AU:48.5-51.5 IT:47.5-51.5 UK:47.0-50.5	50/ AU:48.5-51.5 IT:47.5-51.5 UK:47.0-51.5
Rated Output Current (A)	8	11	12	14	18	22	24
Power Factor	＞0.99	＞0.99	＞0.99	＞0.99	＞0.99	＞0.99	＞0.99
Harmonic distortion	＜3%	＜3%	＜3%	＜3%	＜3%	＜3%	＜3%
Power Efficiency							
Max. Power	96.83%	97.02%	96.97%	96.90%	97.00%	96.00%	96.10%
European Efficiency	94.81%	95.83%	95.90%	96.18%	96.43%	96.00%	96.10%
MPPT Efficiency	＞99%	＞99%	＞99%	＞99%	＞99%	＞99%	＞99%
Safety Device							
Electromagnetic Compatibility	EN61000-6-1/6-3	EN61000-6-1/6-3	EN61000-6-1/6-3	EN61000-6-1/6-3	EN61000-6-1/6-3	EN61000-6-1/6-3	EN61000-6-1/6-3
Anti-islanding Protection	Built-in	Built-in	Built-in	Built-in	Built-in	Built-in	Built-in
General Information							
length*width*height (mm)	487*340*146	487*340*156	487*340*156	550*370*166	550*370*167	550*370*167	550*370*167
Protection Class	IP65	IP65	IP65	IP65	IP65	IP65	IP65
Weight (kg)	15.6	16	16	24	26	26	27
Working Temp. (℃)	-20℃-+55℃	-20℃-+55℃	-20℃-+55℃	-20℃-+55℃	-20℃-+55℃	-20℃-+55℃	-20℃-+55℃

Topology	No Transformer	No Transformer	No Transformer	No Transformer	No Transformer	No Transformer	No Transformer
Communication Interface	RS485	RS485	RS485	RS485	RS485	RS485	RS485
Power Consumption at night(W)	＜1	＜1	＜1	＜1	＜1	＜1	＜1
Heat-dissipating	Convection	Convection	Convection	Convection	Fan	Fan	Fan
Noise (dB)	＜28	＜28	＜28	＜43	＜43	＜43	＜43
Elevation	2000 meters above sea level without derating power operation						

2.4 20W flat PV tile on-grid system standard configuration

No.	System Type	Peak Power （W）	Quantity of PV tile (pcs)	Operating Voltage (V)	Number of Each String （Pcs）	Inverter	On-grid Voltage
1	HDS-PVTS.N1600.F20.80	1600	80	320	80	1.5KW/220V	Single Phase 220V/50Hz
2	HDS-PVTS.N2000.F20.96	2000	96	384	96	2.0KW/220V	Single Phase 220V/50Hz
3	HDS-PVTS.N2500.F20.128	2500	128	256	64	2.5KW/220V	Single Phase 220V/50Hz
4	HDS-PVTS.N3200.F20.160	3200	160	320	80	3.0KW/220V	Single Phase 220V/50Hz
5	HDS-PVTS.N3800.F20.192	3800	192	384	96	4.0KW/220V	Single Phase 220V/50Hz
6	HDS-PVTS.N4800.F20.240	4800	240	320	80	5.0KW/220V	Single Phase 220V/50Hz
7	HDS-PVTS.N6400.F20.320	6400	320	320	80	6.5KW/220V	Single Phase 220V/50Hz

并网系统型号编号规则：



III. Installation steps and Explanation

3.1 Preparation before Installation

System before the installation should be according to the bill of materials and tools list, check materials and installation tools, in guarantee materials and installation tools are complete, intact for installation work.

Checking of materials

System Type / Parts	HDS-PVTS. N1600.F20.80		HDS-PVTS. N2000.F20.96		HDS-PVTS. N2500.F20.128		HDS-PVTS. N3200.F20.160	
	Type	Quantity	Type	Quantity	Type	Quantity	Type	Quantity
PV tile	20W	80pcs	20W	96pcs	20W	128pc	20W	160pcs
On-grid	1500W	1pcs	200	1pcs	2500	1pcs	3000	1pcs
DC Circuit	500V/10A/2P	1pcs	500V/10A/2P	1pcs	500V/10A/2P	2pcs	500V/10A/2P	2pcs
AC Circuit	10A/2P	1pcs	16A/2P	1pcs	20A/2P	1pcs	25A/2P	1pcs
DC Rated	440V/10A	1pcs	440V/10A	1pcs	440V/10A	2pcs	440V10A	2pcs
AC Rated	2P/10A	1pcs	2P/16A	1pcs	2P/20A	1pcs	2P/25A	1pcs
DC Surge	2P/500V	1pcs	2P/500	1pcs	2P/500	2pcs	2P/500	2pcs
AC Surge	2P/20A	1pcs	2P/20A	1pcs	2P/20A	1pcs	2P/40A	1pcs
DC Side Cable	4mm²	Red:20m black:20m	4mm²	red:20m Black:20	4mm²	red:20m black:20m	4mm²	red:40m black:40m

System Type / Parts	HDS-PVTS.N3800.F20.192		HDS-PVTS.N4800.F20.240		HDS-PVTS.N6400.F20.320	
	Type	Quantity	Type	Quantity	Type	Quantity
PV tile	20W	192pcs	20W	240pcs	20W	320pcs
On-grid Inverter	4000	1pcs	5000	1pcs	6000	1pcs

DC Circuit Breaker	500V/10A/2P	2pcs	500V/10A/2P	3pcs	500V/10A/2P	4pcs
AC Circuit Breaker	32A/2P	1pcs	40A/2P	1pcs	50A/2P	1pcs
DC Rated Fuses	440V/10A	2pcs	440V/10A	3pcs	660V/10A	4pcs
AC Rated Fuses	2P/32A	1pcs	2P/32A	1pcs	2P/50A	1pcs
DC Surge Protector	2P/500	2pcs	2P/500	3pcs	2P/500	4pcs
AC Surge Protector	2P/40A	1cps	2P/40A	1pcs	2P/60A	1pcs
DC Side Cable	4mm²	red:40m black:40m	4mm²	red:60m black:60m	4mm²	red:80m black:80m

Preparing Installing Tools

No.	Name	Type	Use	Picture	Remark
1	Hammer		With concrete nails, fixed the battens and rafters		
	Direction	Before use, wear cotton gloves. Left hand holding concrete nails, right hand holding the hammer handle, and gradually force the battens and rafters fixed.			
2	Electric hand drill	AC portable charge	With wood screw, fixed the battens and rafters		
	direction	Before use, make sure hand drill clockwise direction of rotation. Left hand fix the wood screw and hand drill to right position, right hand holding the hand drill and start switch, slightly hard to fix the tile and tile battens. See: hand drill operation manual. Note: Cotton glove is prohibited wearing incase of preventing hand hurt during high-speed rotation.			
3	Screwdriver	Screwdriver set	Screws fixed object with the desired fixed		According to the specifications of choosing the right screwdriver

	direction	Before use, confirm screwdriver and screws specifications meet. Left hand to screw with a screwdriver head fit, and alignment mark position, right hand holding the handle and turn clockwise, gradually forced the screw with the desired stationary objects.			
4	Cutting machine	220V AC	Cut to the desired shape of the tile		Cutting discs: tile cutting discs
	direction	Before use, make sure the cutting between the plate and the shaft is not loose, wearing face masks. Left hand fixing the tile, right hand holding the handle aligned with the position marked on the tile and start button for cutting. Just contact tiles should not be using high-speed, then gradually increase the speed. Another people use water for cooling the cutting disc. See: cutting machine operation manual. Note: Cotton glove is prohibited wearing incase of preventing hand hurt during high-speed rotation.			
5	Impact drill	220V DC	Punch on metope (Inverter, Controller)		Drill: A diameter of 8 bits;
	direction	Before use, to confirm whether there is a loose bit, wear masks. Left hand holding the front handle of hammer, right hand holding the lower handle, alignment has been marked wall and press the start button. High-speed should not to use, then gradually increase the speed, depth and with the right hole. Note: Cotton glove is prohibited wearing incase of preventing hand hurt during high-speed rotation.			
6	Snapline ink fountain		Confirm horizontal line		ink
	direction	Before use, import the ink into ink fountain, ink sufficient contact with the ink line. One person grasps one end of the ink line and zeroed on the marked place, another person, left hand holding the fountain, the alignment mark points, right hand flicking ink line will stay with clear traces on battens.			

