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CHINA LESSO  
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# Component User Installation and Maintenance Guide

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## Overview

- First, thank you for choosing Photovoltaic module (also known as solar panel, hereafter referred to as “module”) of Guangdong Lesso Banhao New Energy Technology Group Co., Ltd. The guide includes information on module installation and safe handling of Guangdong Lesso Banhao New Energy Technology Group Co., Ltd. (hereafter referred to as “Banhao”).
- Before installation, operation and maintenance be sure to read and understand the instruction guide. Please provide the guide to solar system owner, installer for a reference, and inform requirement and suggestion related to safety, handing and maintenance. For any questions, please contact Banhao sales department for further explanation.
- Banhao module is designed in accordance with international IEC61215 and IEC61730 standards. Banhao module is applicable to public accessible system and systems with over 50V DC or over 240W power. Banhao module also passes IEC61730-1 and IEC61730-2, which meet safety class II.
- Before installing a solar Photovoltaic system, the installer should become familiar with mechanical and electrical requirements for such a system. Fail to follow the instructions in the guide will lead to the invalidity of product warranty. Please safe keep the guide for future reference.

## Disclaimer of Liability

- No responsibility is assumed by Banhao for any infringement of patents or other rights of the third parties, which happened during the use of Banhao modules.
- Because the installation, operation, use and maintenance of modules are beyond Banhao’s control, Banhao does not assume any responsibility for power loss, module damage, casualty and other extra costs caused by improper installation, operation, use or maintenance.
- The information in the guide is based on Banhao’s knowledge and experience and is believed to be reliable, but such information including product specification and suggestions does not constitute a warranty, explicitly or implicitly expressed. Banhao reserves the right to update the installation guide, solar products, specification and product information with prior notice.

## General Safety

- Mechanical Installation and electrical Installation of the PV modules have to refer to the related regulations, including electrical regulations, architecture law and power connection request. As for the specific terms, please contact the local authorities and obtain the corresponding license. The installer should conform to all applicable safety precautions and local regulations listed in this guide when installing the PV modules.
- Under normal operating conditions, data of power, current and voltage and so on produced by PV modules may differ from those under standard test conditions listed in the label. Accordingly, during system design, values of short-circuit current ( $I_{sc}$ ) and open-circuit voltages( $V_{oc}$ ) marked on module label should be multiplied by a factor of 1.25 when determining component voltage ratings, conductor ampacity, fuse sizes and size of controls connected to the module or system output.
- Use only equipment, connectors, wiring and support frames for use in a Photovoltaic system. Prohibit using modules of different configurations in the same system. It is recommended to use the inverter with integrated PID effect restore function at night in order to avoid PID effect in power station. Observe the instructions and safety precautions for all other components used in the system, including wiring and cables, connectors, DC-breakers, mounting hardware, inverters, batteries, etc.
- Each individual module can generate direct current when exposed to direct sunlight. Contact with electriferous parts is potentially hazardous. Exercise caution when wiring or handling modules exposed to sunlight.
- Prohibit using mirror or other magnifiers to artificially concentrate sunlight on the module. Completely cover all modules with an opaque material during installation to prevent electricity from being generated.



- Prohibit demounting modules under loads. Prohibit attempting to disassemble the module or remove any attached labels or components. Prohibit making identifying signs on the

module by using sharp objects. Prohibit applying paint or adhesive to module top surface.



- Make sure not to use sharp objects to wipe the surface of the module. Prohibit scratching or hitting PV modules, for the avoidance of damage. Prohibit using or installing broken modules to avoid the hazard of fire, electric shock and injury.
- Keep children well away from the system while transporting and installing mechanical and electrical components.

### Transportation, Storage and Handling

- Banhao Solar PV modules must be transported in the supplied packaging only and kept in the packaging until they are ready to be installed. Please protect the packaging without damage. Secure pallets from falling over. Do not exceed the maximum height of pallets to be stacked, as indicated on the pallet package. Please store pallets in a cool, dry and flat location. If it is necessary to store PV modules prior to installation, the PV modules should remain inside the packaging and protected from exposure that could compromise the durability of the packaging. For temporary storage, modules should be placed in dry and ventilated room, setting the glass surface downward. At most 31 pieces modules are put in each pallet when using a metal pallet.



