

# HJT PV MODULE INSTALLATION MANUAL

## **1. General Information**

1.1 Overview

1.2 Installation Manual Disclaimer

1.3 Limitation of Liability

1.4 Fire Safety

## **2. Installation**

2.1 Installation Safety

2.2 Installation Condition

2.3 Mechanical Installation Introduction

## **3. Module Wiring**

3.1 Correct Wiring Scheme

3.2 Correct Connection of Plug Connectors

## **4. Grounding**

## **5. Electrical Specification**

5.1 Test conditions

5.2 Electrical performance parameter table

5.3 Electrical Installation

## **6. Module Junction box properties**

6.1 Cable

6.2 Connector

6.3 Bypass diode

## **7. Maintenance and Care**

7.1 Visual Inspection

7.2 Module Cleaning

7.3 Inspection of Connector and Cable

## **1. General Information**

### **1.1 Overview**

This general manual provides important safety information relating to the installation, maintenance and handling of heterojunction(HJT) solar modules. Professional installer must read these guidelines carefully and strictly follow these instructions. Failure to follow these instructions may result in death, injury or property damage. The installation and handling of HJT PV modules requires professional skills and should only be performed by qualified professionals. Installers must inform end -users (consumers) about the aforesaid information accordingly.

The "module" or "HJT module" in this specification refers to one or more HS series HJT photovoltaic modules. Please keep this manual for future reference

It is recommended to visit the HUASUN website [www.huasunsolar.com](http://www.huasunsolar.com) regularly to obtain the latest version.

### **1.2 Installation Manual Disclaimer**

Because the use of the manual and the conditions or methods of installation, operation, use and maintenance of photovoltaic (PV) product are beyond HUASUN's control, HUASUN 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 HUASUN 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 HUASUN'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. HUASUN reserve the right to change the manual, the PV produce, the specifications, or product information sheets without prior notice.

### **1.3 Limitation of Liability**

HUASUN is not responsible for any form of injury, including but not limited to module operation, system installation, and physical injury, injury and property damage caused by whether it is in accordance with the instructions in this manual.

### **1.4 Fire Safety**

Please refer to local laws and regulations before installing modules and abide by requirements on building fire protection. According to the corresponding certification standards, the fire rating of Huasun modules is Class A (According to UL790).

The roof should be coated by a layer of fireproof materials with suitable fire protection rating for roofing installation and make sure that the back sheet and the mounting surface are fully ventilated.

Different roof structures and installation modes will affect fireproof performance of buildings. Improper installation may lead to the risk of fire.

To guarantee roof fire rating, the distance between module frame and roof surface must be  $\geq 10\text{cm}$ . (4in)

Adopt proper module accessories such as fuse, circuit breaker and grounding connector according to local regulations.

Please do not apply modules in where exposed inflammable gases are nearby.

## 2. Installation

### 2.1 Installation Safety

- ① Huasun modules have been qualified for Class II.
- ② The modules are not suitable for space environments, also not suitable for particularly harsh environments such as offshore without specially protected.
- ③ Always wear protective head gear, insulating gloves and safety shoes (with rubber soles).
- ④ Never disconnect electrical connections or unplug connectors while the circuit is under load.
- ⑤ Contact with electrically active parts of the modules, such as terminals, can result in burns, sparks and lethal shock whether or not the module is connected.
- ⑥ 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.
- ⑦ Do not work in the rain, snow or in windy conditions.
- ⑧ Avoid exposing cables and connectors to direct sunlight and scratches or cuts in order to prevent insulation degradation.
- ⑨ Use only insulated tools that are approved for working on electrical installations.
- ⑩ Keep children well away from the system while transporting and installing mechanical and electrical components.
- 11 Completely cover the module with an opaque material during installation to prevent electricity from being generated.
- 12 Do not wear metallic rings, watchbands, earrings, nose rings, lip rings or other metallic objects while installing or troubleshooting photovoltaic systems.
- 13 Follow the safety regulations (e.g., safety rules for working on electrical power plant stations) of your regions and for all other system components, including wires and cables, connectors, charging regulators, inverters, storage batteries, rechargeable batteries, etc.
- 14 Under normal conditions, a photovoltaic module is likely to experience conditions that produce more current and/or voltage than reported at standard test conditions. Accordingly, the values of  $I_{sc}$  and  $V_{oc}$  marked on this module should be multiplied by a factor of 1.25 when determining component voltage ratings, conductor current ratings, minimum factor of fuse sizes, and size of controls connected to the PV output.
- 15 Only use same connectors to connect modules to form a string, or connect to another device. Removing the connectors will void the warranty.

### 2.2 Installation Conditions

### 2.2.1 Climate Conditions

Please install the modules in the following conditions:

- a) Working environment: -40°C to +40°C
- b) Humidity: < 85RH%

\* Note: The mechanical load bearing (include wind and snow loads) of the module is based on the installation method and installation location. When calculating the mechanical load, a professional installer must calculate it according to the design requirements of the system. Modules should be installed in locations where the altitude is less than 2000m

### 2.2.2 Site Selection

- The modules should be facing south in northern latitudes and north in southern latitudes. HUASUN recommends that the inclination angle of the installation modules should not be less than 10°, so that the dust is washed away by rain, and more effective light intensity and ventilation are obtained, because the hot air above and below the components can flow in one direction and the components are efficient at lower temperatures higher.
- For detailed information about the best installation angle, please refer to the standard solar photovoltaic installation guide or consult professional solar installers and system integrators.
- The modules should not be blocked by sunlight at any time.
- Do not use components near or in locations where flammable gas may be generated or collected.
- The modules cannot be directly irradiated by artificially concentrated sunlight.

## 2.3 Mechanical Installation Introduction

HJT PV modules usually can be installed in the following ways: Clamps and Bolts.

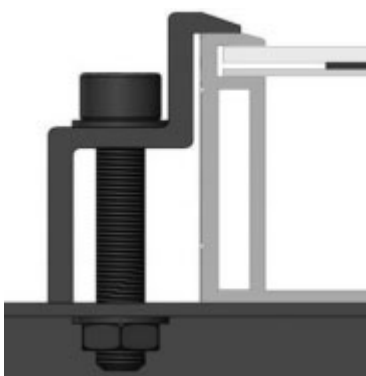
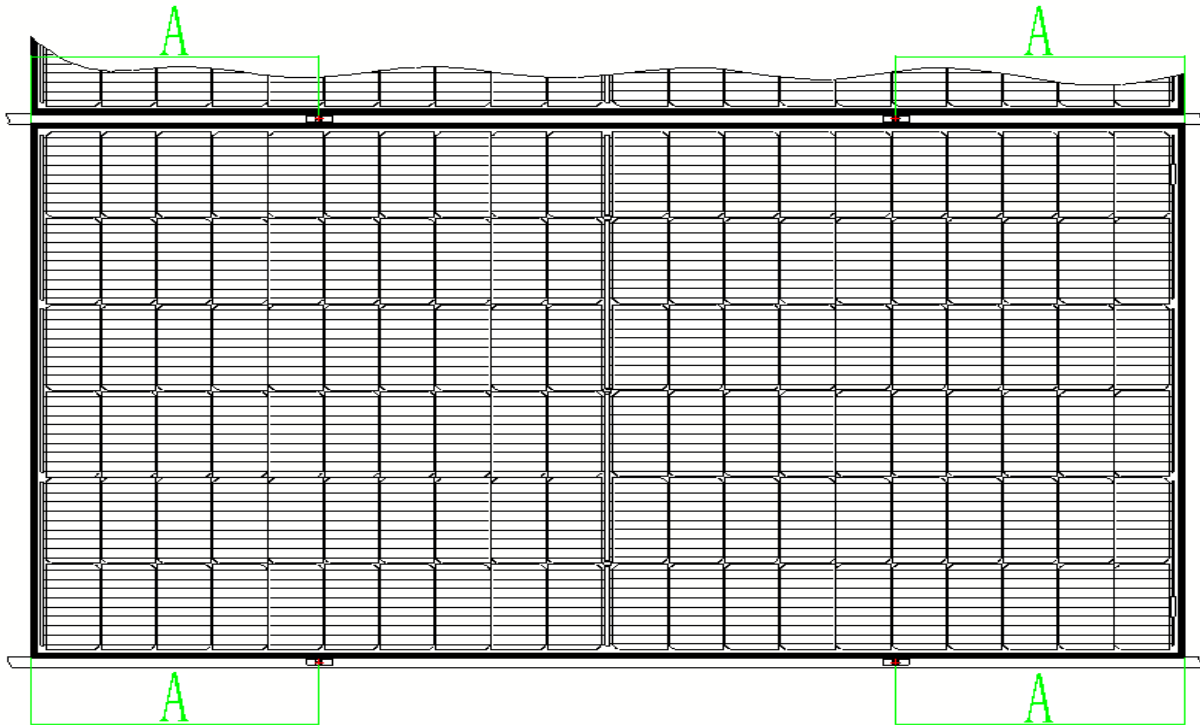
Note:

- 1) All installation methods herein are for reference only, and HUASUN is not responsible for providing related installation parts, design and installation of modules systems. Mechanical load and safety must be completed by a professional system installer or an experienced person.
- 2) Before installation, you need to confirm the following important items:
  - a) Visually check the module for any damage. Clean the module if any dirt or residue remains from shipping .
  - b) Check if the serial number of the module is correct.
- 3) The mechanical load of HUASUN HJT PV modules (framed module) was tested under 5400Pa on the front side (Designed 3600Pa, safety factor 1.5) and 2400Pa on the back side (Designed 1600Pa, safety factor 1.5) , PV modules (frameless module) was tested under 3600Pa on the front side (Designed 2400Pa, safety factor 1.5) and 2400Pa on the back side (Designed 1600Pa, safety factor 1.5) . If the installation environment of the module is snowy and strong wind, special protection should be adopted when the module is installed to meet the actual requirements.

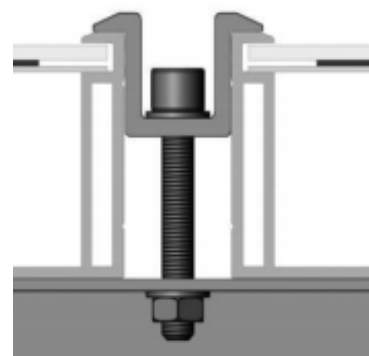
### 2.3.1 Mounting with Clamps (framed module)

The module clamps used with M8 bolts should not contact with the front glass and not deform the frame. Be sure to avoid shadowing effects from the module clamps. The module frame is not to be modified under any circumstances. When choosing the type of clamp-mounting method, please make sure that there are four clamps on each module, two clamps should be attached on each long sides of the module.

Depending on the local wind and snow loads, if excessive pressure load is expected, additional clamps or support would be required to ensure the module can bear the load. The torque used for installation is 16-20N.