7	tape	Steel tap	Confirm dimension		3-5M
	direction	Hooked the end of tape and one end of the measured object, measuring distance and mark.			
8	Multimeter		Measure the open-circuit voltage, short-circuit current		
	direction	Before use, choose the correct shifts and distance, measured respectively with red and black probe line contact, then read and show the number of records. Open-circuit voltage: red and black probe and measured circuit in parallel Short-circuit current: red and black prove and measured circuit in parallel			
9	Wire stripers		Wire stripping		
	Direction	The wire against the corresponding strippers, strip the cables with one hand firmly.			
10	Hydraulic Clamp		Tighten terminals and cables		
	direction	Will wear a cable end into the hydraulic clamp terminals corresponding notch, exert by hands and check the effect of hydraulic, move or not.			
11	Nipper pliers		Fastening cable and cable		
	direction	To cross over the cable with the nipper pliers twist in the same direction until the fastening.			
12	MC4 wrench		tightening solar connector and solar cable		

	direction	When used, the beginning and end of MC4 head wrench into the intermediate space, respectively, and circular holes, and clockwise until tightened.			
13	Knife		Cut the cable sheath		
	direction	The knife blade out of the sheath cutting and stripping.			

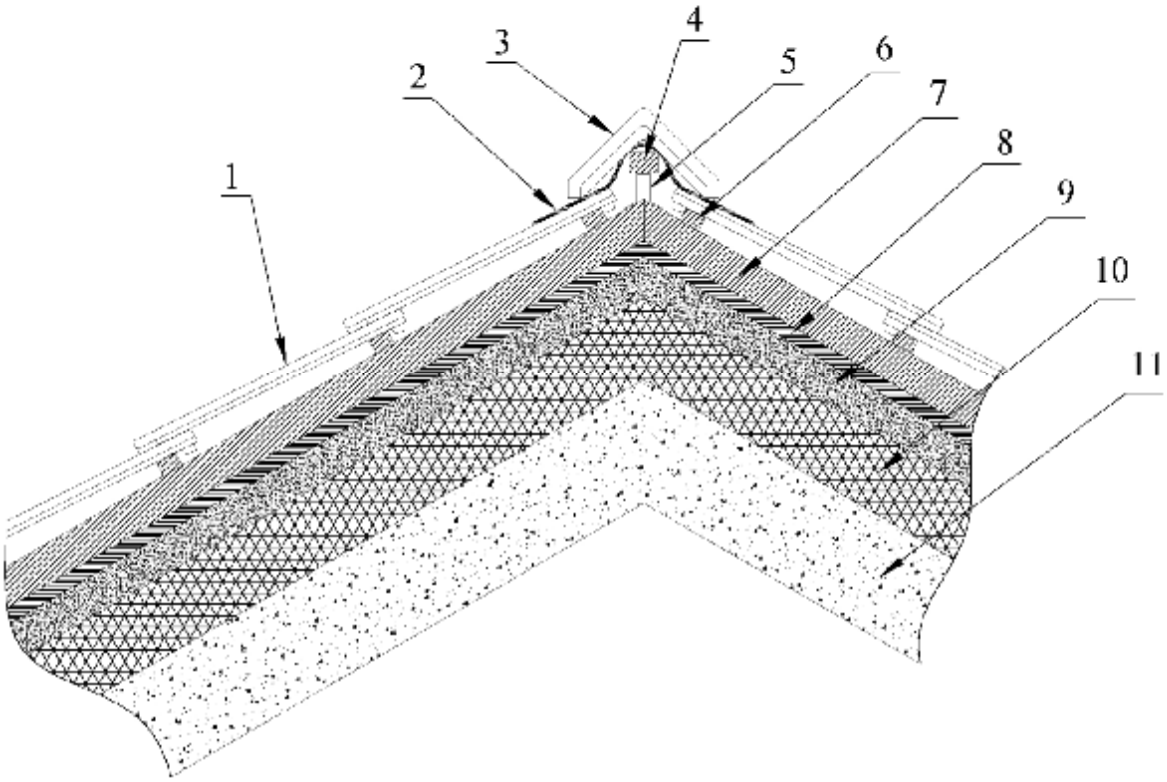
Determine the selected roofing is suitable to install the system.

According to the reference standard roofing system size, and arrangement of the standard required under the roof size, choose the appropriate standard systems. Roof mounting area must be larger than the chosen standard mounting area required for the system.

No.	Quantity of PV tile （pcs）	Standard arrangement （line*row）	Number of strings （pcs/string*string ）	String voltage （V）	Min. roofing size （vertical m* horizontal m=size ㎡）	
1	80	8*10	80*1	320	2.84*6.37=18.09	
2	96	8*12	96*1	384	2.84*7.94=22.55	
3	128	8*16	64*2	256	2.84*10.48=29.76	
4	160	10*16	80*2	320	3.53*10.48=37.00	
5	192	12*16	96*2	384	4.22*10.48=44.23	
6	240	12*20	80*3	320	4.22*13.01=54.90	
7	320	16*20	80*4	320	5.60*13.01=72.86	
Notice	Tile size	up / down	420mm	Lap method	up /down	345mm
		left / right	664mm		left / right	634mm

3.2 Installation for PV tile and match tile

3.2.1 PV tile roof structure of the system



PV tile ventilation roofing system structure

1- PV tile (or match tile)）2-Ventilation waterproof self-adhesive tape 3-Ridge tile 4- Ridge supporting wood 5- holding wooden bracket 6-roof batten 7-counter batten 8-Waterproof layer 9-held nail layer 10-Insulation layer 11-concret roof

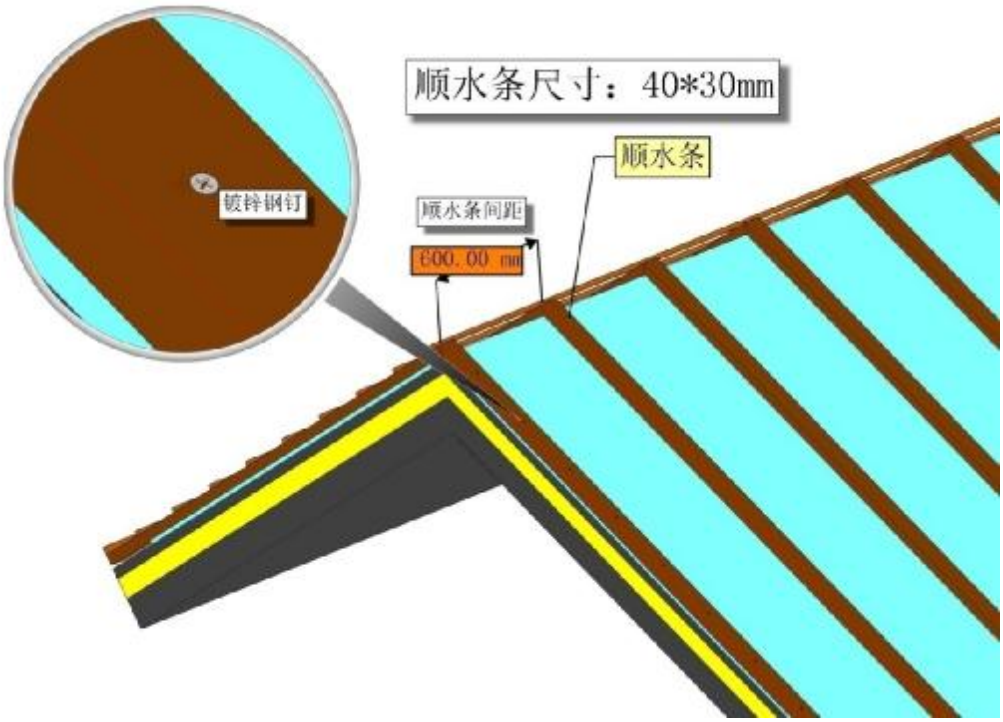
3.2.2 Installation Steps of PV Tile and Match Tile

1. How to install counter batten

(Remark: This installation steps are according to the different structure of roof, has different installation way and installation requirement.)