Figure1 Pallet of PV modules

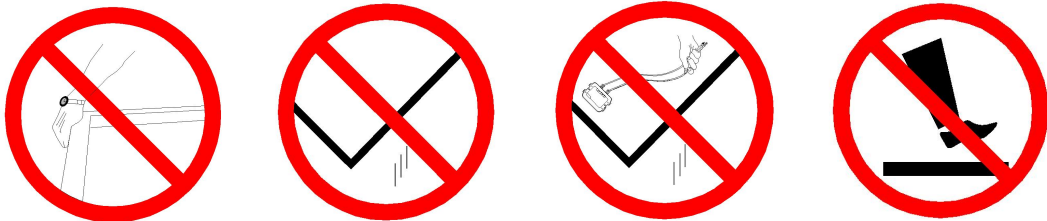
- Banhao Solar PV modules are heavy, and should be handled with care. For unpacking PV modules from Banhao supplied packaging, first remove the pallet lid and securing straps. Remove one PV module at a time by sliding them up the channel in the package. Please pay

attention to the rest of modules in the packaging in case that they fall over to one side.



Figure 2 Removing PV modules from a pallet

- Prohibit wearing watches and rings to prevent from scratching PV modules when carrying them. Bumping and collision of module during carrying and installation is not allowed. Violently pushing down module is not allowed. Never use the junction box or cables as a grip. Prohibit standing or stepping on the module. Prohibit one PV module falling on the other PV module. Never step or place heavy objects on PV modules. Broken glass can result in personal injury. PV modules with broken glass cannot be repaired and must not be used. Broken or damaged PV modules must be handled carefully and disposed of properly.



- Check PV modules for damage due to transportation before they are installed. PV module surfaces are susceptible to damage that could affect the performance or safety of the PV module. Contact the sales service department of Banhao in order to obtain information on making claims for defective PV modules.
- For your safety, do not disassemble or modify Banhao PV modules in any way. Doing so may degrade performance or cause irreparable damage and will void any applicable warranty.

## Product Identifications

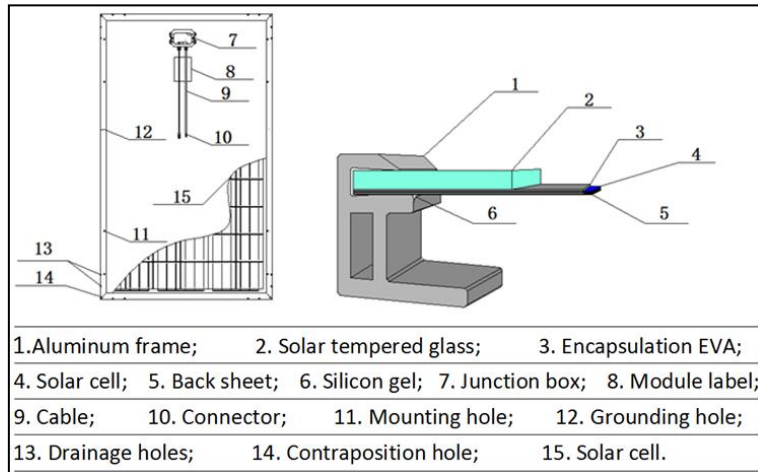


Figure 3 Banhao PV module structure

- Each module has a label on its rear side providing the following information: the product type, rated power, rated current, rated voltage, open circuit voltage, short circuit current, all as measured under standard test conditions, and weight, dimension, the maximum system voltage, maximum fuse rating and so on.
- Each module has several serial numbers for traceability. One is permanently sealed up in the interior of the module, which is visible when viewing from the front of the module. The rest are pasted on to frame and back sheet. The serial number coding is as follow:



BH1C51LAC220101010001

- BH: Banhao Logo
- 1C51: Factory code
- L: Solar cell type
- A: Tickets type
- C: Products type
- 220101: Date of Order (2022.01.01)
- 01: Production order number
- 0001: Serial number

- Module size as below:

Dimension	Module Model
2279mm(L) x1134mm(W) x 35mm(H)	A series

2278mm(L) x1134mm(W) x 35mm(H)	B series
2256mm(L) x1133mm(W) x 35mm(H)	C series
2094mm(L) x1134mm(W) x 35mm(H)	Dseries
1909mm(L) x1134mm(W) x 35mm(H)	E series
1724mm(L) x1134mm(W) x 35mm(H)	F series
2384mm(L) x1303mm(W) x 35mm(H)	G series
2174mm(L) x1303mm(W) x 35mm(H)	H series
1964mm(L) x1303mm(W) x 35mm(H)	I series

## Installation Environment

- Banhao PV modules are suitable for ground installation in areas below 2000 meters above sea level, which cannot be used in outer space.
- Banhao suggests modules are installed in ambient temperature of  $-40^{\circ}\text{C}\sim 40^{\circ}\text{C}$  and humidity less than RH85% environment. The ambient temperature refers to the lowest and highest monthly average temperature of installation site. If modules are long-term exposed beyond the ambient temperature limit of  $-40^{\circ}\text{C}\sim 70^{\circ}\text{C}$ , damage and power loss may occur earlier.
- The designed mechanical load for the product is: 1600 Pa for positive side; 1600 Pa for negative side. The safety factor is 1.5
- Modules should be installed in areas with plenty irradiation, rather than shaded area.
- Modules should be protected against thunder and lightning while installation and operation, especially in frequent thunder and lightning area. Otherwise, modules are possible to be struck by lightning.
- Prohibit installing modules in places of serious salt mist corrosion or obvious corrosive gases. It is recommended to install modules in places which are at least 1km away from seaside.
- Prohibit installing module near facilities or in places where inflammable gases can be generated or converged.
- Prohibit installing modules in water immersed place, and place with water heating or water spray devices.

## Mechanical Installation

- **General Rules**



- Solar system installation requires professional knowledge and skills, and it should be operated by qualified personnel with specialized and licensed tools. Module installation personnel take all risks which may cause injuries, such as electric shock. Module installation has to refer to local and state applicable laws and regulations. If necessary, installation permission for architecture electric system should be obtained.
- Solar modules convert solar energy into DC current, which is designed for outdoor installation on ground, support frame and rooftop. System installer and installer are responsible for designing a proper support structure.
- During installation, operate using only dry tools under dry conditions. Prohibit handling modules when they are wet unless wearing appropriate protective equipment. Operation is not allowed in the rain, snow, or in windy conditions.
- Prohibit wearing watch, ring, earring, nose ring, mouth ring or other metal accessories while installation and maintenance. Prohibit touching modules with bare hands, as glass surface and frame may be hot, there is a risk of burns and electric shock.



- Because of heat-expansion and cold-contraction effect of module frames, there should be at least 10mm distance between two adjacent modules. While installation, the side of module with junction box should be at higher position.
- Using screwing mounting, be sure to use mounting holes on the aluminum frames. The most commonly used mounting method is to use the central 4 mounting holes on frames. In places with frequent snow and wind days, it is suggested to use 8 mounting holes.
- **Selecting Mounting Direction and Angle**
- For maximum system efficiency, when installed in the northern hemisphere, modules should face south direction, while in the south hemisphere, modules should face north direction.
- Modules can be installed by long frames or short frames. Before installation, make sure the cable length is enough. If extra cables needed, make sure to choose cables with the

same type of connector.

- To get the correct installation angle, please refer to standard PV module installation guide or consult with professional installer or expert. Banhao recommend to choose over 10° installation angle, so modules can be self cleaned during rain.
- Modules in the same series should be installed at the same angle. Different installation angles shall cause unmatched current because absorption of different irradiation, which lead to reduced efficiency of solar system.

- **Selecting Proper Support Frame**

- Always observe the instructions and safety precautions of support frames to be used with modules. To choose proper support frame, which meets load requirement. Load is calculated by system designer or installer. Mounting frames must be made of anti-abrasion, anti-corrosion and UV-resistant materials.
- Do not try to drill holes in the glass surface of modules, doing so will void the warranty.

- **Ground Mounting**

- Select proper height, elevation angle and distance of mounting system to prevent the lowest edge of modules from being covered by snow and rain. In addition, make sure modules are placed high enough so that it is not shaded by plants, buildings and obstructions or damaged by sand and stone driven by wind.