Fringe Modules Installation



Middle Modules Installation

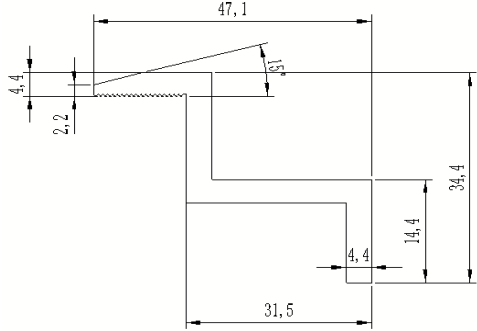
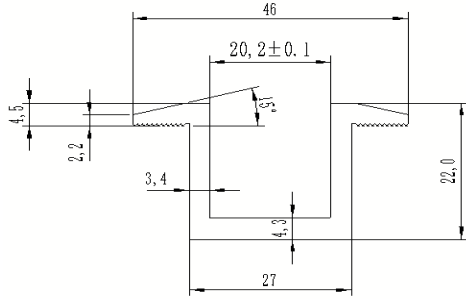
Module Type	A	Clamp Length	Clamp Type (for reference)
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HS-B120DS HS-B120DSN HS-B120DSB HS-S120SS HS-S120SSB HS-S120DSB HS-B96DS HS-B96DSN	439±50mm	60mm	
HS-B132DS HS-B132DSN HS-B132DSB HS-S132SS HS-S132SSB	485±50mm	60mm	
HS-B144DS HS-B144DSN <sup>①</sup> HS-B144DSB HS-S144SS HS-S144SSB	525±50mm	60mm	
HS-B156DS HS-B156DSN HS-B156DSB HS-S156SS HS-S156SSB	567±50mm	60mm	
HS-210-B110DS	440~540mm	60mm	

HS-210-B120DS	360~430mm	60mm
HS-210-B132DS	440~540mm	60mm
HS-182-B108DS HS-182-B108DSN HS-182-B108DSB	300~400mm	60mm
HS-182-B144DS	510~610mm	60mm

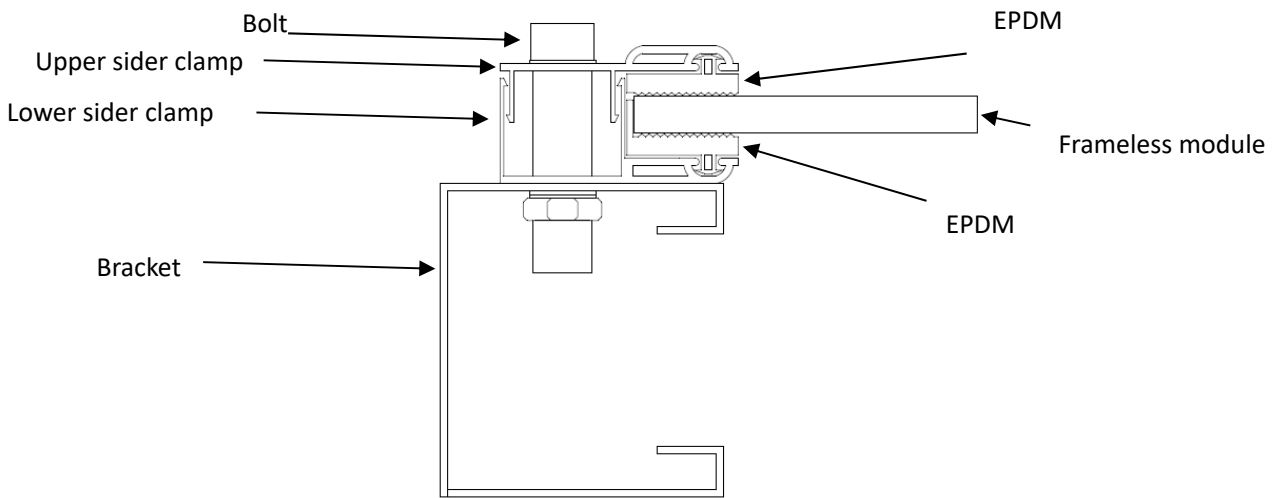
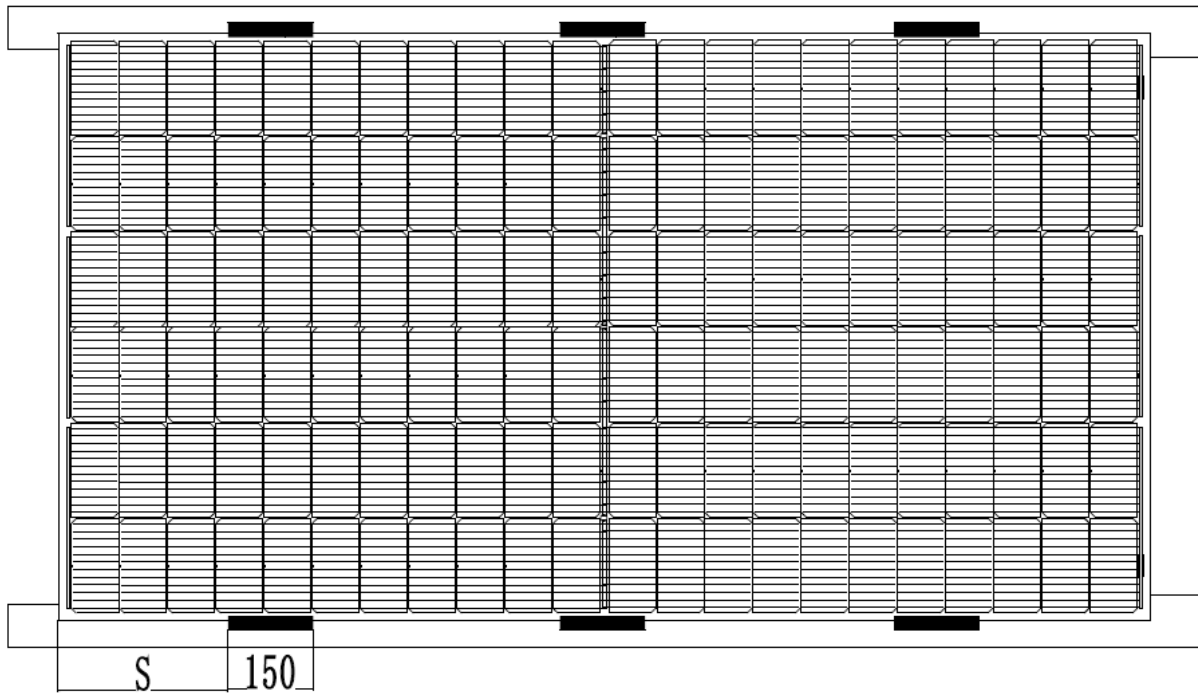
①Note: When the B side of the frame is 11mm, the installation method is 6 blocks, the distance between the two sides of the block is 240mm from the frame, and the middle blocks are 814mm from both sides, and the load is  $\pm 2400\text{Pa}$ .

### 2.3.2 Mounting with Clamps (frameless module)

The module clamps used with M8 bolts should not make glass winding. Be sure to avoid shadowing effects from the module clamps. When choosing the type of clamp-mounting method, please make sure that there are six clamps on each module, three clamps should be attached on each long sides of the module.

Depending on the local wind and snow loads, if excessive pressure load is expected, additional clamps or support would be required to ensure the module can bear the load. The torque used for installation is 16-20N.





Module Type	S	Clamp Length
HS-B120DN HS-B120DNN	300~400mm	150mm
HS-B132DN HS-B132DNN	300~400mm	150mm
HS-B144DN HS-B144DNN	400~500mm	150mm
HS-B96DNN	200~300mm	150mm

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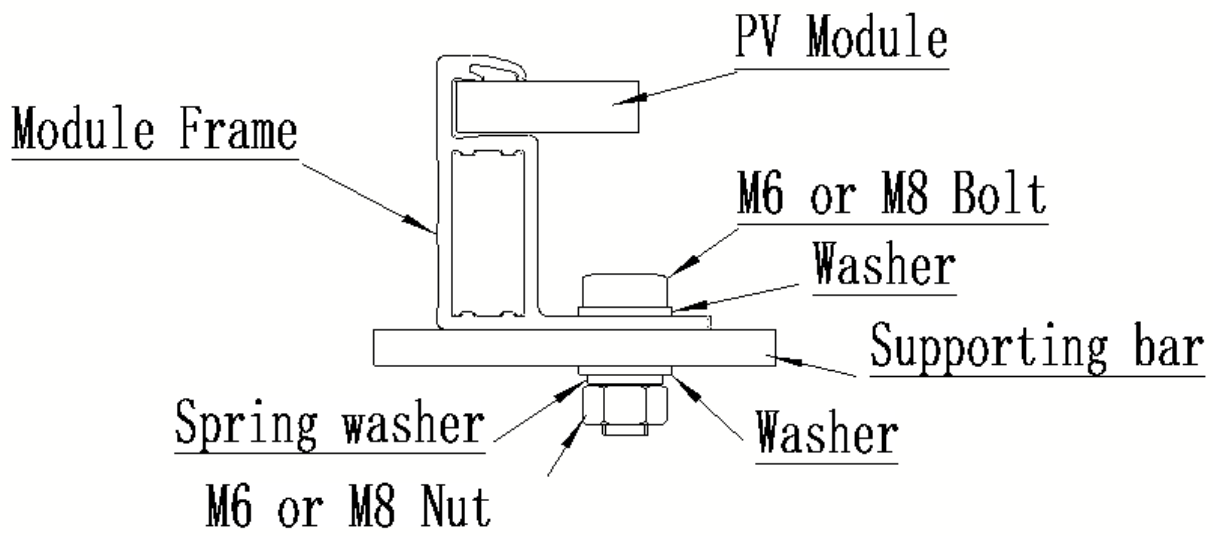
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### 2.3.3 Mounting with Bolts (framed module)

There are 4 or 8 mounting holes of 9mm\*14mm and 7mm\*10mm on the frame of the module. In consideration of the fastness of the module after installation, each mounting hole must be fixed with the corresponding bolt connection.



Module Type	Bolt Type	Quantity
HS-B120DS HS-B120DSN HS-B120DSB HS-S120SS HS-S120SSB HS-S120DSB HS-B96DS HS-B96DSN	M8	4 sets
HS-B132DS HS-B132DSN HS-B132DSB HS-S132SS HS-S132SSB HS-B144DS HS-B144DSN HS-B144DSB HS-S144SS HS-S144SSB HS-B156DS HS-B156DSN	M6 & M8	4 sets/each

HS-B156DSB HS-S156SS HS-S156SSB HS-210-B110DS HS-210-B120DS HS-210-B132DS HS-182-B108DS HS-182-B108DSN HS-182-B108DSB HS-182-B144DS		
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### 3. Module Wiring

#### 3.1 Correct Wiring Scheme

- ① Ensure that the wiring is correct before starting up the system. If the measured open circuit voltage (Voc) and short-circuit current (Isc) differ substantially from the specifications, this indicates that there is a wiring fault.
- ② Do not connect different connectors (brand and model) together.
- ③ Before the modules are connected to the grid, appropriate protective measures need to be taken to prevent water vapor and dust from penetrating into the connector.
- ④ The cable should be fixed on the module frame or mounting rail to avoid blocking the back of the module.
- ⑤ In order to meet the system wiring requirements, the distance between the two adjacent modules of the left and right must be within 50mm; for the adjacent two rows of modules, the distance between the modules must be within 25mm.

#### 3.2 Correct Connection of Plug Connectors

- Make sure that all connections are safe and properly mated. The PV connectors should not be subjected to stress from the exterior. Connectors should only be used to connect the circuit. They should never be used to turn the circuit on and off.
- If the connector is not connected positively and negatively, the connector is not waterproof. After the modules are installed, they need to be connected as soon as possible or take appropriate measures (such as using connector end caps) to avoid infiltration of water vapor and dust.
- Do not clean or precondition the connectors using lubricants or any unauthorized chemical substances.

### 4. Grounding

4.1 Module frame should be grounded to avoid lightning strikes and for electrical safety. It can be connected by using a 4mm<sup>2</sup> copper wire through the adjacent ground hole on the module frame. If there is no ground hole, you can also use the unused mounting hole on frame for the grounding;

4.2 When grounding, the screw must penetrate the anodized coating of the frame and it should be tightened to secure.

4.3 The grounding conductor or grounding wire may be copper, copper alloy or any other material used as an electrical conductor that meets the requirements of the corresponding National Electrical Code, and the grounding conductor must be connected to the earth by suitable grounding electrode;

4.4 The following grounding methods are permitted:

① Use grounding clamp for grounding

a. There is a  $\varnothing 5\text{mm}$  diameter ground hole in the middle near the edge on the back frame of the module.

b. The grounding between the modules should be done by a qualified electrician and the grounding device must be made by a qualified electrical manufacturer. The recommended torque value is  $2.3\text{N}\cdot\text{m}$ . Use a 12AWG size copper wire as grounding clamp. The copper wire should not be damaged by pressure installation.

② Grounding by unused mounting holes

Existing but unused mounting holes on the module can be used to install the grounding device.

a. Align the grounding clip with the mounting hole of the frame. Use the grounding bolt to thread through the grounding clamp and the frame;

b. Put the star-washer on the other side and tighten the lock nut;

c. Pass the grounding wire through the grounding clip. The material and size of the grounding wire should meet the requirements of the relevant local national, regional and local laws and regulations, and standards;

d. Tighten the fastening bolts of the grounding wire to complete the installation.

③ Other third-party grounding devices

Huasun modules may be grounded using a third-party grounding device, but the grounding must be reliable and certified, and the grounding device is operated in accordance with the manufacturer's requirements.

## 5. Electrical Specification

### 5.1 Test conditions

The module electrical rating are measured under two Standard Test Conditions, In some cases, the module may generate a voltage or current value higher or lower than the rated value. The maximum allowable reflected light intensity on the back is  $300\text{W}/\text{m}^2$ .