According to the structure of roof surface to finish the concrete roof, laying the heat preservation and insulation layer, held nail layer, waterproof layer. The material for counter batten is section size 40*30mm anticorrosive batten, the length for counter batten is according to the roof size, transverse spacing distance for counter batten is 400~600mm. Counter batten should be fixed by galvanize steel nail, the distance between nails should less

of 500mm, the length of steel nail should be moderate, and must in held nail layer. The arrange of counter batten as shown in the figure below.



Installation drawing for Counter batten

2. How to install roof batten

The roof batten uses 30*20mm anticorrosive roof batten, transverse spacing distance for roof batten is 375mm. The lap length between up and down is 65mm. (Remark: if the distance for roof batten or overlap size for PV tile needs to adjust, must ensure the overlap location for solar cell without sunshine.) When you install the roof batten, you must use steel tape confirm the roof batten distance, fixed position by Snapline ink fountain, using wood screw (or steel nail), and electric hand drill (or hammer) to fix the roof batten on the counter batten. When you flip the elastic line, be sure the battens parallel to each other.

3. How to install PV tile and match tile

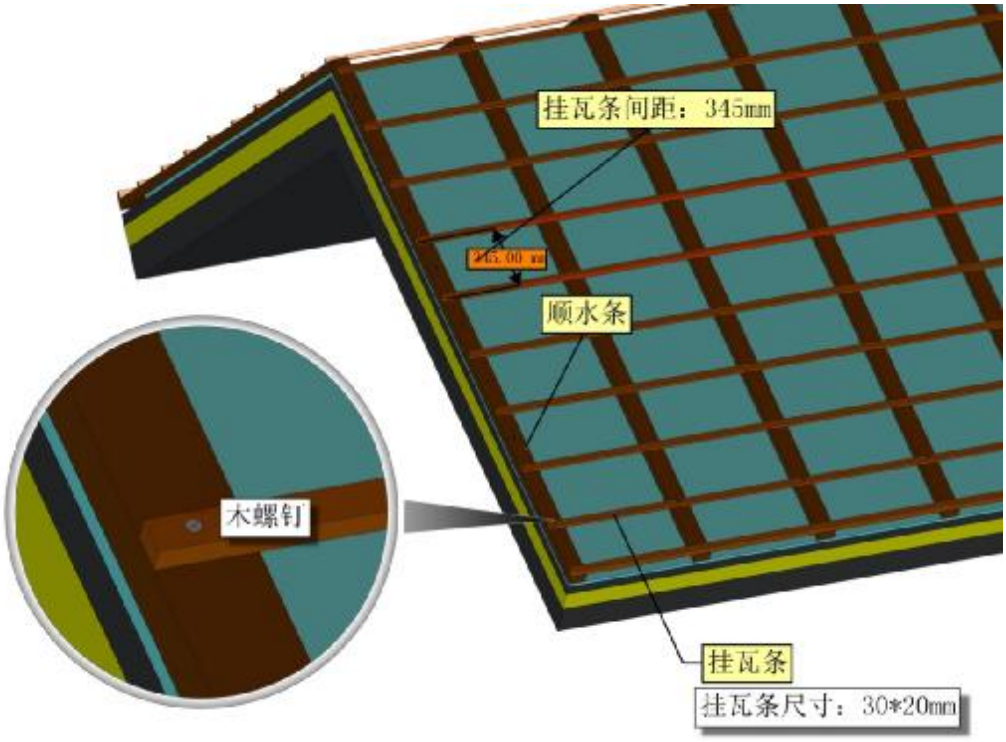
1、The install sequence for 20w PV flat tile and match tile is from right side to left side, then from down side to up side. In order to make the roof has a better waterproof performance, we suggest overlap joint between upper and lower two layers. As the chart shown.

The roof batten uses 30*20mm anticorrosive roof batten, transverse spacing distance for roof batten is 375mm. The lap length between up and down is 65mm. (Remark: if the distance for roof batten or overlap size for PV tile needs to adjust, must ensure the overlap

location for solar cell without sunshine.) When you install the roof batten, you must use steel tape confirm the roof batten distance, fixed position by Snapline ink fountain, using wood screw (or steel nail), and electric hand drill (or hammer) to fix the roof batten on the counter batten. When you flip the elastic line, be sure the battens parallel to each other.

3. How to install PV tile and match tile

1、The install sequence for 8w PV wave tile and match tile is from right side to left side, then from down side to up side. In order to make the roof has a better waterproof performance, we suggest overlap joint between upper and lower two layers. As shown before.