- **Rooftop Mounting**

- When installing a module on a roof or building, please make sure it is installed under the weather of no winds or breeze. Installing a module in strong wind may cause accident.
- When installing a module on a rooftop or building, ensure that it is securely fastened and won't fall as a result of wind or snow loads.
- When installing module on a roof, ensure that the roof construction is suitable. System designer need to set up corresponding support frames according to the special structure of the rooftop. In addition, any roof penetration required to mount the module must be properly sealed to prevent leaks.
- Adequate ventilation space should be provided under the module for cooling (10cm minimum interval between module and rooftop).

- **Installation Methods**

- Banhao offers one type of installation, screwing mounting (install through the mounting holes).
- Each module has eight 9\*14mm mounting holes at the aluminum frames used to fix the modules by M8 screw on the supporting structure.

- **Mounting Methods and Positions**

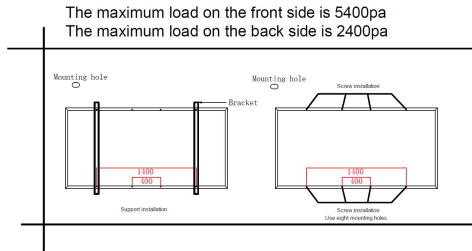


Figure 4 Mounting methods and positions

- The designed mechanical load for the A/B/C/D/E/F series product is:3600Pa for positive side;1600Pa for negative side.The safety factor is 1.5.
- For frame Heshan Linghe Electric Technology Co., Ltd. , A/B/C/D/E/F series product installed with 8 bolts and 4 rails, design load is 3600Pa (downward) / 1600Pa (upward).
- installation method: clamps are not recommended.

- **Mounting Details**

- **Screwing Mounting**

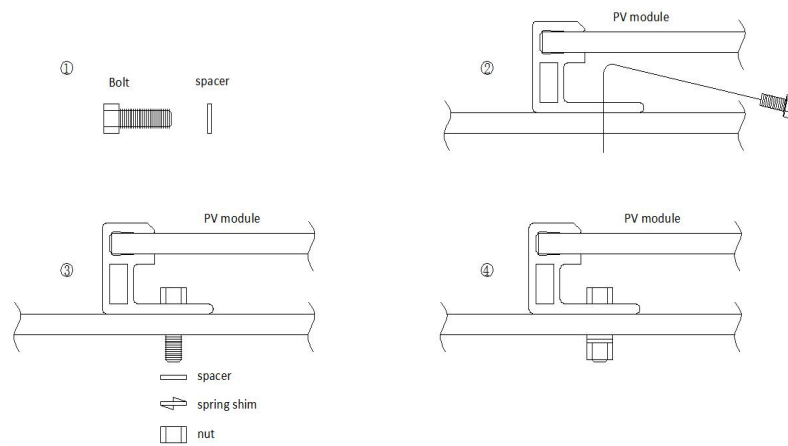


Figure 5 Screwing mounting

## Electrical Installation

- **General Installation**

- Under normal conditions, modules may produce more power compared with STC

conditions. When selecting solar system equipments parameters, such as rated voltage, rated current, fuse model, power output related parameters, actual installation environment and conditions should be considered.

- Please make sure connector, inverter and other electrical components are in disconnected state when installing modules.
- The modules are connected in series and then in parallel to form a PV array, especially for application with a high operation voltage. If modules are connected in series, the total voltage is equal to the sum of individual voltages. For applications requirement of high current, several modules can be connected in parallel, the total current is equal to the sum of individual currents.
- The maximum quantity of modules in series and in parallel must be calculated based on the related regulations. The open-circuit voltage (Voc) under the expected lowest local temperature and the highest irradiation should not exceed DC1500V, the regulated maximum system voltage. Reference formula for quantity of modules in series:  $1500V / (1.25 * Voc)$  ; Reference formula for quantity of modules in parallel:  $Max. Series Fuse (A) / I_{sc} + 1$ .
- The cross-sectional area of cable mated with connector is recommended to be  $4mm^2$ , temperature range:  $-40^{\circ}C \sim 70^{\circ}C$ . The plug connector has its own polarity, and must be same type. Make sure that connection is clean, dry, safe and tight. Wrong connection or loose connection may cause electric arc or electric shock. Plug connector should not receive external stress. Unqualified personnel are prohibited to open locked nut. Connectors should only be used to connect circuit, but never be used to turn circuit on or off.
- Please refer to the regional and national regulations to determine the system wires size, type and temperature. To prevent the cables and the connectors from overheating, the cross-sectional area of cable and the capacity of connector must be selected to suit the system short circuit current and temperature when they are exposed to sunlight, otherwise the cable and connector will be overheated under large current.
- The cable delivered with modules is  $1 \times 4.0mm^2$  H1Z2Z2-K cable certified by TÜV Rheinland according to EN 50618. The connector delivered with 1500V system voltage