5.1.1  $1000\text{W}/\text{m}^2$  on front, irradiance with AM 1.5 spectrum and 25 deg ( $77^\circ\text{F}$ ) ambient temperature, hereinafter referred to as STC.

5.1.2  $1000\text{W}/\text{m}^2$  on front,  $135\text{W}/\text{m}^2$  on back, irradiance with AM 1.5 spectrum and 25 deg ( $77^\circ\text{F}$ ) ambient temperature, hereinafter referred to as BSTC.

## 5.2 Electrical performance parameter table

### 5.2.1 Electrical rating (grid back panel glass, Data under STC)

MODULE TYPE/S	HS-B96DSN29 5	HS-B96DSN30 0	HS-B96DSN30 5	HS-B96DSN31 0	HS-B96DSN31 5	HS-B96DSN32 0
Voc(with tolerance ± 3%) [V] :	35.7	35.89	36.09	36.28	36.47	36.65
Isc (with tolerance ± 5%) [A] :	10.42	10.52	10.62	10.72	10.82	10.92
VPmax [V] :	29.74	29.92	30.05	30.19	30.38	30.51
IPmax [A] :	9.92	10.03	10.15	10.27	10.37	10.49
Pmax (with tolerance ± 3%) [W] :	295	300	305	310	315	320
$\alpha$ [%/°C]	0.04%					
$\beta$ [%/°C]	-0.24%					
$\delta$ [%/°C]	-0.26%					
Maximum Series Fuse(A)	20A					

MODULE TYPE/S	HS-B144D S440	HS-B144D S445	HS-B144D S450	HS-B144D S455	HS-B144D S460	HS-B144D S465	HS-B144D S470	HS-B144D S475	HS-B144D S480
	HS-B144D N440	HS-B144D N445	HS-B144D N450	HS-B144D N455	HS-B144D N460	HS-B144D N465	HS-B144D N470	HS-B144D N475	HS-B144D N480
Voc (with tolerance± 3%) [V].....	52.70	52.83	52.96	53.09	53.22	53.35	53.48	53.61	53.74
Isc (with tolerance±5%) [A] .....	10.34	10.40	10.46	10.52	10.58	10.64	10.70	10.76	10.82
VPmax [V].....	44.45	44.65	44.85	45.04	45.24	45.44	45.66	45.86	46.08
IPmax [A] .....	9.92	9.98	10.05	10.12	10.18	10.24	10.30	10.36	10.43
Pmax (with tolerance +3%)[W].....	440	445	450	455	460	465	470	475	480
$\alpha$ [%/°C]	0.04%								

MODULE TYPE/S	HS-B144D	HS-B144D	HS-B144D	HS-B144D	HS-B144D	HS-B144D	HS-B144D	HS-B144D	HS-B144D
	S440	S445	S450	S455	S460	S465	S470	S475	S480
	HS-B144D	HS-B144D	HS-B144D	HS-B144D	HS-B144D	HS-B144D	HS-B144D	HS-B144D	HS-B144D
	N440	N445	N450	N455	N460	N465	N470	N475	N480
$\beta$ [%/°C]	-0.24%								
$\delta$ [%/°C]	-0.26%								
Maximum Series Fuse(A)	20A								

MODULE TYPE/S	HS-B120D	HS-B120D	HS-B120D	HS-B120D	HS-B120D	HS-B120D	HS-B120D	HS-B120D	HS-B120D
	S365	S370	S375	S380	S385	S390	S395	S400	S405
	HS-B120D	HS-B120D	HS-B120D	HS-B120D	HS-B120D	HS-B120D	HS-B120D	HS-B120D	HS-B120D
	N365	N370	N375	N380	N385	N390	N395	N400	N405
Voc (with tolerance $\pm$ 3%) [V].....	43.83	43.96	44.09	44.22	44.35	44.48	44.61	44.74	44.87
Isc (with tolerance $\pm$ 5%) [A] .....	10.32	10.38	10.44	10.50	10.56	10.62	10.68	10.74	10.80
VPmax [V].....	36.90	37.11	37.31	37.52	37.70	37.91	38.16	38.36	38.57
IPmax [A] .....	9.91	9.98	10.06	10.14	10.22	10.30	10.36	10.44	10.52
Pmax (with tolerance +3%)[W].....	365	370	375	380	385	390	395	400	405
$\alpha$ [%/°C]	0.04%								
$\beta$ [%/°C]	-0.24%								
$\delta$ [%/°C]	-0.26%								
Maximum Series Fuse(A)	20A								

MODULE TYPE/S	HS-B132D	HS-B132D	HS-B132D	HS-B132D	HS-B132D	HS-B132D	HS-B132D	HS-B132D	HS-B132D
	S405	S410	S415	S420	S425	S430	S435	S440	S445
	HS-B132D	HS-B132D	HS-B132D	HS-B132D	HS-B132D	HS-B132D	HS-B132D	HS-B132D	HS-B132D
	N405	N410	N415	N420	N425	N430	N435	N440	N445

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Voc (with tolerance±3%) [V].....	48.31	48.47	48.62	48.80	48.9	49.08	49.21	49.29	49.42
Isc (with tolerance±5%) [A].....	10.61	10.63	10.65	10.66	10.69	10.7	10.72	10.75	10.77
VPmax [V].....	39.63	39.97	40.30	40.66	40.95	41.31	41.63	41.95	42.27
IPmax [A].....	10.22	10.26	10.30	10.33	10.38	10.41	10.45	10.49	10.53
Pmax (with tolerance +3%)[W].....	405	410	415	420	425	430	435	440	445
$\alpha$ [%/°C]	0.04%								
$\beta$ [%/°C]	-0.24%								
$\delta$ [%/°C]	-0.26%								
Maximum Series Fuse(A)	20A								

MODULE TYPE/S	HS-B144D S485	HS-B144D S490	HS-B144D S495	HS-B144D S500	HS-B132D S445	HS-B132D S450	HS-B132D S455	HS-B120D S405	HS-B120D S410	HS-B120D S415
	HS-B144D N485	HS-B144D N490	HS-B144D N495	HS-B144D N500	HS-B132D N445	HS-B132D N450	HS-B132D N455	HS-B120D N405	HS-B120D N410	HS-B120D N415
Voc (with tolerance±3%) [V].....	54.00	54.25	54.50	54.75	49.71	50.12	50.53	45.04	45.34	45.64
Isc (with tolerance±5%) [A].....	10.88	10.94	11.00	11.06	10.78	10.81	10.84	10.8	10.86	10.92
VPmax [V].....	46.20	46.36	46.53	46.69	42.27	42.58	42.89	38.5	38.68	38.86
IPmax [A].....	10.50	10.57	10.64	10.71	10.53	10.57	10.61	10.52	10.6	10.68
Pmax (with tolerance +3%)[W].....	485	490	495	500	445	450	455	405	410	415
$\alpha$ [%/°C]	0.04%									
$\beta$ [%/°C]	-0.24%									
$\delta$ [%/°C]	-0.26%									
Maximum Series Fuse(A)	20A									

module type/s	HS-B156DS490	HS-B156DS495	HS-B156DS500	HS-B156DS505	HS-B156DS510	HS-B156DS515	HS-B156DS520
Voc (with tolerance±3%) [V] :	57.86	57.93	58.01	58.04	58.15	58.19	58.21
Isc (with tolerance±5%) [A] :	10.64	10.66	10.67	10.70	10.71	10.73	10.76
VPmax [V] :	47.72	48.02	48.36	48.61	48.95	49.24	49.53
IPmax [A] :	10.27	10.31	10.34	10.39	10.42	10.46	10.50
Pmax (with tolerance +3%)[W] :	490	495	500	505	510	515	520
$\alpha$ [%/°C]	0.04%						
$\beta$ [%/°C]	-0.24%						
$\delta$ [%/°C]	-0.26%						
Maximum Series Fuse(A)	20A						

MODULE TYPE/S	HS-210-B132D	HS-210-B132D	HS-210-B132D	HS-210-B132D	HS-210-B132D	HS-210-B132D	HS-210-B132D	HS-210-B132D	HS-210-B132D
	S640	S645	S650	S655	S660	S665	S670	S675	S680
	Voc (with tolerance±3%) [V] .....	48.17	48.34	48.51	48.68	48.85	49.02	49.18	49.34
Isc (with tolerance±5%) [A] .....	16.71	16.77	16.83	16.89	16.95	17.01	17.07	17.13	17.19
VPmax [V] .....	40.23	40.39	40.55	40.71	40.87	41.03	41.19	41.34	41.49
IPmax [A] .....	15.91	15.97	16.03	16.09	16.15	16.21	16.27	16.33	16.39
Pmax (with tolerance +3%)[W] .....	640	645	650	655	660	665	670	675	680
$\alpha$ [%/°C]	0.04%								
$\beta$ [%/°C]	-0.24%								
$\delta$ [%/°C]	-0.26%								
Maximum Series Fuse(A)	35A								

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MODULE TYPE/S	HS-210-B132D S685	HS-210-B132D S690	HS-210-B132D S695	HS-210-B132D S700	HS-210-B132D S705	HS-210-B132D S710	HS-210-B132D S715	HS-210-B132D S720
Voc (with tolerance±3%) [V].....	49.66	49.82	49.98	50.13	50.29	50.44	50.59	50.74
Isc (with tolerance±5%) [A].....	17.25	17.31	17.37	17.43	17.49	17.55	17.61	17.67
VPmax [V].....	41.65	41.80	41.95	42.10	42.25	42.39	42.54	42.68
IPmax [A].....	16.45	16.51	16.57	16.63	16.69	16.75	16.81	16.87
Pmax (with tolerance +3%)[W].....	685	690	695	700	705	710	715	720
$\alpha$ [%/°C]	0.04%							
$\beta$ [%/°C]	-0.24%							
$\delta$ [%/°C]	-0.26%							
Maximum Series Fuse(A)	35A							

MODULE TYPE/S	HS-210-B120D S595	HS-210-B120D S600	HS-210-B120D S605	HS-210-B120D S610	HS-210-B120D S615	HS-210-B120D S620	HS-210-B120D S625	HS-210-B120D S630	HS-210-B120D S635
Voc (with tolerance±3%) [V].....	44.04	44.22	44.41	44.59	44.77	44.95	45.13	45.30	45.48
Isc (with tolerance±5%) [A].....	16.95	17.01	17.07	17.13	17.19	17.25	17.31	17.37	17.43
VPmax [V].....	36.85	37.02	37.19	37.36	37.53	37.69	37.86	38.03	38.19
IPmax [A].....	16.15	16.21	16.27	16.33	16.39	16.45	16.51	16.57	16.63
Pmax (with tolerance +3%)[W].....	595	600	605	610	615	620	625	630	635
$\alpha$ [%/°C]	0.04%								
$\beta$ [%/°C]	-0.24%								
$\delta$ [%/°C]	-0.26%								

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Maximum Series Fuse(A)	35A
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MODULE TYPE/S	HS-210-B110D S540	HS-210-B110D S545	HS-210-B110D S550	HS-210-B110D S555	HS-210-B110D S560	HS-210-B110D S565	HS-210-B110D S570	HS-210-B110D S575	HS-210-B110D S580
Voc (with tolerance±3%) [V] .....	39.97	40.17	40.37	40.57	40.77	40.96	41.16	41.35	41.54
Isc (with tolerance±5%) [A] .....	16.95	17.01	17.07	17.13	17.19	17.25	17.31	17.37	17.43
VPmax [V] .....	33.44	33.63	33.81	33.99	34.17	34.35	34.53	34.71	34.88
IPmax [A] .....	16.15	16.21	16.27	16.33	16.39	16.45	16.51	16.57	16.63
Pmax (with tolerance +3%)[W] .....	540	545	550	555	560	565	570	575	580
$\alpha$ [%/°C]	0.04%								
$\beta$ [%/°C]	-0.24%								
$\delta$ [%/°C]	-0.26%								
Maximum Series Fuse(A)	35A								

MODULE TYPE/S	HS-182-B108DS410	HS-182-B108DS415	HS-182-B108DS420	HS-182-B108DS425	HS-182-B108DS430	HS-182-B108DS435	HS-182-B108DS440
Voc(with tolerance ±3%) [V] .....	39.26	39.53	39.8	40.07	40.3	40.56	40.83
Isc (with tolerance ±5%) [A] .....	13.09	13.14	13.19	13.24	13.3	13.35	13.40
VPmax [V] .....	32.52	32.76	33	33.23	33.49	33.75	34.01
IPmax [A] .....	12.61	12.67	12.73	12.79	12.84	12.89	12.94