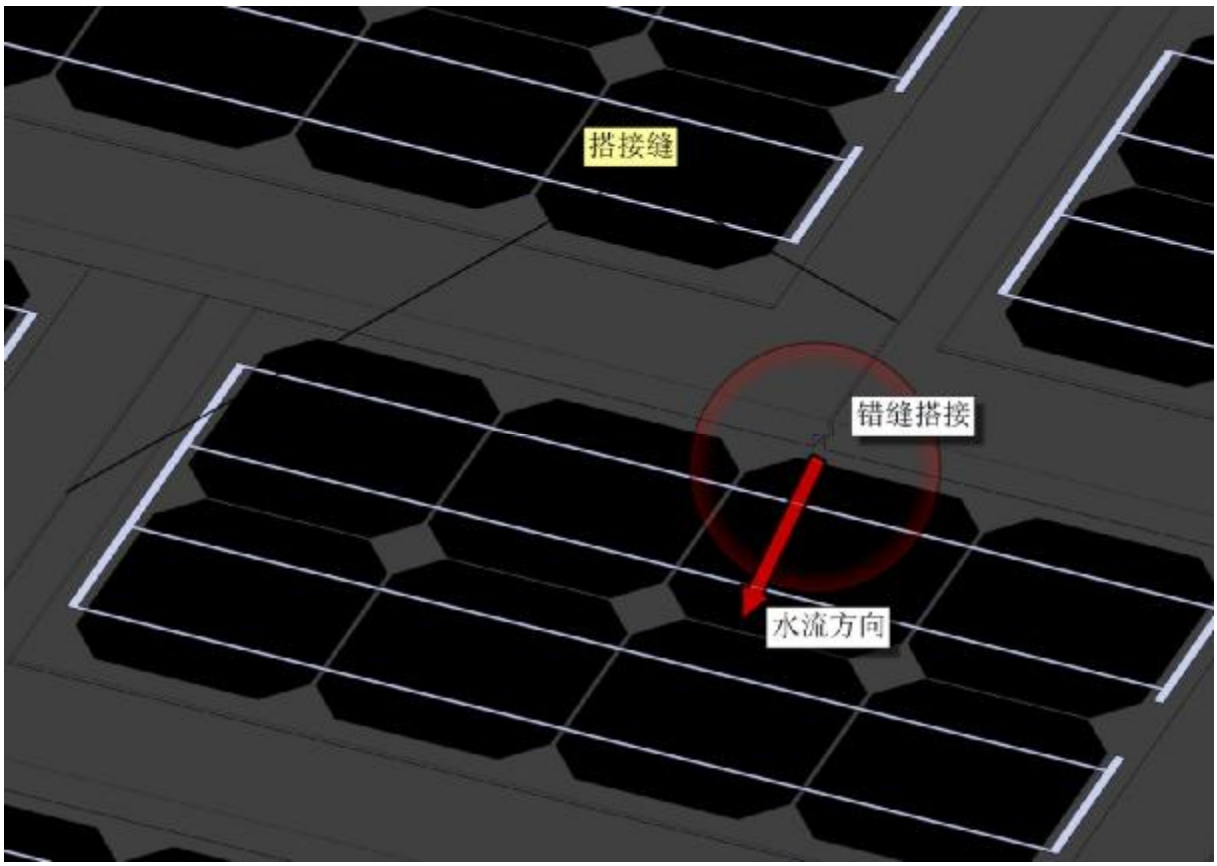


The roof batten uses 30*20mm anticorrosive roof batten, transverse spacing distance for roof batten is 375mm. The lap length between up and down is 65mm. (Remark: if the distance for roof batten or overlap size for PV tile needs to adjust, must ensure the overlap location for solar cell without sunshine.) When you install the roof batten, you must use steel tape confirm the roof batten distance, fixed position by Snapline ink fountain, using wood screw (or steel nail), and electric hand drill (or hammer) to fix the roof batten on the counter batten. When you flip the elastic line, be sure the battens parallel to each other.

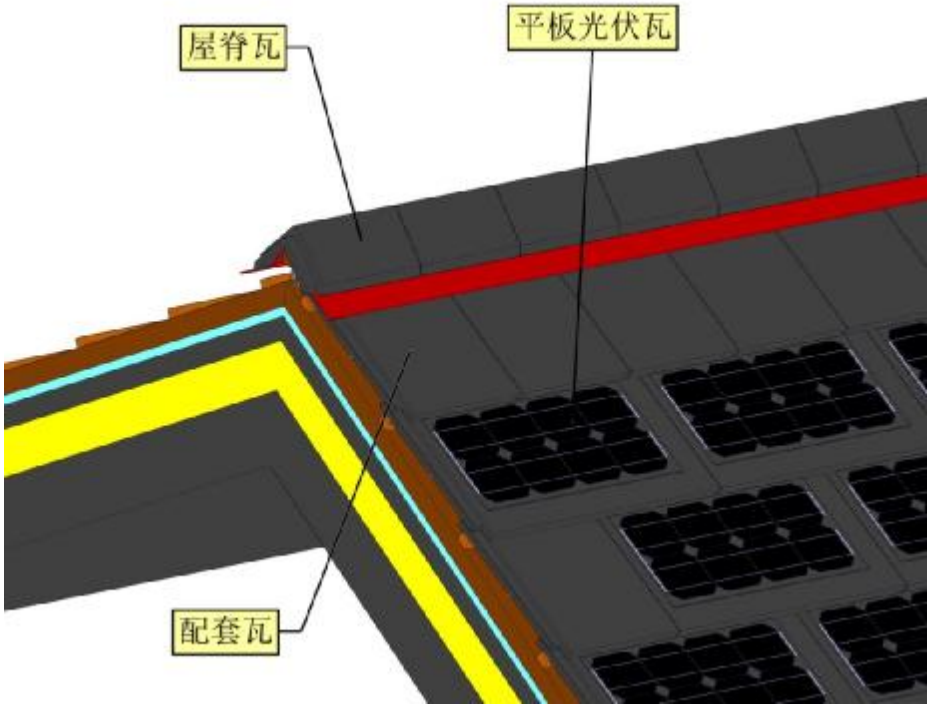
3. How to install PV tile and match tile

1、The install sequence for 20w PV wave tile and match tile is from right side to left side, then from down side to up side. In order to make the roof has a better waterproof

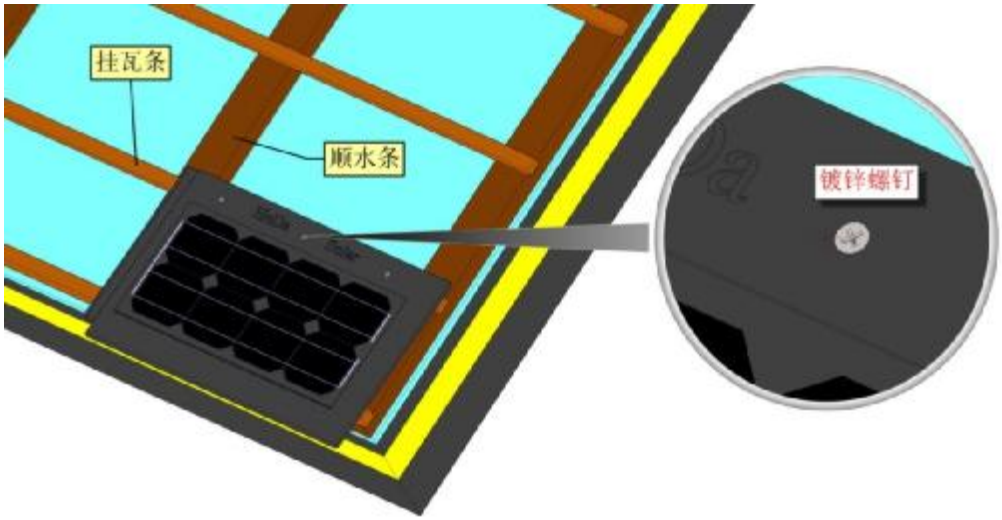
performance, we suggest overlap joint between upper and lower two layers. As the chart shown.



2、Notice：When install the PV tile, match tile and ridge tile, the lower edge of upper tile cannot cover the lower layer PV tile's solar cell, as incorrect installation will seriously affect the power performance of the system, thus requiring the last layer of tile should use match tile. On the edge of the roof or roofing oblique need cutting tiles, require to use match tile. When the PV tile installed, the roof must keep clean in case of affecting generate power, such as cement covered by pollutant on PV tile.



3、Nail hole in tile must use galvanize screws to fix tiles on the counter batten.