modules is PV-CO02-xy manufactured by UTK. The connector delivered with 1500V system voltage modules is PV-KST4-EVO2/xy\_UR/ PV-KBT4-EVO2/xy\_UR manufactured by Stäbli or PV-CO02-xy form UTK .

- Module over current protection is rated for DC use. Please refer to the application requirements of local standard to determine the fuse. If reverse current which exceed the Max. Series fuse current pass through modules, over current protective device of the same specifications should be used to protect the modules. If modules in parallel exceed 2 strings, each string must be installed with an over current protective device.
- In places with frequent thunder and lightning, arrester device must be installed for solar system. To reduce the risk of lightning stroke, loop area should be as small as possible when laying cables.
- When fixing cables on support frames, mechanical damage of cables and modules must be avoided. Do not press cables with force. Use proper way to fix cables, using bundles resistant to light to fix and avoiding direct exposure to sunlight and being soaked in water.

- **Grid-connected Electrical System**

- DC generated by solar system can be converted into AC and connected to a utility grid system. As local utility policies on connecting solar system to utility grid varies in different regions, please consult with a qualified system designer to design a system. Permits are normally required to install such a system and the utility must formally inspect and approve such a system before it can be connected to the grid.

- **Grounding**

- To avoid the risk of electric shock or fire, module frames should be grounded before operation of solar system.
- For grounding and bonding requirements, please refer the regional and national safety and electrical installation standards.
- Proper grounding way is to connect metal devices which are not used for conductive purpose with grounding device or support frames integrated with grounding device. Grounding holes set on aluminum frames (Ø4) and grounding signs cannot be used for fixing modules, do not try to drill holes on modules.

- Use screws, washer, and nut which are made of stainless steel, grounding cables in  $\Omega$  shape and fix between screw head and washer, and screw pass through grounding holes. A toothed washer is required to make proper and reliable grounding connection with the anodized aluminum frame.

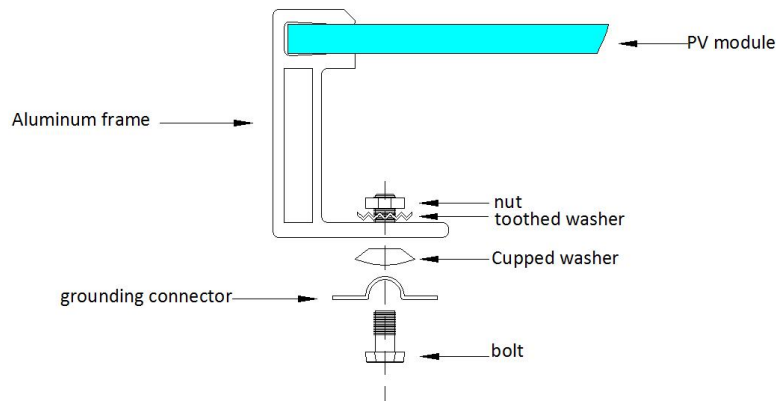


Figure 6 Grounding methods and positions

- Solar system can be grounded by connecting to support frames integrated with grounding device or to separate grounding device. Make sure grounding is safe and effective, and do not cause electrochemical corrosion of different metals and aluminum frames.
- To get the most output power and avoid PID effect, the negative DC electrode of the array is supposed to be grounded when installation. If not, the output power may decrease.