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MODULE TYPE/S	HS-182-B108DS410	HS-182-B108DS415	HS-182-B108DS420	HS-182-B108DS425	HS-182-B108DS430	HS-182-B108DS435	HS-182-B108DS440
P <sub>max</sub> (with tolerance ± 3%) [W] .....	410	415	420	425	430	435	440
α [%/°C]	0.04%						
β [%/°C]	-0.24%						
δ [%/°C]	-0.26%						
Maximum Series Fuse(A)	25A						

MODULE TYPE/S	HS-182-B108DS445	HS-182-B108DS450
V <sub>oc</sub> (with tolerance ± 3%) [V] .....	41.09	41.34
I <sub>sc</sub> (with tolerance ± 5%) [A] .....	13.45	13.50
V <sub>Pmax</sub> [V] .....	34.26	34.51
I <sub>Pmax</sub> [A].....	12.99	13.04
P <sub>max</sub> (with tolerance ± 3%) [W] .....	445	450
α [%/°C]	0.04%	
β [%/°C]	-0.24%	
δ [%/°C]	-0.26%	
Maximum Series Fuse(A)	25A	

MODULE TYPE/S	HS-182-B108DS B410	HS-182-B108DS B415	HS-182-B108DS B420	HS-182-B108DS B425	HS-182-B108DS B430	HS-182-B108DS B435	HS-182-B108DS B440	HS-182-B108DS B445	HS-182-B108DS B450
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V <sub>oc</sub> (with tolerance ± 3%) [V] ..	40.26	40.54	40.82	41.1	41.37	41.64	41.91	42.18	42.44
I <sub>sc</sub> (with tolerance ± 5%) [A] ..	12.75	12.8	12.85	12.9	12.95	13	13.05	13.1	13.15
V <sub>Pmax</sub> [V] ..	33.53	33.8	34.07	34.33	34.6	34.86	35.12	35.38	35.63
I <sub>Pmax</sub> [A]....	12.23	12.28	12.33	12.38	12.43	12.48	12.53	12.58	12.63
P <sub>max</sub> (with tolerance ± 3%) [W].....	410	415	420	425	430	435	440	445	450
α [%/°C]	0.04%								
β [%/°C]	-0.24%								
δ [%/°C]	-0.26%								
Maximum Series Fuse(A)	25A								

<b>MODULE TYPE/S</b>	HS-182-B108DS N410	HS-182-B108DS N415	HS-182-B108DS N420	HS-182-B108DS N425	HS-182-B108DS N430	HS-182-B108DS N435	HS-182-B108DS N440	HS-182-B108DS N445	HS-182-B108DS N450
V <sub>oc</sub> (with tolerance ± 3%) [V] ..	40.28	40.56	40.83	41.1	41.37	41.64	41.91	42.18	42.44
I <sub>sc</sub> (with tolerance ± 5%) [A] ..	12.75	12.8	12.85	12.9	12.95	13	13.05	13.1	13.15
V <sub>Pmax</sub> [V] ..	33.53	33.8	34.07	34.33	34.6	34.86	35.12	35.38	35.63
I <sub>Pmax</sub> [A]....	12.23	12.28	12.33	12.38	12.43	12.48	12.53	12.58	12.63
P <sub>max</sub> (with tolerance ± 3%) [W].....	410	415	420	425	430	435	440	445	450

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MODULE TYPE/S	HS-182-B108DS N410	HS-182-B108DS N415	HS-182-B108DS N420	HS-182-B108DS N425	HS-182-B108DS N430	HS-182-B108DS N435	HS-182-B108DS N440	HS-182-B108DS N445	HS-182-B108DS N450
$\alpha$ [%/°C]	0.04%								
$\beta$ [%/°C]	-0.24%								
$\delta$ [%/°C]	-0.26%								
Maximum Series Fuse(A)	25A								

MODULE TYPE/S	HS-182-S108DS B410	HS-182-S108DS B415	HS-182-S108DS B420	HS-182-S108DS B425	HS-182-S108DS B430	HS-182-S108DS B435	HS-182-S108DS B440	HS-182-S108DS B445	HS-182-S108DS B450
$V_{oc}$ (with tolerance $\pm 3\%$ ) [V] ..	40.26	40.54	40.82	41.1	41.37	41.64	41.91	42.18	42.44
$I_{sc}$ (with tolerance $\pm 5\%$ ) [A] ..	12.75	12.8	12.85	12.9	12.95	13	13.05	13.1	13.15
$V_{Pmax}$ [V] ..	33.53	33.8	34.07	34.33	34.6	34.86	35.12	35.38	35.63
$I_{Pmax}$ [A]....	12.23	12.28	12.33	12.38	12.43	12.48	12.53	12.58	12.63
$P_{max}$ (with tolerance $\pm 3\%$ ) [W].....	410	415	420	425	430	435	440	445	450
$\alpha$ [%/°C]	0.04%								
$\beta$ [%/°C]	-0.24%								
$\delta$ [%/°C]	-0.26%								
Maximum Series Fuse(A)	25A								

MODULE TYPE/S	HS-182-B144DS55	HS-182-B144DS55	HS-182-B144DS56	HS-182-B144DS56	HS-182-B144DS57	HS-182-B144DS57	HS-182-B144DS58
	0	5	0	5	0	5	0
V <sub>oc</sub> (with tolerance ± 3%) [V] .....	52.87	53.04	53.22	53.39	53.55	53.72	53.92
I <sub>sc</sub> (with tolerance ± 5%) [A] .....	13.00	13.06	13.12	13.18	13.24	13.3	13.35
V <sub>Pmax</sub> [V] .....	43.69	43.91	44.13	44.35	44.57	44.79	45.00
I <sub>Pmax</sub> [A].....	12.59	12.64	12.69	12.74	12.79	12.84	12.89
P <sub>max</sub> (with tolerance ± 3%) [W] .....	550	555	560	565	570	575	580
α [%/°C]	0.04%						
β [%/°C]	-0.24%						
δ [%/°C]	-0.26%						
Maximum Series Fuse(A)	25A						

MODULE TYPE/S	HS-182-B144DS58	HS-182-B144DS59	HS-182-B144DS59	HS-182-B144DS60
	5	0	5	0
V <sub>oc</sub> (with tolerance ± 3%) [V] .....	54.12	54.31	54.50	54.70
I <sub>sc</sub> (with tolerance ± 5%) [A] .....	13.40	13.45	13.50	13.55
V <sub>Pmax</sub> [V] .....	45.21	45.42	45.63	45.84
I <sub>Pmax</sub> [A].....	12.94	12.99	13.04	13.09
P <sub>max</sub> (with tolerance ± 3%) [W] .....	585	590	595	600

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$\alpha$ [%/°C]	0.04%
$\beta$ [%/°C]	-0.24%
$\delta$ [%/°C]	-0.26%
Maximum Series Fuse(A)	25A

### 5.2.2 Electrical rating (grid back panel glass、Data under BSTC)

MODULE TYPE/S	HS-B96DSN29	HS-B96DSN30	HS-B96DSN30	HS-B96DSN31	HS-B96DSN31	HS-B96DSN32
	5	0	5	0	5	0
Voc(with tolerance $\pm$ 3%) [V] .....	36.31	36.73	37.12	37.51	37.86	38.24
Isc (with tolerance $\pm$ 5%) [A] .....	11.46	11.48	11.51	11.54	11.58	11.61
VPmax [V] .....	30.03	30.35	30.69	31	31.31	31.64
IPmax [A].....	10.99	11.04	11.08	11.13	11.18	11.22
Pmax (with tolerance $\pm$ 3%) [W] .....	330	335	340	345	350	355
$\alpha$ [%/°C]	0.04%					
$\beta$ [%/°C]	-0.24%					
$\delta$ [%/°C]	-0.26%					
Maximum Series Fuse(A)	20A					

MODULE TYPE/S	HS-B144D	HS-B144D	HS-B144D	HS-B144D	HS-B144D	HS-B144D	HS-B144D	HS-B144D	HS-B144D
	S440	S445	S450	S455	S460	S465	S470	S475	S480
	HS-B144D	HS-B144D	HS-B144D	HS-B144D	HS-B144D	HS-B144D	HS-B144D	HS-B144D	HS-B144D
	N440	N445	N450	N455	N460	N465	N470	N475	N480

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MODULE TYPE/S	HS-B144D	HS-B144D	HS-B144D	HS-B144D	HS-B144D	HS-B144D	HS-B144D	HS-B144D	HS-B144D
	S440	S445	S450	S455	S460	S465	S470	S475	S480
	HS-B144D	HS-B144D	HS-B144D	HS-B144D	HS-B144D	HS-B144D	HS-B144D	HS-B144D	HS-B144D
	N440	N445	N450	N455	N460	N465	N470	N475	N480
Voc (with tolerance±3%) [V].....	53.53	53.73	53.93	54.13	54.33	54.73	55.33	55.93	56.53
Isc (with tolerance±5%) [A] .....	11.42	11.45	11.47	11.50	11.53	11.57	11.61	11.65	11.69
VPmax [V].....	45.28	45.51	45.74	45.97	46.20	46.40	46.60	46.80	47.00
IPmax [A] .....	10.96	11.01	11.05	11.10	11.14	11.19	11.24	11.29	11.34
Pmax (with tolerance +3%)[W].....	490	495	500	505	510	515	520	525	530
$\alpha$ [%/°C]	0.04%								
$\beta$ [%/°C]	-0.24%								
$\delta$ [%/°C]	-0.26%								
Maximum Series Fuse(A)	20A								

MODULE TYPE/S	HS-B120D	HS-B120D	HS-B120D	HS-B120D	HS-B120D	HS-B120D	HS-B120D	HS-B120D	HS-B120D
	S365	S370	S375	S380	S385	S390	S395	S400	S405
	HS-B120D	HS-B120D	HS-B120D	HS-B120D	HS-B120D	HS-B120D	HS-B120D	HS-B120D	HS-B120D
	N365	N370	N375	N380	N385	N390	N395	N400	N405
Voc (with tolerance±3%) [V].....	44.61	44.78	45.17	45.34	45.61	45.94	46.81	47.51	48.11
Isc (with tolerance±5%) [A] .....	11.41	11.43	11.46	11.49	11.53	11.57	11.61	11.65	11.67
VPmax [V].....	37.63	37.78	38.12	38.31	38.50	38.67	38.93	39.20	39.28
IPmax [A] .....	10.85	10.95	11.03	11.09	11.13	11.18	11.23	11.28	11.33
Pmax (with tolerance +3%)[W].....	405	410	415	420	425	430	435	440	445
$\alpha$ [%/°C]	0.04%								
$\beta$ [%/°C]	-0.24%								

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<b>MODULE TYPE/S</b>	HS-B120D S365	HS-B120D S370	HS-B120D S375	HS-B120D S380	HS-B120D S385	HS-B120D S390	HS-B120D S395	HS-B120D S400	HS-B120D S405
	HS-B120D N365	HS-B120D N370	HS-B120D N375	HS-B120D N380	HS-B120D N385	HS-B120D N390	HS-B120D N395	HS-B120D N400	HS-B120D N405
$\delta$ [%/°C]	-0.26%								
Maximum Series Fuse(A)	20A								

<b>MODULE TYPE/S</b>	HS-B132D S405	HS-B132D S410	HS-B132D S415	HS-B132D S420	HS-B132D S425	HS-B132D S430	HS-B132D S435	HS-B132D S440	HS-B132D S445
	HS-B132D N405	HS-B132D N410	HS-B132D N415	HS-B132D N420	HS-B132D N425	HS-B132D N430	HS-B132D N435	HS-B132D N440	HS-B132D N445
Voc (with tolerance±3%) [V].....	49.06	49.16	49.26	49.4	49.45	49.59	49.67	49.71	49.83
Isc (with tolerance±5%) [A].....	11.61	11.63	11.65	11.66	11.69	11.7	11.72	11.75	11.77
VPmax [V].....	40.11	40.41	40.71	41.05	41.31	41.64	41.93	42.22	42.54
IPmax [A].....	11.22	11.26	11.30	11.33	11.38	11.41	11.45	11.49	11.53
Pmax (with tolerance+3%)[W].....	450	455	460	465	470	475	480	485	490
$\alpha$ [%/°C]	0.04%								
$\beta$ [%/°C]	-0.24%								
$\delta$ [%/°C]	-0.26%								
Maximum Series Fuse(A)	20A								