4、Wiring and arrangement of PV tile

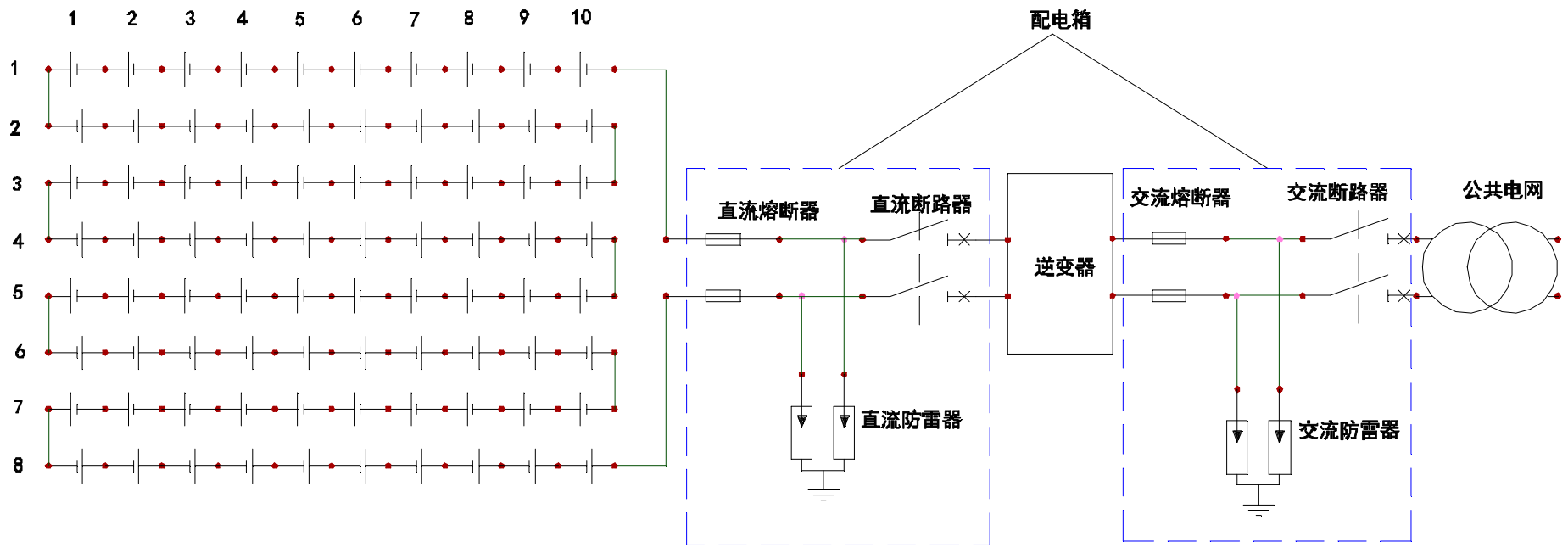
Even the same type of PV tile, there will be a large difference because of the roof structure, the mounting area of the different tile arrangement. In order to standardize the installation, as well as for PV system engineers in selecting system can accurately choose suitable for the selected standard roofing system. In the following table lists the standard arrangement of standard systems, as well as in the standard arrangement under the required installation

dimensions.

When install a PV tile system recommended standard arrangement for installation. If the selected roof cannot meet the standard arrangement, please contact PV system engineer, ensure that the installation is feasible in the case of change of PV arrangement.

Standard arrangement table

System Type	Quantity of PV tile（pcs）	Standard arrangement（line*row）	Number of strings（pcs/string*str	String voltage（V）	Min. roofing size（vertical m* horizontal m=size ㎡）	
HDS-PVTS.N1600.F20.80	80	8*10	80*1	320	2.84*6.37=18.09	
HDS-PVTS.N2000.F20.96	96	8*12	96*1	384	2.84*7.94=22.55	
HDS-PVTS.N2500.F20.128	128	8*16	64*2	256	2.84*10.48=29.76	
HDS-PVTS.N3200.F20.160	160	10*16	80*2	320	3.53*10.48=37.00	
HDS-PVTS.N3800.F20.192	192	12*16	96*2	384	4.22*10.48=44.23	
HDS-PVTS.N4800.F20.240	240	12*20	80*3	320	4.22*13.01=54.90	
HDS-PVTS.N6400.F20.320	320	16*20	80*4	320	5.60*13.01=72.86	
Notice	Tile size	up / down	420mm	Lap method	up /down	345mm
		left / right	664mm		left / right	654mm