## Adjustment and Maintenance

Banhao recommends the following adjustment and maintenance items to ensure optimum performance of the module:

- Electrical and mechanical connections should be checked at least once half a year by qualified personnel to verify they are clean, secure and undamaged. Pay attention to observe the maintenance instructions for all components used in the system, such as support frames, inverters, combiner box, batteries, etc.
- As time goes on, dirt and dust may accumulate on the surface of modules, resulting in the

decrease of output power. It is recommended to clean modules at least once a year to ensure the maximum output power, especially in low rainfall areas. Please choose to clean modules when sunshine is not strong.

- Do not touch glass surface with bare hand, to avoid leaving fingerprint and other dirt on the glass. When cleaning module surface, use dry duster or dishcloth to remove dirt, and then use soft sponge or dishcloth to clean it with water. Mild, non-abrasive cleansers (all kinds of commercial glass cleansers, ethyl alcohol, methyl alcohol etc) can be used to remove stubborn dirt.
- Do not use water with high mineral content and excessive water pressure to clean modules. Normal water supply is applicable.
- For modules installed in dusty places, blow dust first when cleaning modules. To clean snow on modules, do not try to scrape the frozen snow and ice with too much force.
- Do not clean modules with broken glass or bare cables, there is electric shock hazard.
- If any problems arise, have them investigated by qualified personnel.

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## The appendix

- The information of the modules are as follows:

\*All electrical data shall be shown as relative to standard test conditions (STC:1000W/m<sup>2</sup>,25±2°C,AM=1.5

according to IEC 60904-3).

- xxxD(HPM)72(182) /xxxD(HPM)66(182)/xxxD(HPM)60(182)/xxxD(HPM)54(182) Series

Type Name or Model No.....	xxxD(HPM)72(182) (xxx=520~550)	xxxD(HPM)66(182) (xxx=480~505)	xxxD(HPM)60(182) (xxx=435~455)	xxxD(HPM)54(182) ) (xxx=390~410)
Maximum System Voltage [V <sub>DC</sub> ] ...	1500	1500	1500	1500
Rated Maximum Power [W].....	520,525,530,535, 540, 545,550	480,485,490, 495,500,505	435,440,445, 450,455	390,395,400, 405,410
Tolerance of Rated Maximum Power [%].....	0~+3%	0~+3%	0~+3%	0~+3%
Rated Short Circuit Current [A].....	13.63,13.68,13.74, 13.79,13.85,13.91, 13.97	13.64,13.70,13.77, 13.83,13.89,13.95	13.69,13.76,13.83, 13.90,13.97	13.64,13.71,13.79, 13.87,13.95
Tolerance of Rated Short Circuit Current [%].....	±3%	±3%	±3%	±3%
Rated Open Circuit Voltage [V].....	48.62,48.82,49.02, 49.22,49.42,49.62, 49.82	44.67,44.87,45.07, 45.27,45.47,45.67	40.72,40.92,41.12, 41.32,41.52	36.57,36.77,36.97, 37.17,37.37
Tolerance of Rated Open Circuit Voltage [%].....	±3%	±3%	±3%	±3%
Rated Maximum Power Current [A] .....	12.76,12.81,12.87, 12.92,12.98,13.04, 13.10	12.77,12.83,12.90, 12.96,13.02,13.08	12.82,12.89,12.96, 13.03,13.10	12.36,12.44,12.52, 13.00,13.08
Rated Maximum Power Voltage [V] .....	40.80,41.00,41.20, 41.40,41.60,41.80, 42.00	37.60,37.80,38.00, 38.20,38.40,38.60	33.93,34.13,34.33, 34.53,34.73	31.55,31.75,31.95, 31.15,31.35
Over-current protection rating [A]:	25	25	25	25
Protection Classification (IEC 61730).....	Class II	Class II	Class II	Class II
Dimensions (l x w x h) [mm].....	2279x1134x35 2278x1134x35 2256x1133x35	2094x1134x35	1909x1134x35	1724x1134x35
Module area [m <sup>2</sup> ].....	2.59	2.38	2.17	1.96
Min-creepage distance [mm].....	13.5	13.5	13.5	13.5
Number of solar cells	144	132	120	108
Cells per bypass diode	48	44	40	36
Serial/parallel connection of cells (S,SP,SPS)	SP	SP	SP	SP
Number of diodes	3	3	3	3