<b>MODULE TYPE/S</b>	HS-B144D S485	HS-B144D S490	HS-B144D S495	HS-B144D S500	HS-B132D S445	HS-B132D S450	HS-B132D S455	HS-B120D S405	HS-B120D S410	HS-B120D S415
	HS-B144D N485	HS-B144D N490	HS-B144D N495	HS-B144D N500	HS-B132D N445	HS-B132D N450	HS-B132D N455	HS-B120D N405	HS-B120D N410	HS-B120D N415

MODULE TYPE/S	HS- B144D S485	HS- B144D S490	HS- B144D S495	HS- B144D S500	HS- B132D S445	HS- B132D S450	HS- B132D S455	HS- B120D S405	HS- B120D S410	HS- B120D S415
	HS- B144D N485	HS- B144D N490	HS- B144D N495	HS- B144D N500	HS- B132D N445	HS- B132D N450	HS- B132D N455	HS- B120D N405	HS- B120D N410	HS- B120D N415
	Voc (with tolerance±3%) [V] .....	56.55	56.58	56.61	56.62	51.34	51.41	51.47	47.54	47.58
Isc (with tolerance±5%) [A] .....	12.11	12.19	12.28	12.35	12.19	12.28	12.35	11.99	12.1	12.22
VPmax [V] .....	47.10	47.46	47.81	48.17	42.5	42.79	43.07	39.28	39.55	39.81
IPmax [A] .....	11.36	11.38	11.4	11.42	11.53	11.57	11.61	11.33	11.38	11.43
Pmax (with tolerance +3%)[W] .....	535	540	545	550	490	495	500	445	450	455
$\alpha$ [%/°C]	0.04%									
$\beta$ [%/°C]	-0.24%									
$\delta$ [%/°C]	-0.26%									
Maximum Series Fuse(A)	20A									

module type/s	HS- B156DS490	HS- B156DS495	HS- B156DS500	HS- B156DS505	HS- B156DS510	HS- B156DS515	HS- B156DS520
Voc (with tolerance±3%) [V] :	58.24	58.26	58.27	58.28	58.30	58.33	58.38
Isc (with tolerance±5%) [A] :	11.65	11.67	11.68	11.71	11.72	11.74	11.76
VPmax [V] :	47.88	48.15	48.46	48.69	49.00	49.26	49.53
IPmax [A] :	11.28	11.32	11.35	11.40	11.43	11.47	11.51
Pmax (with tolerance +3%)[W] :	540	545	550	555	560	565	570
$\alpha$ [%/°C]	0.04%						
$\beta$ [%/°C]	-0.24%						
$\delta$ [%/°C]	-0.26%						

Maximum Series Fuse(A)	20A
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MODULE TYPE/S	HS-210-B132D-S640	HS-210-B132D-S645	HS-210-B132D-S650	HS-210-B132D-S655	HS-210-B132D-S660	HS-210-B132D-S665	HS-210-B132D-S670	HS-210-B132D-S675	HS-210-B132D-S680
Voc (with tolerance±3%) [V].....	48.17	48.34	48.51	48.68	48.85	49.02	49.18	49.34	49.50
Isc (with tolerance±5%) [A].....	18.54	18.59	18.64	18.70	18.75	18.80	18.85	18.91	18.96
VPmax [V].....	40.23	40.39	40.55	40.71	40.87	41.03	41.19	41.34	41.49
IPmax [A].....	17.65	17.71	17.76	17.81	17.87	17.92	17.97	18.03	18.08
Pmax (with tolerance +3%)[W].....	710	715	720	725	730	735	740	745	750
$\alpha$ [%/°C]	0.04%								
$\beta$ [%/°C]	-0.24%								
$\delta$ [%/°C]	-0.26%								
Maximum Series Fuse(A)	35A								

MODULE TYPE/S	HS-210-B132D-S685	HS-210-B132D-S690	HS-210-B132D-S695	HS-210-B132D-S700	HS-210-B132D-S705	HS-210-B132D-S710	HS-210-B132D-S715	HS-210-B132D-S720
Voc (with tolerance±3%) [V].....	49.66	49.82	49.98	50.13	50.29	50.44	50.59	50.74
Isc (with tolerance±5%) [A].....	19.01	19.07	19.12	19.17	19.22	19.28	19.33	19.39
VPmax [V].....	41.65	41.80	41.95	42.10	42.25	42.39	42.54	42.68
IPmax [A].....	18.13	18.19	18.24	18.29	18.35	18.41	18.46	18.51
Pmax (with tolerance +3%)[W].....	755	760	765	770	775	780	785	790

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$\alpha$ [%/°C]	0.04%
$\beta$ [%/°C]	-0.24%
$\delta$ [%/°C]	-0.26%
Maximum Series Fuse(A)	35A

MODULE TYPE/S	HS-210-B120D S595	HS-210-B120D S600	HS-210-B120D S605	HS-210-B120D S610	HS-210-B120D S615	HS-210-B120D S620	HS-210-B120D S625	HS-210-B120D S630	HS-210-B120D S635
Voc (with tolerance±3%) [V].....	44.04	44.22	44.41	44.59	44.77	44.95	45.13	45.30	45.48
Isc (with tolerance±5%) [A] .....	18.80	18.85	18.90	18.96	19.01	19.06	19.11	19.16	19.21
VPmax [V].....	36.85	37.02	37.19	37.36	37.53	37.69	37.86	38.03	38.19
IPmax [A] .....	17.92	17.97	18.02	18.07	18.12	18.18	18.23	18.28	18.33
Pmax (with tolerance+3%)[W].....	660	665	670	675	680	685	690	695	700
$\alpha$ [%/°C]	0.04%								
$\beta$ [%/°C]	-0.24%								
$\delta$ [%/°C]	-0.26%								
Maximum Series Fuse(A)	35A								

MODULE TYPE/S	HS-210-B110D S540	HS-210-B110D S545	HS-210-B110D S550	HS-210-B110D S555	HS-210-B110D S560	HS-210-B110D S565	HS-210-B110D S570	HS-210-B110D S575	HS-210-B110D S580
Voc (with tolerance±3%) [V].....	39.97	40.17	40.37	40.57	40.77	40.96	41.16	41.35	41.54
Isc (with tolerance±5%) [A] .....	18.83	18.88	18.93	18.98	19.03	19.08	19.13	19.18	19.23
VPmax [V].....	33.44	33.63	33.81	33.99	34.17	34.35	34.53	34.71	34.88
IPmax [A] .....	17.95	17.99	18.05	18.10	18.15	18.20	18.25	18.30	18.35

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P <sub>max</sub> (with tolerance +3%)[W] .....	600	605	610	615	620	625	630	635	640
$\alpha$ [%/°C]	0.04%								
$\beta$ [%/°C]	-0.24%								
$\delta$ [%/°C]	-0.26%								
Maximum Series Fuse(A)	35A								

MODULE TYPE/S	HS-182-B108DS410	HS-182-B108DS415	HS-182-B108DS420	HS-182-B108DS425	HS-182-B108DS430	HS-182-B108DS435	HS-182-B108DS440
V <sub>oc</sub> (with tolerance $\pm$ 3%) [V] .....	39.26	39.53	39.80	40.07	40.30	40.56	40.83
I <sub>sc</sub> (with tolerance $\pm$ 5%) [A] .....	14.53	14.57	14.60	14.64	14.69	14.73	14.77
V <sub>Pmax</sub> [V] .....	32.52	32.76	33.00	33.23	33.49	33.75	34.01
I <sub>Pmax</sub> [A] .....	14.00	14.05	14.08	14.14	14.18	14.23	14.27
P <sub>max</sub> (with tolerance $\pm$ 3%) [W] .....	455	460	465	470	475	480	485
$\alpha$ [%/°C]	0.04%						
$\beta$ [%/°C]	-0.24%						
$\delta$ [%/°C]	-0.26%						
Maximum Series Fuse(A)	25A						

MODULE TYPE/S	HS-182-B108DS445	HS-182-B108DS450
V <sub>oc</sub> (with tolerance $\pm$ 3%) [V] .....	41.09	41.34

Isc (with tolerance $\pm$ 5%) [A] .....	14.81	14.85
VPmax [V] .....	34.26	34.51
IPmax [A].....	14.31	14.35
Pmax (with tolerance $\pm$ 3%) [W] .....	490	495
$\alpha$ [%/°C]	0.04%	
$\beta$ [%/°C]	-0.24%	
$\delta$ [%/°C]	-0.26%	
Maximum Series Fuse(A)	25A	

MODULE TYPE/S	HS-182-B108DS B410	HS-182-B108DS B415	HS-182-B108DS B420	HS-182-B108DS B425	HS-182-B108DS B430	HS-182-B108DS B435	HS-182-B108DS B440	HS-182-B108DS B445	HS-182-B108DS B450
Voc(with tolerance $\pm$ 3%) [V] ..	40.26	40.54	40.82	41.10	41.37	41.64	41.91	42.18	42.44
Isc (with tolerance $\pm$ 5%) [A] ..	14.15	14.19	14.23	14.26	14.31	14.34	14.38	14.42	14.47
VPmax [V] ..	33.53	33.80	34.07	34.33	34.60	34.86	35.12	35.38	35.63
IPmax [A]....	13.57	13.61	13.65	13.70	13.73	13.77	13.81	13.85	13.90
Pmax (with tolerance $\pm$ 3%) [W].....	455	460	465	470	475	480	485	490	495
$\alpha$ [%/°C]	0.04%								
$\beta$ [%/°C]	-0.24%								
$\delta$ [%/°C]	-0.26%								

Maximum Series Fuse(A)	25A
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MODULE TYPE/S	HS-182-B108DS N410	HS-182-B108DS N415	HS-182-B108DS N420	HS-182-B108DS N425	HS-182-B108DS N430	HS-182-B108DS N435	HS-182-B108DS N440	HS-182-B108DS N445	HS-182-B108DS N450
V <sub>oc</sub> (with tolerance ± 3%) [V] ..	40.28	40.56	40.83	41.10	41.37	41.64	41.91	42.18	42.44
I <sub>sc</sub> (with tolerance ± 5%) [A] ..	14.3	14.34	14.38	14.42	14.46	14.49	14.53	14.57	14.61
V <sub>Pmax</sub> [V] ..	33.53	33.80	34.07	34.33	34.60	34.86	35.12	35.38	35.63
I <sub>Pmax</sub> [A]....	13.72	13.76	13.8	13.84	13.88	13.92	13.96	14	14.04
P <sub>max</sub> (with tolerance ± 3%) [W].....	460	465	470	475	480	485	490	495	500
α [%/°C]	0.04%								
β [%/°C]	-0.24%								
δ [%/°C]	-0.26%								
Maximum Series Fuse(A)	25A								

MODULE TYPE/S	HS-182-B144DS55 0	HS-182-B144DS55 5	HS-182-B144DS56 0	HS-182-B144DS56 5	HS-182-B144DS57 0	HS-182-B144DS57 5	HS-182-B144DS58 0
V <sub>oc</sub> (with tolerance ± 3%) [V] .....	52.87	53.04	53.22	53.39	53.55	53.72	53.92

MODULE TYPE/S	HS-182-B144DS55	HS-182-B144DS55	HS-182-B144DS56	HS-182-B144DS56	HS-182-B144DS57	HS-182-B144DS57	HS-182-B144DS58
	0	5	0	5	0	5	0
Isc (with tolerance $\pm$ 5%) [A] .....	14.42	14.47	14.52	14.58	14.63	14.69	14.73
VPmax [V] .....	43.69	43.91	44.13	44.35	44.57	44.79	45.00
IPmax [A].....	13.97	14.01	14.05	14.10	14.14	14.18	14.23
Pmax (with tolerance $\pm$ 3%) [W] .....	610	615	620	625	630	635	640
$\alpha$ [%/°C]	0.04%						
$\beta$ [%/°C]	-0.24%						
$\delta$ [%/°C]	-0.26%						
Maximum Series Fuse(A)	25A						

MODULE TYPE/S	HS-182-B144DS58	HS-182-B144DS59	HS-182-B144DS59	HS-182-B144DS60
	5	0	5	0
Voc(with tolerance $\pm$ 3%) [V] .....	54.12	54.31	54.50	54.70
Isc (with tolerance $\pm$ 5%) [A] .....	14.77	14.82	14.86	14.91
VPmax [V] .....	45.21	45.42	45.63	45.84
IPmax [A].....	14.27	14.32	14.36	14.40
Pmax (with tolerance $\pm$ 3%) [W] .....	645	650	655	660
$\alpha$ [%/°C]	0.04%			
$\beta$ [%/°C]	-0.24%			
$\delta$ [%/°C]	-0.26%			