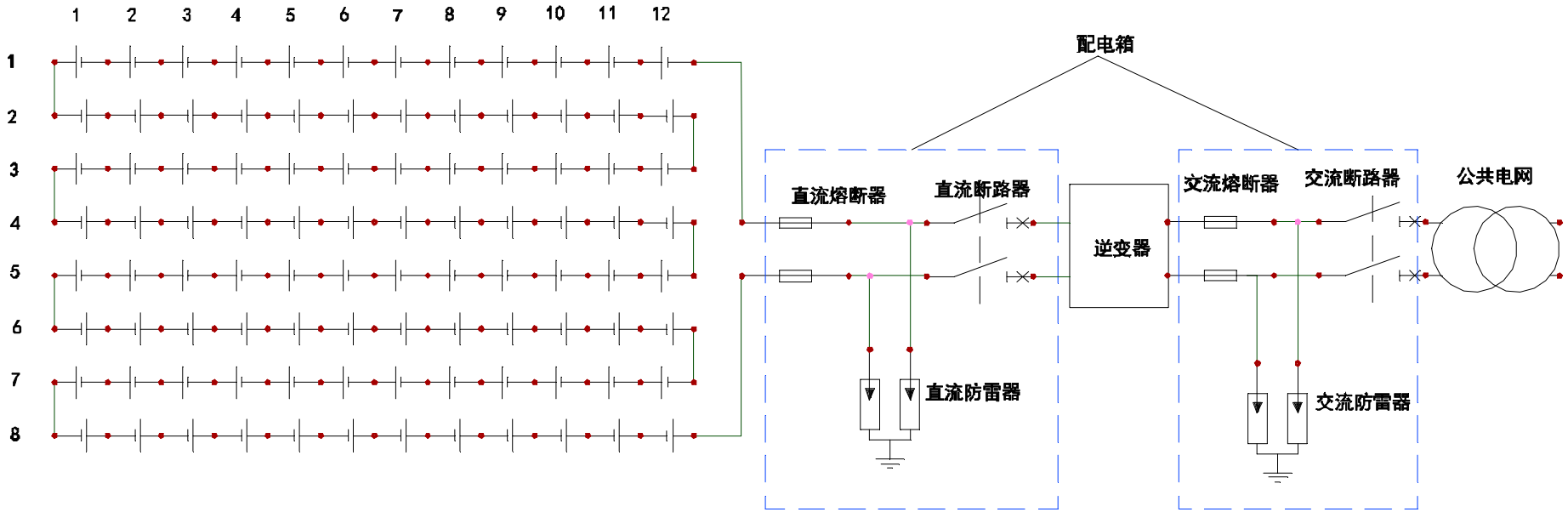


说明：1、表示一片20W平板光伏瓦

2、在该系统中总共使用了80片20W平板光伏瓦，总装机容量1600W。

3、标准排列方式8行×10列，需安装面积2.84*6.37=18.09m2

HDS-PVTS.N1600.F20.80 System wiring diagram

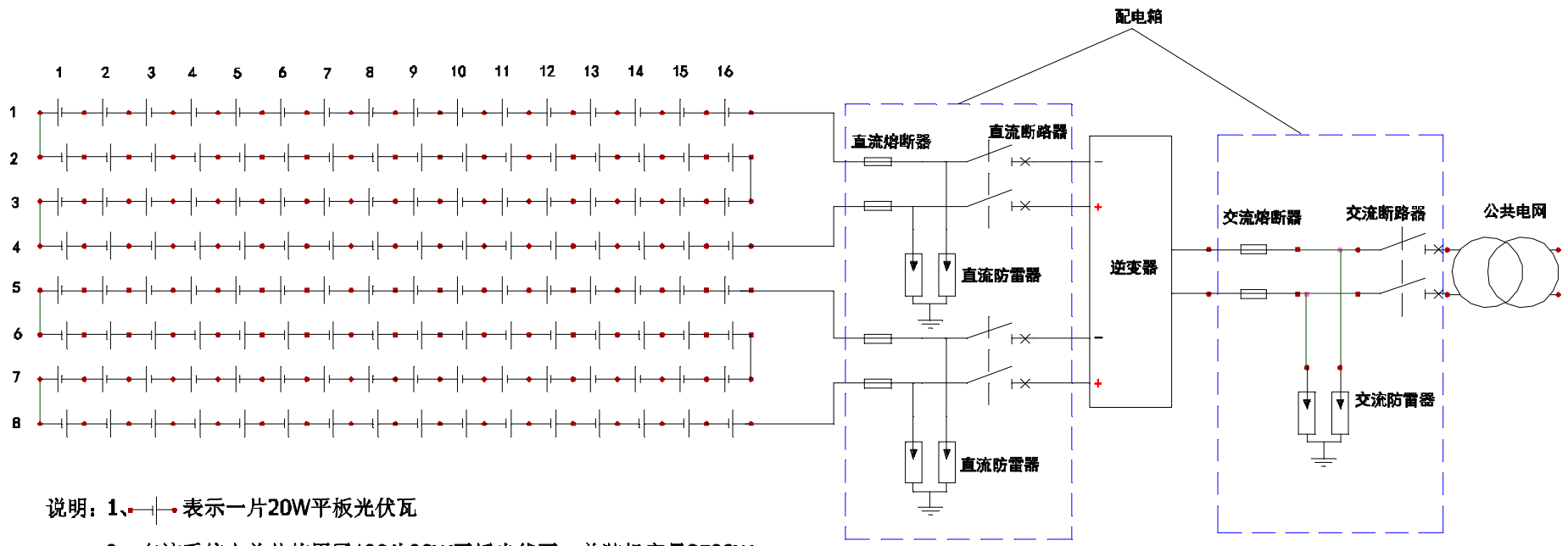


说明：1、  表示一片20W平板光伏瓦

2、在该系统中总共使用了96片20W平板光伏瓦，总装机容量2000W。

3、标准排列方式8行×12列，需安装面积2.84*7.94=22.55m2

HDS-PVTS.N2000.F20.96 System wiring diagram



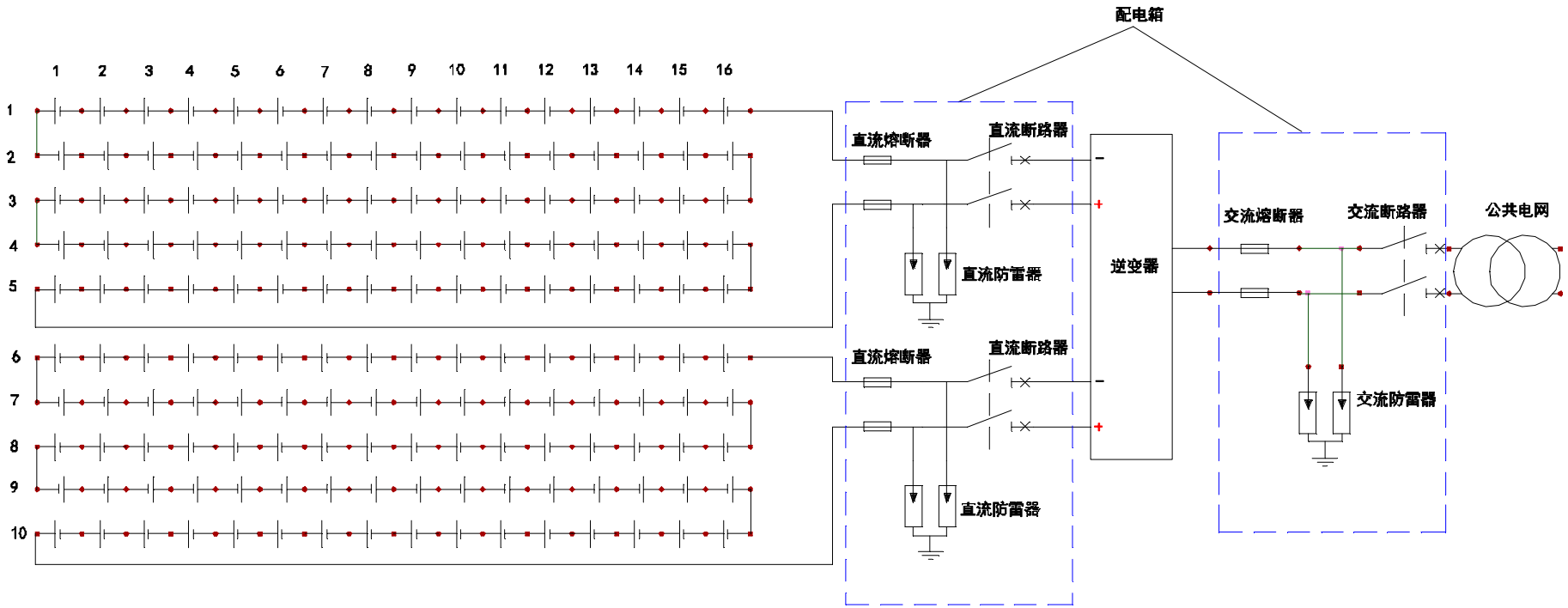
说明：1、表示一片20W平板光伏瓦

2、在该系统中总共使用了128片20W平板光伏瓦，总装机容量2500W。

3、标准排列方式8行×16列，需安装面积2.84*10.48=29.76m2

4、接线方式：64片光伏瓦为一串，总共2串光伏瓦阵列汇流后接入逆变器

HDS-PVTS.N2500.F20.128 System wiring diagram



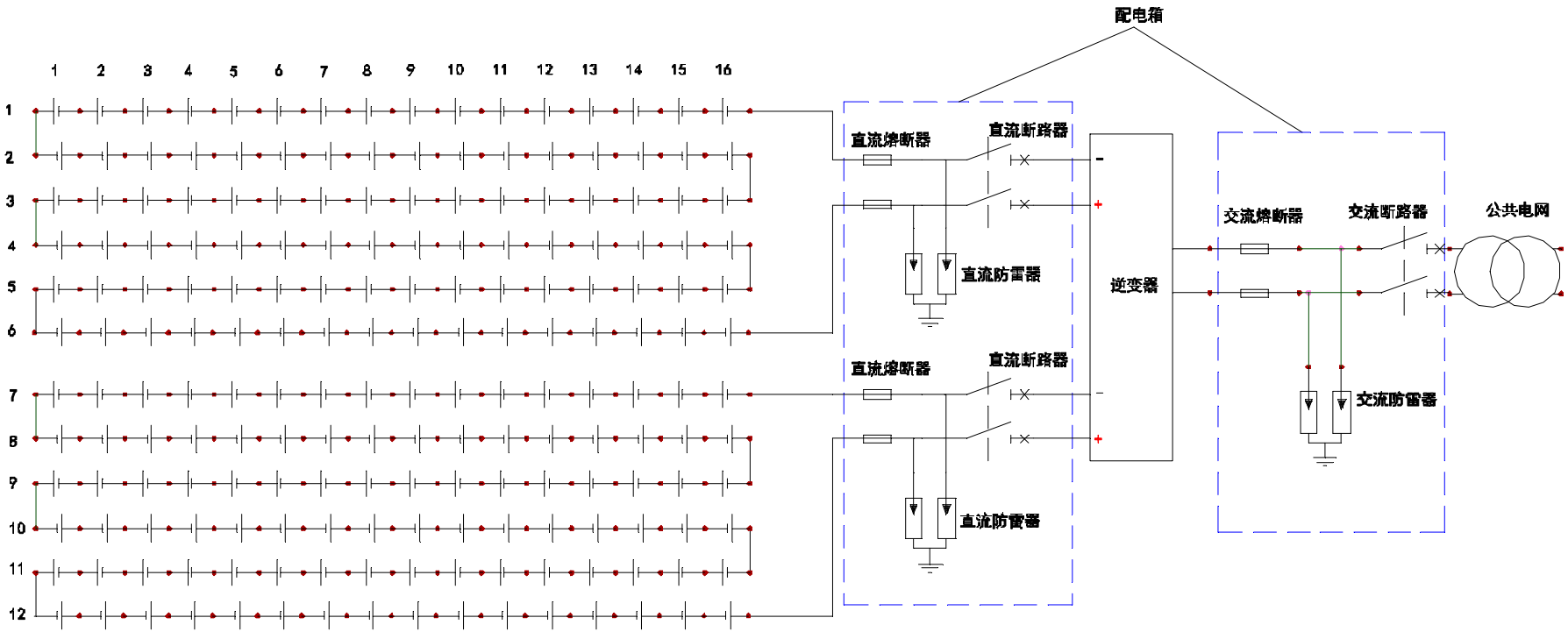
说明：1、⊣⊢表示一片20W平板光伏瓦

2、在该系统中总共使用了160片20W平板光伏瓦，总装机容量3200W。

3、标准排列方式10行×16列，需安装面积3.53*10.48=37m2

4、接线方式：80片光伏瓦为一串，2串光伏瓦汇流后接入逆变器