● xxxD(HBD)72(182) /xxxD(HBD)66(182)/xxxD(HBD)60(182)/xxxD(HBD)54(182) Series

Type Name or Model No.....	xxxD(HBD)72(182) (xxx=530~555)	xxxD(HBD)66(182) (xxx=485~510)	xxxD(HBD)60(182) (xxx=440~465)	xxxD(HBD)54(182) ) (xxx=395~420)
Maximum System Voltage [V <sub>DC</sub> ] ...	1500	1500	1500	1500
Rated Maximum Power [W].....	530,535,540, 545,550,555	485,490,495, 500,505,510	440,445,450, 455,460,465	395,400,405, 410,415,420
Tolerance of Rated Maximum Power [%].....	0~+3%	0~+3%	0~+3%	0~+3%
Rated Short Circuit Current [A].....	13.73,13.80,13.87, 13.94,14.01,14.07	13.71,13.78,13.85, 13.92,13.99,14.06	13.69,13.76,13.83, 13.90,13.97,14.04	13.67,13.74,13.81, 13.88,13.95,14.02
Tolerance of Rated Short Circuit Current [%].....	±3%	±3%	±3%	±3%
Rated Open Circuit Voltage [V].....	49.30,49.40,49.52, 49.64,49.78,49.93	45.14,45.24,45.36, 45.48,45.62,45.77	40.98,41.08,41.20, 41.32,41.46,41.61	36.86,36.96,37.08, 37.20,37.34,37.49
Tolerance of Rated Open Circuit Voltage [%].....	±3%	±3%	±3%	±3%
Rated Maximum Power Current [A] .....	12.84,12.91,12.98, 13.05,13.12,13.19	12.82,12.89,12.96, 13.03,13.10,13.17	12.80,12.87,12.94, 13.01,13.08,13.15	12.78,12.85,12.92, 12.99,13.06,13.13
Rated Maximum Power Voltage [V] .....	41.29,41.45,41.61, 41.77,41.93,42.08	37.84,38.02,38.20, 38.38,38.56,38.74	34.38,34.58,34.78, 34.98,35.18,35.38	30.92,31.13,31.35, 31.57,31.79,31.99
Over-current protection rating [A]:	25	25	25	25
Protection Classification (IEC 61730).....	Class II	Class II	Class II	Class II
Dimensions (l x w x h) [mm].....	2279x1134x35 2278x1134x35 2256x1133x35	2094x1134x35	1909x1134x35	1724x1134x35
Module area [m <sup>2</sup> ].....	2.59	2.38	2.17	1.96
Min-creepage distance [mm].....	13.5	13.5	13.5	13.5
Number of solar cells	144	132	120	108
Cells per bypass diode	48	44	40	36
Serial/parallel connection of cells (S,SP,SPS)	SP	SP	SP	SP
Number of diodes	3	3	3	3

● xxxD(HPM)66(210) /xxxD(HPM)60(210)/xxxD(HPM)54(210) Series

Type Name or Model No.....	xxxD(HPM)66(210) (xxx=640~670)	xxxD(HPM)60(210) (xxx=580~605)	xxxD(HPM)54(210) (xxx=520~540)
Maximum System Voltage [V <sub>DC</sub> ] ...	1500	1500	1500
Rated Maximum Power [W].....	640,645,650,655	580,585,590,595	520,525,530,

	,660,665,670	,600,605	535,540
Tolerance of Rated Maximum Power [%].....	0~+3%	0~+3%	0~+3%
Rated Short Circuit Current [A].....	18.34,18.38,18.42,18.46,18.46,18.50,18.54,18.60	18.32,18.36,18.40,18.44,18.48,18.56	18.30,18.34,18.38,18.42,18.46
Tolerance of Rated Short Circuit Current [%].....	±3%	±3%	±3%
Rated Open Circuit Voltage [V].....	44.80,45.00,45.20,45.40,45.60,45.80,46.00	40.60,40.80,41.00,41.20,41.40,41.60	36.40,36.80,37.20,37.60
Tolerance of Rated Open Circuit Voltage [%].....	±3%	±3%	±3%
Rated Maximum Power Current [A] .....	17.26,17.30,17.34,17.38,17.42,17.46,17.50	17.32,17.36,17.41,17.45,17.50,17.54	17.40,17.45,17.50,17.55,17.60
Rated Maximum Power Voltage [V] .....	37.10,37.30,37.50,37.70,37.90,38.10,38.30	33.50,33.70,33.90,34.10,34.30,34.50	29.90,30.10,30.30,30.50,30.70
Over-current protection rating [A]:	25	25	25
Protection Classification (IEC 61730).....	Class II	Class II	Class II
Dimensions (l x w x h) [mm].....	2384x1303x35	2174x1303x35	1964x1303x35
Module area [m <sup>2</sup> ].....	3.11	2.84	2.26
Min-creepage distance [mm].....	14	14	14
Number of solar cells	132	120	108
Cells per bypass diode	44	40	36
Serial/parallel connection of cells (S,SP,SPS)	SP	SP	SP
Number of diodes	3	3	3