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Maximum Series Fuse(A)	25A
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### 5.2.3 Electrical rating (clear back panel glass、Data under STC)

MODULE TYPE/S	HS-B144D SN440	HS-B144D SN445	HS-B144D SN450	HS-B144D SN455	HS-B144D SN460	HS-B144D SN465	HS-B144D SN470	HS-B144D SN475	HS-B144D SN480
	HS-B144D NN440	HS-B144D NN445	HS-B144D NN450	HS-B144D NN455	HS-B144D NN460	HS-B144D NN465	HS-B144D NN470	HS-B144D NN475	HS-B144D NN480
Voc (with tolerance±3%) [V].....	53.08	53.18	53.28	53.38	53.48	53.58	53.68	53.78	53.88
Isc (with tolerance±5%) [A].....	10.44	10.54	10.64	10.74	10.84	10.94	11.04	11.14	11.24
VPmax [V].....	44.33	44.39	44.45	44.51	44.57	44.63	44.69	44.75	44.81
IPmax [A].....	9.94	10.04	10.14	10.24	10.34	10.43	10.53	10.63	10.73
Pmax (with tolerance +3%)[W].....	440	445	450	455	460	465	470	475	480
$\alpha$ [%/°C]	0.04%								
$\beta$ [%/°C]	-0.24%								
$\delta$ [%/°C]	-0.26%								
Maximum Series Fuse(A)	20A								

MODULE TYPE/S	HS-B120DS N365	HS-B120D SN370	HS-B120DS N375	HS-B120D SN380	HS-B120D SN385	HS-B120D SN390	HS-B120DS N395	HS-B120DS N400	HS-B120D SN405
	HS-B120D NN365	HS-B120D NN370	HS-B120D NN375	HS-B120D NN380	HS-B120D NN385	HS-B120D NN390	HS-B120D NN395	HS-B120D NN400	HS-B120D NN405
Voc (with tolerance±3%) [V].....	44.17	44.27	44.37	44.47	44.57	44.67	44.77	44.87	44.97
Isc (with tolerance±5%) [A].....	10.42	10.52	10.62	10.72	10.82	10.92	11.02	11.12	11.22
VPmax [V].....	36.87	36.96	37.02	37.09	37.15	37.23	37.32	37.43	37.53

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MODULE TYPE/S	HS-B120DS N365	HS-B120D SN370	HS-B120DS N375	HS-B120D SN380	HS-B120D SN385	HS-B120D SN390	HS-B120DS N395	HS-B120DS N400	HS-B120D SN405
	HS-B120D NN365	HS-B120D NN370	HS-B120D NN375	HS-B120D NN380	HS-B120D NN385	HS-B120D NN390	HS-B120D NN395	HS-B120D NN400	HS-B120D NN405
IPmax [A].....	9.92	10.03	10.15	10.27	10.37	10.49	10.60	10.70	10.81
Pmax (with tolerance +3%)[W] .....	365	370	375	380	385	390	395	400	405
$\alpha$ [%/°C]	0.04%								
$\beta$ [%/°C]	-0.24%								
$\delta$ [%/°C]	-0.26%								
Maximum Series Fuse(A)	20A								

MODULE TYPE/S	HS-B132DS N405	HS-B132D SN410	HS-B132DS N415	HS-B132D SN420	HS-B132D SN425	HS-B132D SN430	HS-B132DS N435	HS-B132DS N440	HS-B132D SN445
	HS-B132D NN405	HS-B132D NN410	HS-B132D NN415	HS-B132D NN420	HS-B132D NN425	HS-B132D NN430	HS-B132D NN435	HS-B132D NN440	HS-B132D NN445
Voc (with tolerance± 3%) [V].....	47.46	47.62	47.72	47.82	47.95	48.09	48.18	48.26	48.43
Isc (with tolerance±5%) [A].....	10.8	10.82	10.85	10.88	10.9	10.92	10.95	10.98	10.99
VPmax [V] .....	39.17	39.47	39.83	40.2	40.48	40.84	41.16	41.44	41.79
IPmax [A].....	10.34	10.39	10.42	10.45	10.5	10.53	10.57	10.62	10.65
Pmax (with tolerance +3%)[W] .....	405	410	415	420	425	430	435	440	445
$\alpha$ [%/°C]	0.04%								
$\beta$ [%/°C]	-0.24%								
$\delta$ [%/°C]	-0.26%								
Maximum Series Fuse(A)	20A								

module type/s	HS-B156DSN49 0	HS-B156DSN49 5	HS-B156DSN50 0	HS-B156DSN50 5	HS-B156DSN51 0	HS-B156DSN51 5	HS-B156DSN52 0

Voc (with tolerance $\pm 3\%$ ) [V] :	57.46	57.87	58.27	58.67	59.07	59.46	59.85
Isc (with tolerance $\pm 5\%$ ) [A] :	10.47	10.49	10.51	10.53	10.55	10.57	10.59
VPmax [V] :	48.52	48.87	49.27	49.66	50.05	50.45	50.84
IPmax [A] :	10.10	10.13	10.15	10.17	10.19	10.21	10.23
Pmax (with tolerance $+3\%$ )[W] :	490	495	500	505	510	515	520
$\alpha$ [%/°C]	0.04%						
$\beta$ [%/°C]	-0.24%						
$\delta$ [%/°C]	-0.26%						
Maximum Series Fuse(A)	20A						

module type/s	HS-B96DNN295	HS-B96DNN300	HS-B96DNN305	HS-B96DNN310	HS-B96DNN315	HS-B96DNN320
Voc (with tolerance $\pm 3\%$ ) [V] :	34.20	34.43	34.66	34.91	35.17	35.40
Isc (with tolerance $\pm 5\%$ ) [A] :	10.84	10.87	10.90	10.92	10.94	10.97
VPmax [V] :	28.34	28.74	29.14	29.47	29.86	30.22
IPmax [A] :	10.41	10.44	10.47	10.52	10.55	10.59
Pmax (with tolerance $+3\%$ )[W] :	295	300	305	310	315	320

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$\alpha$ [%/°C]	0.04%
$\beta$ [%/°C]	-0.24%
$\delta$ [%/°C]	-0.26%
Maximum Series Fuse(A)	20A

module type/s	HS-B96DS295	HS-B96DS300	HS-B96DS305	HS-B96DS310	HS-B96DS315	HS-B96DS320
Voc (with tolerance $\pm$ 3%) [V] :	34.20	34.43	34.66	34.91	35.17	35.40
Isc (with tolerance $\pm$ 5%) [A] :	10.84	10.87	10.90	10.92	10.94	10.97
VPmax [V] :	28.34	28.74	29.14	29.47	29.86	30.22
IPmax [A] :	10.41	10.44	10.47	10.52	10.55	10.59
Pmax (with tolerance +3%)[W] :	295	300	305	310	315	320
$\alpha$ [%/°C]	0.04%					
$\beta$ [%/°C]	-0.24%					
$\delta$ [%/°C]	-0.26%					
Maximum Series Fuse(A)	20A					

#### 5.2.4 Electrical rating (clear back panel glass、Data under BSTC)

MODULE TYPE/S	HS-B144DS N440	HS-B144DS N445	HS-B144DS N450	HS-B144D SN455	HS-B144D SN460	HS-B144D SN465	HS-B144DS N470	HS-B144D SN475	HS-B144D SN480
	HS-B144D NN440	HS-B144D NN445	HS-B144D NN450	HS-B144D NN455	HS-B144D NN460	HS-B144D NN465	HS-B144D NN470	HS-B144D NN475	HS-B144D NN480

MODULE TYPE/S	HS-B144DS N440	HS-B144DS N445	HS-B144DS N450	HS-B144D SN455	HS-B144D SN460	HS-B144D SN465	HS-B144DS N470	HS-B144D SN475	HS-B144D SN480
	HS-B144D NN440	HS-B144D NN445	HS-B144D NN450	HS-B144D NN455	HS-B144D NN460	HS-B144D NN465	HS-B144D NN470	HS-B144D NN475	HS-B144D NN480
Voc (with tolerance± 3%) [V].....	53.86	54.06	54.26	54.46	54.66	54.92	55.37	55.97	56.63
Isc (with tolerance±5%) [A].....	11.47	11.50	11.52	11.55	11.58	11.61	11.64	11.66	11.69
VPmax [V] .....	45.46	45.69	45.94	46.19	46.44	46.64	46.84	47.04	47.24
IPmax [A].....	11.00	11.05	11.09	11.14	11.19	11.23	11.27	11.31	11.35
Pmax (with tolerance +3%)[W] .....	495	500	505	510	515	520	525	530	535
$\alpha$ [%/°C]	0.04%								
$\beta$ [%/°C]	-0.24%								
$\delta$ [%/°C]	-0.26%								
Maximum Series Fuse(A)	20A								

MODULE TYPE/S	HS-B120DS N365	HS-B120D SN370	HS-B120DS N375	HS-B120D SN380	HS-B120DS N385	HS-B120DS N390	HS-B120DS N395	HS-B120DS N400	HS-B120D SN405
	HS-B120D NN365	HS-B120D NN370	HS-B120D NN375	HS-B120D NN380	HS-B120D NN385	HS-B120D NN390	HS-B120D NN395	HS-B120D NN400	HS-B120D NN405
Voc (with tolerance± 3%) [V].....	44.88	45.05	45.45	45.61	45.88	46.21	46.84	47.54	48.39
Isc (with tolerance±5%) [A].....	11.46	11.48	11.51	11.54	11.58	11.61	11.64	11.66	11.68
VPmax [V] .....	37.88	38.08	38.28	38.49	38.70	38.87	39.18	39.50	39.72
IPmax [A].....	10.99	11.04	11.08	11.13	11.18	11.22	11.28	11.32	11.34
Pmax (with tolerance +3%)[W] .....	410	415	420	425	430	435	440	445	450
$\alpha$ [%/°C]	0.04%								
$\beta$ [%/°C]	-0.24%								
$\delta$ [%/°C]	-0.26%								

<b>MODULE TYPE/S</b>	HS-B120DS N365	HS-B120D SN370	HS-B120DS N375	HS-B120D SN380	HS-B120DS N385	HS-B120DS N390	HS-B120DS N395	HS-B120DS N400	HS-B120D SN405
	HS-B120D NN365	HS-B120D NN370	HS-B120D NN375	HS-B120D NN380	HS-B120D NN385	HS-B120D NN390	HS-B120D NN395	HS-B120D NN400	HS-B120D NN405
Maximum Series Fuse(A)	20A								

<b>MODULE TYPE/S</b>	HS-B132DS N405	HS-B132DS N410	HS-B132DS N415	HS-B132D SN420	HS-B132D SN425	HS-B132D SN430	HS-B132DS N435	HS-B132D SN440	HS-B132D SN445
	HS-B132D NN405	HS-B132D NN410	HS-B132D NN415	HS-B132D NN420	HS-B132D NN425	HS-B132D NN430	HS-B132D NN435	HS-B132D NN440	HS-B132D NN445
Voc (with tolerance± 3%) [V].....	49.4	49.49	49.58	49.72	49.76	49.89	49.97	50.01	50.19
Isc (with tolerance±5%) [A].....	11.66	11.68	11.70	11.71	11.74	11.75	11.77	11.80	11.82
VPmax [V].....	40.38	40.68	40.97	41.31	41.56	41.89	42.18	42.47	42.78
IPmax [A].....	11.27	11.31	11.35	11.38	11.43	11.46	11.50	11.54	11.58
Pmax (with tolerance +3%)[W].....	455	460	465	470	475	480	485	490	495
$\alpha$ [%/°C]	0.04%								
$\beta$ [%/°C]	-0.24%								
$\delta$ [%/°C]	-0.26%								
Maximum Series Fuse(A)	20A								

<b>module type/s</b>	HS-B156DSN49 0	HS-B156DSN49 5	HS-B156DSN50 0	HS-B156DSN50 5	HS-B156DSN51 0	HS-B156DSN51 5	HS-B156DSN52 0
Voc (with tolerance ± 3%) [V] :	57.66	58.02	58.32	58.68	59.13	59.48	59.87
Isc(with tolerance ± 5%)	11.62	11.64	11.67	11.69	11.71	11.73	11.75