HDS-PVTS.N3200.F20.160 系统接线图



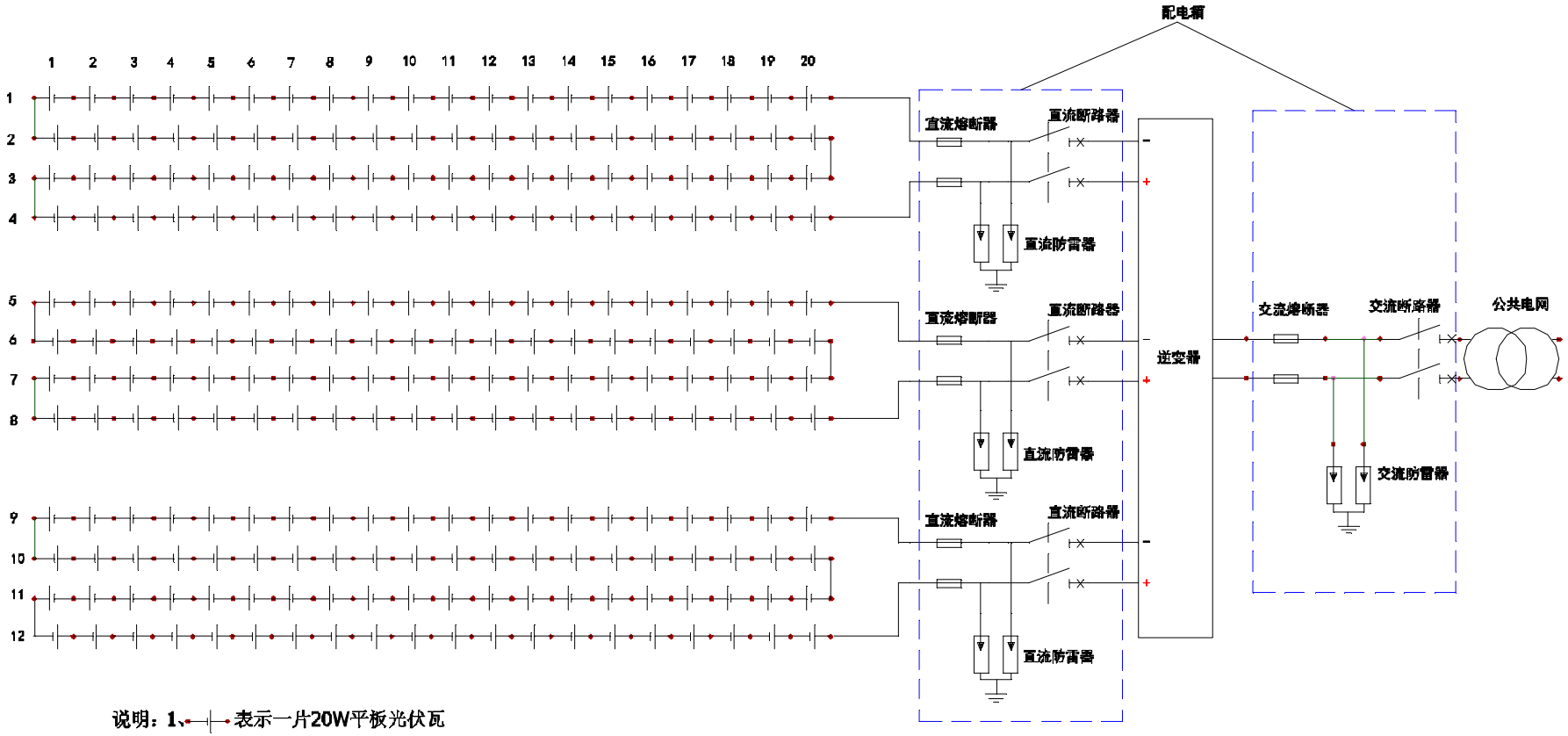
说明：1、—|—表示一片20W平板光伏瓦

2、在该系统中总共使用了192片20W平板光伏瓦，总装机容量3800W。

3、标准排列方式12行×16列，需安装面积4.22*10.48=44.23m2

4、接线方式：96片光伏瓦为一串，2串光伏瓦汇流后接入逆变器

HDS-PVTS.N3800.F20.192 System wiring diagram



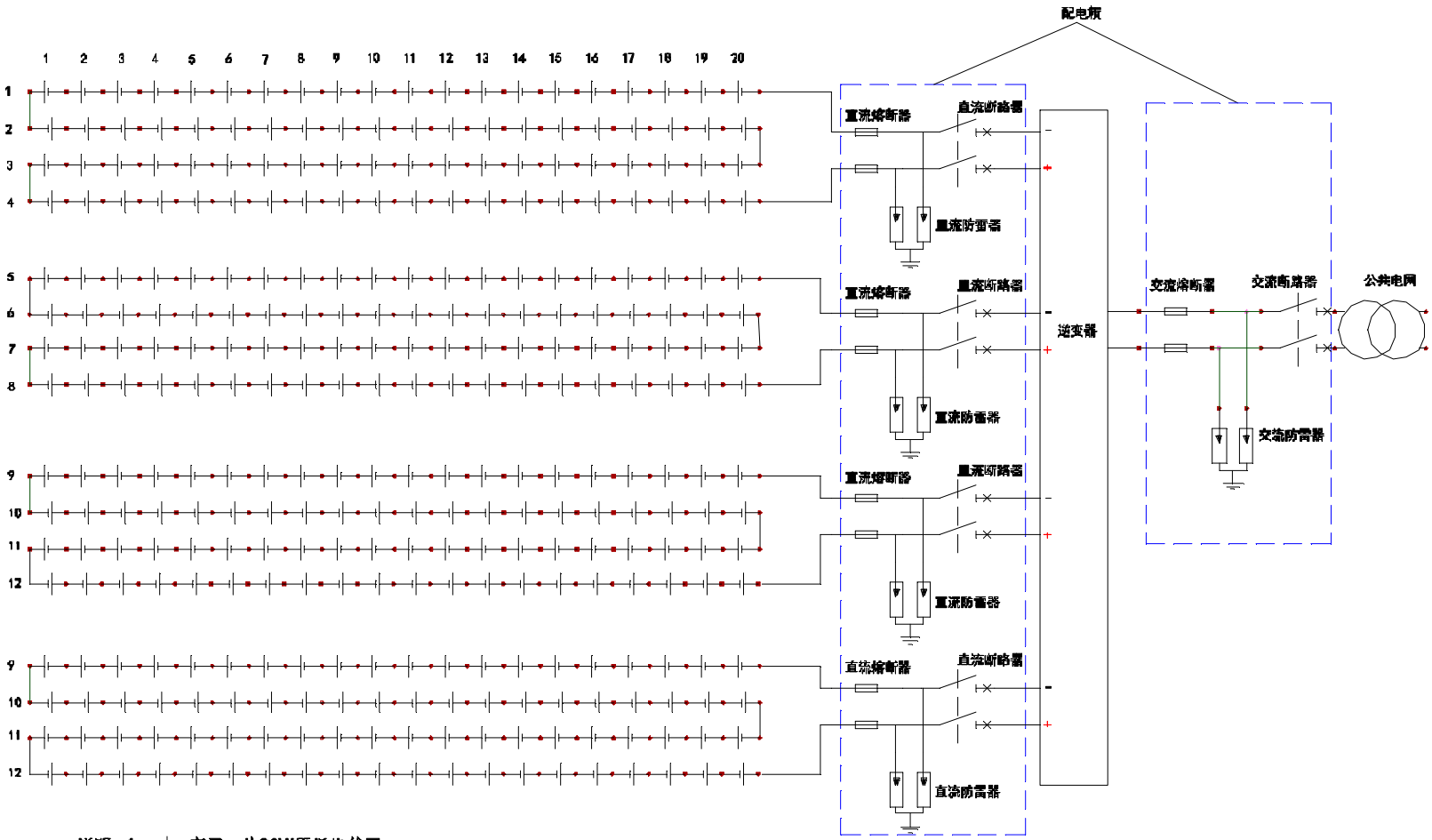
说明：1、—|—表示一片20W平板光伏瓦

2、在该系统中总共使用了240片20W平板光伏瓦，总装机容量4800W。

3、标准排列方式12行×20列，需安装面积4.22*13.01=54.9m2

4、接线方式：80片光伏瓦为一串，3串光伏瓦汇流后接入逆变器

HDS-PVTS.N4800.F20.240 System wiring diagram



说明：1、┤├表示一片20W平板光伏瓦

2、在该系统中总共使用了320片20W平板光伏瓦，总装机容量6400W。

3、标准排列方式16行×20列，需安装面积5.6*13.01=72.86m2

4、接线方式：80片光伏瓦为一串，4串光伏瓦汇流后接入逆变器

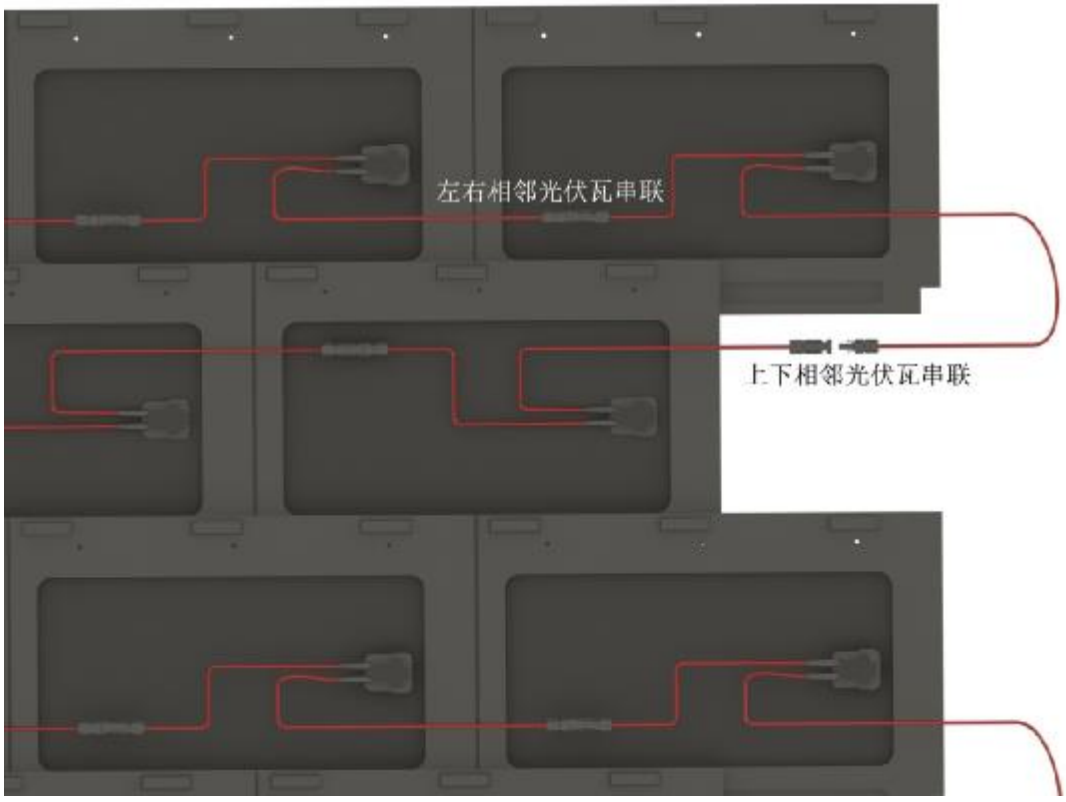
HDS-PVTS.N6400.F20.320 System wiring diagram

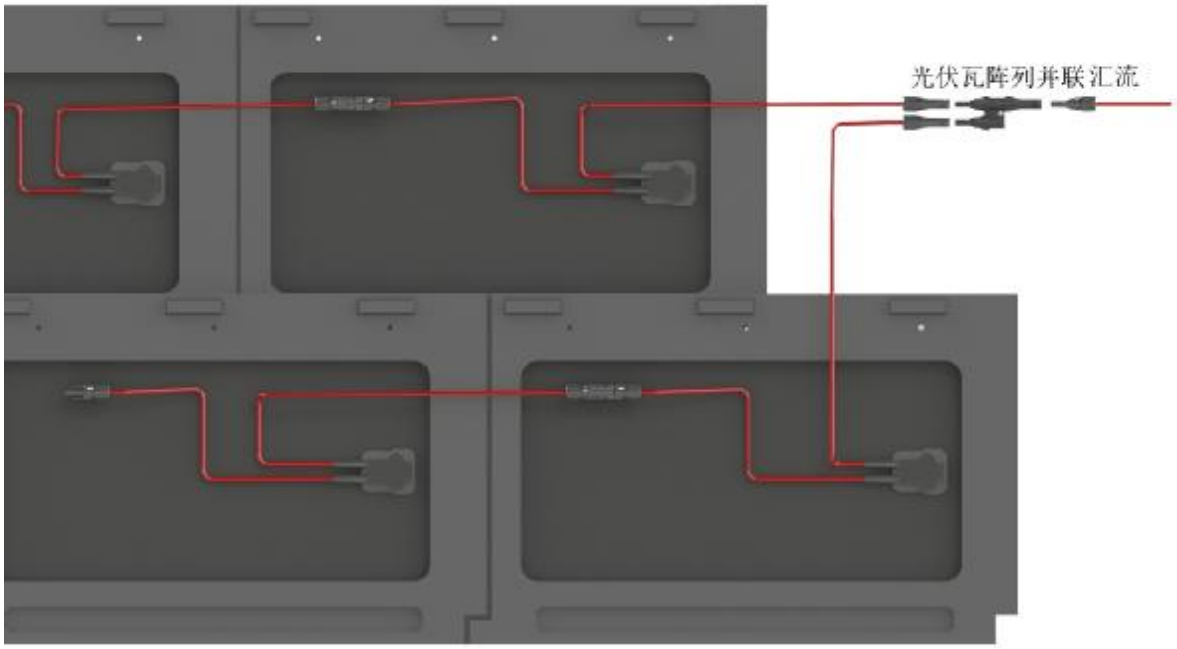
Every 20 pieces PV tiles installed, the string must detect the open circuit voltage, if the open circuit is zero, the PV tile should be checked on this part of PV tile connector case, eliminate trip point. Do not test after all PV tiles is installed.

Cut the wiring as required after the installation of PV tiles, respond to each series of PV array for testing the open circuit voltage of PV tile array corresponds with the theoretical value. If the deviation exceeds the error range, please test tube service whether there is damage during the installation process.

Notice: During installation, do not to bring PV tile array short circuit the positive and negative.

PV tile connector and wiring method as shown below.





VI. Contact Us

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