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[A] :							
VPmax [V] :	49.06	49.38	49.69	50.05	50.41	50.76	51.12
IPmax [A] :	11.11	11.14	11.17	11.19	11.21	11.23	11.25
Pmax (with tolerance +3%)[W] :	545	550	555	560	565	570	575
$\alpha$ [%/°C]	0.04%						
$\beta$ [%/°C]	-0.24%						
$\delta$ [%/°C]	-0.26%						
Maximum Series Fuse(A)	20A						

module type/s	HS- B96DNN295	HS- B96DNN300	HS- B96DNN305	HS- B96DNN310	HS- B96DNN315	HS- B96DNN320
Voc (with tolerance± 3%) [V] :	34.91	35.13	35.38	35.55	35.80	36.03
Isc (with tolerance± 5%) [A] :	11.70	11.72	11.73	11.76	11.77	11.79
VPmax [V] :	28.69	29.03	29.39	29.70	30.06	30.39
IPmax [A] :	11.33	11.37	11.40	11.45	11.48	11.52
Pmax (with tolerance +3%)[W] :	325	330	335	340	345	350
$\alpha$ [%/°C]	0.04%					
$\beta$ [%/°C]	-0.24%					
$\delta$ [%/°C]	-0.26%					

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Maximum Series Fuse(A)	20A
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module type/s	HS-B96DS295	HS-B96DS300	HS-B96DS305	HS-B96DS310	HS-B96DS315	HS-B96DS320
Voc (with tolerance $\pm$ 3%) [V] :	34.91	35.13	35.38	35.55	35.80	36.03
Isc (with tolerance $\pm$ 5%) [A] :	11.70	11.72	11.73	11.76	11.77	11.79
VPmax [V] :	28.69	29.03	29.39	29.70	30.06	30.39
IPmax [A] :	11.33	11.37	11.40	11.45	11.48	11.52
Pmax (with tolerance +3%)[W] :	325	330	335	340	345	350
$\alpha$ [%/°C]	0.04%					
$\beta$ [%/°C]	-0.24%					
$\delta$ [%/°C]	-0.26%					
Maximum Series Fuse(A)	20A					

### 5.2.5 Electrical rating (black grid back panel glass、Data under STC)

module type/s	HS-B156DSB490	HS-B156DSB495	HS-B156DSB500	HS-B156DSB505	HS-B156DSB510	HS-B156DSB515	HS-B156DSB520
Voc (with tolerance $\pm$ 3%) [V] :	57.46	57.87	58.27	58.67	59.07	59.46	59.85
Isc (with tolerance $\pm$ 5%) [A] :	10.47	10.49	10.51	10.53	10.55	10.57	10.59



VPmax [V] :	48.52	48.87	49.27	49.66	50.05	50.45	50.84
IPmax [A] :	10.10	10.13	10.15	10.17	10.19	10.21	10.23
Pmax (with tolerance +3%)[W] :	490	495	500	505	510	515	520
$\alpha$ [%/°C]	0.04%						
$\beta$ [%/°C]	-0.24%						
$\delta$ [%/°C]	-0.26%						
Maximum Series Fuse(A)	20A						

module type/s	HS-B144DSB45 0	HS-B144DSB45 5	HS-B144DSB46 0	HS-B144DSB46 5	HS-B144DSB47 0	HS-B144DSB47 5	HS-B144DSB48 0
Voc (with tolerance $\pm$ 3%) [V] :	51.46	51.86	52.28	52.68	53.09	53.49	53.88
Isc (with tolerance $\pm$ 5%) [A] :	10.76	10.78	10.80	10.82	10.84	10.86	10.88
VPmax [V] :	44.60	44.97	45.37	45.77	46.17	46.57	46.97
IPmax [A] :	10.09	10.12	10.14	10.16	10.18	10.20	10.22
Pmax (with tolerance +3%)[W] :	450	455	460	465	470	475	480
$\alpha$ [%/°C]	0.04%						
$\beta$ [%/°C]	-0.24%						
$\delta$ [%/°C]	-0.26%						
Maximum Series Fuse(A)	20A						

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module type/s	HS-B132DSB41 0	HS-B132DSB41 5	HS-B132DSB42 0	HS-B132DSB42 5	HS-B132DSB43 0	HS-B132DSB43 5	HS-B132DSB44 0
Voc (with tolerance $\pm 3\%$ ) [V] :	46.88	47.31	47.73	48.15	48.57	48.99	49.39
Isc (with tolerance $\pm 5\%$ ) [A] :	10.76	10.78	10.80	10.82	10.84	10.86	10.88
VPmax [V] :	40.64	41.01	41.43	41.84	42.24	42.65	43.06
IPmax [A] :	10.09	10.12	10.14	10.16	10.18	10.20	10.22
Pmax (with tolerance $+3\%$ )[W] :	410	415	420	425	430	435	440
$\alpha$ [%/°C]	0.04%						
$\beta$ [%/°C]	-0.24%						
$\delta$ [%/°C]	-0.26%						
Maximum Series Fuse(A)	20A						

module type/s	HS-B120DSB375	HS-B120DSB380	HS-B120DSB385	HS-B120DSB390	HS-B120DSB395	HS-B120DSB400
Voc (with tolerance $\pm 3\%$ ) [V] :	42.75	43.19	43.62	44.05	44.48	44.90
Isc (with tolerance $\pm 5\%$ ) [A] :	10.78	10.80	10.82	10.84	10.86	10.88
VPmax [V] :	37.10	37.48	37.90	38.32	38.73	39.14
IPmax [A] :	10.11	10.14	10.16	10.18	10.20	10.22

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Pmax (with tolerance +3%)[W] :	375	380	385	390	395	400
$\alpha$ [%/°C]	0.04%					
$\beta$ [%/°C]	-0.24%					
$\delta$ [%/°C]	-0.26%					
Maximum Series Fuse(A)	20A					

### 5.2.6 Electrical rating (black grid back panel glass、Data under BSTC)

module type/s	HS- B156DSB49 0	HS- B156DSB49 5	HS- B156DSB50 0	HS- B156DSB50 5	HS- B156DSB51 0	HS- B156DSB51 5	HS- B156DSB52 0
Voc (with tolerance $\pm$ 3%) [V] :	57.48	57.89	58.29	58.69	59.09	59.48	59.87
Isc (with tolerance $\pm$ 5%) [A] :	11.76	11.78	11.80	11.82	11.84	11.86	11.88
VPmax [V] :	48.83	49.15	49.51	49.87	50.23	50.59	50.94
IPmax [A] :	11.06	11.09	11.11	11.13	11.15	11.17	11.19
Pmax (with tolerance +3%)[W] :	540	545	550	555	560	565	570
$\alpha$ [%/°C]	0.04%						
$\beta$ [%/°C]	-0.24%						
$\delta$ [%/°C]	-0.26%						
Maximum Series Fuse(A)	20A						

module type/s	HS-B144DSB45 0	HS-B144DSB45 5	HS-B144DSB46 0	HS-B144DSB46 5	HS-B144DSB47 0	HS-B144DSB47 5	HS-B144DSB48 0
Voc (with tolerance $\pm 3\%$ ) [V] :	51.79	52.16	52.53	52.89	53.26	53.62	53.97
Isc (with tolerance $\pm 5\%$ ) [A] :	11.76	11.78	11.80	11.82	11.84	11.86	11.88
VPmax [V] :	44.80	45.13	45.50	45.87	46.23	46.60	46.99
IPmax[A] :	11.05	11.08	11.10	11.12	11.14	11.16	11.18
Pmax (with tolerance $+3\%$ )[W] :	495	500	505	510	515	520	525
$\alpha$ [%/°C]	0.04%						
$\beta$ [%/°C]	-0.24%						
$\delta$ [%/°C]	-0.26%						
Maximum Series Fuse(A)	20A						

module type/s	HS-B132DSB41 0	HS-B132DSB41 5	HS-B132DSB42 0	HS-B132DSB42 5	HS-B132DSB43 0	HS-B132DSB43 5	HS-B132DSB44 0
Voc (with tolerance $\pm 3\%$ ) [V] :	47.08	47.46	47.85	48.23	48.60	49.01	49.42
Isc (with tolerance $\pm 5\%$ ) [A] :	11.76	11.78	11.80	11.82	11.84	11.86	11.88
VPmax	40.73	41.07	41.45	41.86	42.28	42.69	43.10

[V] :							
IPmax [A] :	11.05	11.08	11.10	11.12	11.14	11.16	11.18
Pmax (with tolerance +3%)[W] :	450	455	460	465	470	475	480
$\alpha$ [%/°C]	0.04%						
$\beta$ [%/°C]	-0.24%						
$\delta$ [%/°C]	-0.26%						
Maximum Series Fuse(A)	20A						

module type/s	HS- B120DSB345	HS- B120DSB350	HS- B120DSB355	HS- B120DSB360	HS- B120DSB365	HS- B120DSB370
Voc (with tolerance $\pm$ 3%) [V] :	42.77	43.21	43.65	44.08	44.61	44.95
Isc (with tolerance $\pm$ 5%) [A] :	11.78	11.80	11.82	11.84	11.86	11.88
VPmax [V] :	37.14	37.49	37.91	38.36	38.78	39.15
IPmax [A] :	11.07	11.10	11.12	11.14	11.16	11.18
Pmax (with tolerance +3%)[W] :	410	415	420	425	430	435
$\alpha$ [%/°C]	0.04%					
$\beta$ [%/°C]	-0.24%					
$\delta$ [%/°C]	-0.26%					
Maximum Series Fuse(A)	20A					

### 5.2.7 Electrical rating (Data under STC)

module type/s	HS-S156SSB49 0	HS-S156SSB49 5	HS-S156SSB50 0	HS-S156SSB50 5	HS-S156SSB51 0	HS-S156SSB51 5	HS-S156SSB52 0
Voc (with tolerance $\pm 3\%$ ) [V] :	57.46	57.87	58.27	58.67	59.07	59.46	59.85
Isc (with tolerance $\pm 5\%$ ) [A] :	10.47	10.49	10.51	10.53	10.55	10.57	10.59
VPmax [V] :	48.52	48.87	49.27	49.66	50.05	50.45	50.84
IPmax [A] :	10.10	10.13	10.15	10.17	10.19	10.21	10.23
Pmax (with tolerance $+3\%$ )[W] :	490	495	500	505	510	515	520
$\alpha$ [%/°C]	0.04%						
$\beta$ [%/°C]	-0.24%						
$\delta$ [%/°C]	-0.26%						
Maximum Series Fuse(A)	20A						

module type/s	HS-S156SS490	HS-S156SS495	HS-S156SS500	HS-S156SS505	HS-S156SS510	HS-S156SS515	HS-S156SS520
Voc (with tolerance $\pm 3\%$ ) [V] :	57.86	57.93	58.01	58.04	58.15	58.19	58.21
Isc (with tolerance $\pm 5\%$ ) [A] :	10.64	10.66	10.67	10.70	10.71	10.73	10.76
VPmax [V] :	47.72	48.02	48.36	48.61	48.95	49.24	49.53
IPmax	10.27	10.31	10.34	10.39	10.42	10.46	10.50

[A] :							
Pmax (with tolerance +3%)[W] :	490	495	500	505	510	515	520
$\alpha$ [%/°C]	0.04%						
$\beta$ [%/°C]	-0.24%						
$\delta$ [%/°C]	-0.26%						
Maximum Series Fuse(A)	20A						

module type/s	HS- S144SSB45 0	HS- S144SSB45 5	HS- S144SSB46 0	HS- S144SSB46 5	HS- S144SSB47 0	HS- S144SSB47 5	HS- S144SSB48 0
Voc (with tolerance $\pm$ 3%) [V] :	52.82	53.24	53.66	54.07	54.48	54.89	55.30
Isc (with tolerance $\pm$ 5%) [A] :	10.46	10.48	10.50	10.52	10.54	10.56	10.58
VPmax [V] :	44.60	44.97	45.37	45.77	46.17	46.57	46.97
IPmax [A] :	10.09	10.12	10.14	10.16	10.18	10.20	10.22
Pmax (with tolerance +3%)[W] :	450	455	460	465	470	475	480
$\alpha$ [%/°C]	0.04%						
$\beta$ [%/°C]	-0.24%						
$\delta$ [%/°C]	-0.26%						

Maximum Series Fuse(A)	20A
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module type/s	HS-S144SS450	HS-S144SS455	HS-S144SS460	HS-S144SS465	HS-S144SS470	HS-S144SS475	HS-S144SS480
Voc (with tolerance $\pm$ 3%) [V] :	52.96	53.09	53.22	53.35	53.48	53.61	53.74
Isc (with tolerance $\pm$ 5%) [A] :	10.46	10.52	10.58	10.64	10.70	10.76	10.82
VPmax [V] :	44.85	45.04	45.24	45.44	45.66	45.86	46.08
IPmax [A] :	10.05	10.12	10.18	10.24	10.30	10.36	10.43
Pmax (with tolerance +3%)[W] :	450	455	460	465	470	475	480
$\alpha$ [%/°C]	0.04%						
$\beta$ [%/°C]	-0.24%						
$\delta$ [%/°C]	-0.26%						
Maximum Series Fuse(A)	20A						

module type/s	HS-S132SSB41 0	HS-S132SSB41 5	HS-S132SSB42 0	HS-S132SSB42 5	HS-S132SSB43 0	HS-S132SSB43 5	HS-S132SSB44 0
Voc (with tolerance $\pm$ 3%) [V] :	48.12	48.56	48.99	49.42	49.84	50.27	50.69
Isc (with tolerance $\pm$ 5%)	10.46	10.48	10.50	10.52	10.54	10.56	10.58



[A] :							
VPmax [V] :	40.64	41.01	41.43	41.84	42.24	42.65	43.06
IPmax [A] :	10.09	10.12	10.14	10.16	10.18	10.20	10.22
Pmax (with tolerance +3%)[W] :	410	415	420	425	430	435	440
$\alpha$ [%/°C]				0.04%			
$\beta$ [%/°C]				-0.24%			
$\delta$ [%/°C]				-0.26%			
Maximum Series Fuse(A)				20A			

module type/s	HS- S132SS410	HS- S132SS415	HS- S132SS420	HS- S132SS425	HS- S132SS430	HS- S132SS435	HS- S132SS440
Voc (with tolerance± 3%) [V] :	48.47	48.62	48.80	48.90	49.08	49.21	49.29
Isc (with tolerance± 5%) [A] :	10.63	10.65	10.66	10.69	10.70	10.72	10.75
VPmax [V] :	39.97	40.30	40.66	40.95	41.31	41.63	41.95
IPmax [A] :	10.26	10.30	10.33	10.38	10.41	10.45	10.49
Pmax (with tolerance +3%)[W] :	410	415	420	425	430	435	440
$\alpha$ [%/°C]				0.04%			
$\beta$ [%/°C]				-0.24%			

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$\delta$ [%/°C]	-0.26%
Maximum Series Fuse(A)	20A

module type/s	HS-S120SSB375	HS-S120SSB380	HS-S120SSB385	HS-S120SSB390	HS-S120SSB395	HS-S120SSB400
Voc (with tolerance± 3%) [V] :	43.93	44.38	44.83	45.27	45.71	46.14
Isc (with tolerance± 5%) [A] :	10.48	10.50	10.52	10.54	10.56	10.58
VPmax [V] :	37.10	37.48	37.90	38.32	38.73	39.14
IPmax [A] :	10.11	10.14	10.16	10.18	10.20	10.22
Pmax (with tolerance +3%)[W] :	375	380	385	390	395	400
$\alpha$ [%/°C]	0.04%					
$\beta$ [%/°C]	-0.24%					
$\delta$ [%/°C]	-0.26%					
Maximum Series Fuse(A)	20A					

module type/s	HS-S120SS375	HS-S120SS380	HS-S120SS385	HS-S120SS390	HS-S120SS395	HS-S120SS400
Voc (with tolerance± 3%) [V] :	44.09	44.22	44.35	44.48	44.61	44.74
Isc (with tolerance± 5%) [A] :	10.44	10.50	10.56	10.62	10.68	10.74

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VPmax [V] :	37.31	37.52	37.70	37.91	38.16	38.36
IPmax [A] :	10.06	10.14	10.22	10.30	10.36	10.44
Pmax (with tolerance +3%)[W] :	375	380	385	390	395	400
$\alpha$ [%/°C]	0.04%					
$\beta$ [%/°C]	-0.24%					
$\delta$ [%/°C]	-0.26%					
Maximum Series Fuse(A)	20A					

module type/s	HS-S120DSB3 70	HS-S120DSB3 75	HS-S120DSB3 80	HS-S120DSB3 85	HS-S120DSB3 90	HS-S120DSB3 95	HS-S120DSB4 00
Voc (with tolerance $\pm$ 3%) [V] :	44.21	44.52	44.83	45.31	45.61	45.9	46.2
Isc (with tolerance $\pm$ 5%) [A] :	10.42	10.48	10.54	10.56	10.62	10.68	10.74
VPmax [V] :	37.71	37.91	38.11	38.3	38.49	38.68	38.87
IPmax [A] :	9.81	9.89	9.97	10.05	10.13	10.21	10.29
Pmax (with tolerance +3%)[W] :	370	375	380	385	390	395	400
$\alpha$ [%/°C]	0.04%						
$\beta$ [%/°C]	-0.24%						

$\delta$ [%/°C]	-0.26%
Maximum Series Fuse(A)	20A

### 5.3 Electrical Installation

The maximum allowed quantity of modules in string connection shall be calculated according to relative regulations. The open circuit voltage value under the expected lowest temperature shall not exceed the maximum system voltage value allowed by modules and other values required by DC electric parts.

Normally, the VOC factor can be calculated by the following formula.  $C_{Voc} = 1 - \beta V_{oc} \times (25 - T)$

T: The expected lowest temperature of the installation site.

$\beta$ : VOC temperature coefficient (% /°C) (Refer to modules data sheet)

Recommended maximum series is  $[\text{Max System voltage } V / (1.25 \times V_{oc})]$ , parallel module configurations is  $[\text{fuse rating} / 1.25 \times I_{sc}]$

## 6. Module Junction box properties

### 6.1 Cable:

Cable type : H1Z2Z2-K, 4mm<sup>2</sup>

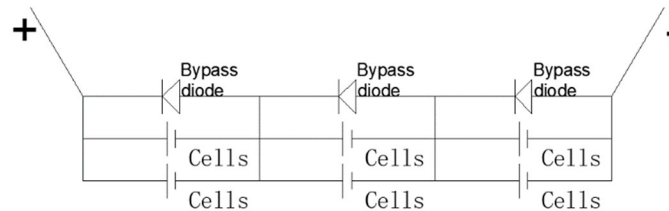
### 6.2 Connector can be connected with PV Connector, type:

Manufacturer	Type	System Voltage (V DC)	Rated Current(A)	Temperature Range
Zhejiang Renhe Photovoltaic Technology Co., Ltd	05-8	1500	30	-40°C to 85°C
	RHC2xyzu	1500	35	-40°C to 85°C
Staubli Electrical Connectors AG	PV-KST4-EVO 2/xy_UR & PV-KBT4-EVO 2/xy_UR	1500	45	-40°C to 85°C
Amphenol Technology (Shenzhen) Co.,Ltd	UTXCFabcd & UTXCMabcd	1500	35	-40°C to 85°C
Tyco Electronics (Shanghai) Co., Ltd	PV4-S1yx	1500	40	-40°C to 85°C
Ningbo huayu Photovoltaic	PV-H4	1500	35	-40°C to 85°C

QC Solar (Suzhou) Corporation	QC4.10-cds	1500	40	-40°C to 85°C
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### 6.3 Bypass diode

6.3.1 Number of series and parallel: As shown in the figure below, each diode is connected in parallel with 2 cell string units, and then connected in series with other cell string units.



Module Type	cell string units
HS-B120DS,HS-B120DSN HS-B120DSB,HS-S120SS HS-S120SSB,HS-B120DN HS-B120DNN, HS-210-B120DS HS-S120DSB	20 half cells in series
HS-B132DS,HS-B132DSN HS-B132DSB,HS-S132SS HS-S132SSB,HS-B132DN HS-B132DNN, HS-210-B132DS	22 half cells in series
HS-B144DS,HS-B144DSN HS-B144DSB,HS-S144SS HS-S144SSB,HS-B144DN HS-B144DNN HS-182-B144DS	24 half cells in series
HS-210-B110DS	22 half cells in series*2 11 half cells in series*1
HS-B156DS,HS-B156DSN HS-B156DSB,HS-S156SS HS-S156SSB	26 half cells in series
HS-B96DNN HS-B96DS	16 half cells in series
HS-182-B108DS HS-182-B108DSN HS-182-B108DSB	18 half cells in series

### 6.3.2 Bypass diode type

Manufacturer	Type	Max. peak reverse voltage (V DC)	Max. average forward current (A)	Max. junction temperature
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Zhejiang Renhe Photovoltaic Technology Co., Ltd	FMK4530B	45	30	200°C
	FMK4530T	45	30	200°C
	FMK5040D	45	40	200°C
QC Solar (Suzhou) Corporation	QCM2545	45	25	200°C
	20SQ050	50	20	200°C
	QCM3045	45	30	200°C
	QCM4045	45	40	200°C
	30SQ050A	50	30	200°C
	QCM5045	45	50	200°C
	QCM5045B	45	50	200°C
PAN JIT ELECTRONICS(WUXI ) CO.,LTD	GF3045	45	30	200°C
	GF3550	50	35	200°C
	GF5545	45	55	200°C
Ningbo huayu Photovoltaic Technology Co.,Ltd	HY3050MK	50	30	200°C
	HY4050MK	50	40	200°C
	HY5050MK	50	50	200°C

## 7. Maintenance and Care

It is required to perform regular inspection and maintenance of the modules, especially during the warranty period. In order to ensure the best performance of the modules, HUASUN recommends the following maintenance measures:

### 7.1 Visual Inspection

Please carefully check the modules for appearance defects. Focus on the following points:

- a) If modules are observed having slight cell color differences at different angles, this is a normal phenomenon of modules with anti-reflection coating technology.
- b) Whether the glass is broken.
- c) Whether any sharp objects touch the surface of the module;
- d) Whether the module is blocked by obstacles or foreign objects; if there is snow, you can use a brush with soft bristles to clean the surface of the module;
- e) Whether there is corrosion near the grid line of the cell. This kind of corrosion is caused by the damage of the packaging material on the surface of the module during installation or transportation, which causes water vapor to penetrate into the module;
- f) Observe whether there are burn-through traces on the back plate of the module;
- g) Check whether the fixing screws between the modules and the bracket are loose or damaged, and adjust or repair them in time;
- h) The system should be checked regularly to ensure that the supporting structure of the junction box is intact.
- i) If you need inspection or maintenance of electrical or mechanical performance, it is

recommended that the inspection or maintenance be carried out by certified and approved professionals to avoid electric shock or personal injury.

## **7.2 Module Cleaning**

### **7.2.1 Safety Warning**

- Cleaning will cause the risk of damage to modules and a series of parts, and also increase the risk of electric shock.
- Cracked or damaged modules will present a risk of electric shock due to leakage current, and wet modules will aggravate this risk of electric shock. Before cleaning, check the modules for cracks, damage, and loose joints.
- During the day, the voltage and current existing in the array are enough to cause fatal electric shock accidents.
- Since touching exposed parts of live parts can cause injury, make sure that the circuit is disconnected before cleaning.
- Before cleaning, make sure that the array and live parts (such as inverters and combiner boxes) are disconnected.
- Wear suitable protective clothing (clothes, insulating gloves, etc.).
- Do not immerse the modules partially or completely in water or any kind of washing liquid.

### **7.2.2 Handling Notice**

- Use a proper cleaning solution and suitable cleaning equipment.
- Do not use abrasive or electric cleaners on the module.
- Particular attention should be taken to avoid the module back-sheet or frame to come in contact with sharp objects, as scratches may directly affect product safety.
- Do not use abrasive cleaners, degreasers or any unauthorized chemical substance (e.g. oil, lubricant, pesticide, etc.) on the module.
- Do not use cleaning corrosive solutions containing hydrofluoric acid, alkali, acetone, or industrial alcohol. Only substances explicitly approved by HUASUN are allowed to be used for cleaning modules.
- HUASUN recommends to avoid rotating brush cleaning methods, as they could create micro-cracks in the PV modules.
- Dirt must never be scraped or rubbed away when dry, as this will cause micro-scratches on the glass surface

## **7.3 Inspection of Connector and Cable**

The following preventive maintenance is recommended every six months:

- a) Check the sealing gels of the junction box for any damage.
- b) 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.