●xxxD(HBD)66(210) /xxxD(HBD)60(210)/xxxD(HBD)54(210) Series

Type Name or Model No.....	xxxD(HBD)66(210) (xxx=640~670)	xxxD(HBD)60(210) (xxx=580~610)	xxxD(HBD)54(210) (xxx=520~550)
Maximum System Voltage [V <sub>DC</sub> ] .....	1500	1500	1500
Rated Maximum Power [W].....	640,645,650,655,660,665,670	580,585,590,595,600,605,610	520,525,530,535,540,545,550
Tolerance of Rated Maximum Power [%].....	0~+3%	0~+3%	0~+3%
Rated Short Circuit Current [A].....	18.26,18.30,18.34,18.38,18.42,	18.21,18.25,18.29,18.33,18.37,	18.16,18.20,18.24,18.28,18.32,

	18.46,18.50	18.41,18.45	18.36,18.40
Tolerance of Rated Short Circuit Current [%].....:	±3%	±3%	±3%
Rated Open Circuit Voltage [V].....:	45.20,45.40,45.60,45.80,46.00,46.20,46.40	41.00,41.20,41.40,41.60,41.80,42.00,42.20	36.80,37.00,37.20,37.40,37.60,37.80,38.00
Tolerance of Rated Open Circuit Voltage [%].....:	±3%	±3%	±3%
Rated Maximum Power Current [A] .....	17.20,17.24,17.28,17.32,17.36,17.40,17.44	17.20,17.25,17.29,17.34,17.38,17.43,17.47	17.21,17.26,17.31,17.36,17.41,17.46,17.50
Rated Maximum Power Voltage [V] .....	37.23,37.43,37.63,37.83,38.03,38.23,38.43	33.73,33.93,34.13,34.33,34.53,34.73,34.93	30.23,30.43,30.63,30.83,31.03,31.23,31.43
Over-current protection rating [A]:	30	30	30
Protection Classification (IEC 61730).....:	Class II	Class II	Class II
Dimensions (l x w x h) [mm].....:	2384x1303x35	2174x1303x35	1964x1303x35
Module area [m <sup>2</sup> ].....:	3.11	2.84	2.26
Min- creepage distance [mm].....:	14	14	14
Number of solar cells	132	120	108
Cells per bypass diode	44	40	36
Serial/parallel connection of cells (S,SP,SPS)	SP	SP	SP
Number of diodes	3	3	3

Temperature coefficient for ,xxxD(HPM)72(182)/xxxD(HPM)66(182)/xxxD(HPM)60(182)/xxxD(HPM)54(182)/xxxD(HBD)72(182)/xxxD(HBD)66(182)/xxxD(HBD)60(182)/xxxD(HBD)54(182)/xxxD(HPM)66(210)/xxxD(HPM)60(210)/xxxD(HPM)54(210)/xxxD(HBD)66(210)

/xxxD(HBD)60(210)/xxxD(HBD)54(210):

$\alpha$ (%/°C)=0.07 ,  $\beta$ (%/°C)=-0.36 ,  $\delta$ (%/°C)=-0.38 ;

The designed mechanical load for ,xxxD(HPM)72(182)/xxxD(HPM)66(182)/xxxD(HPM)60(182)/xxxD(HPM)54(182)/xxxD(HBD)72(182)/xxxD(HBD)66(182)/xxxD(HBD)60(182)/xxxD(HBD)54(182)/xxxD(HPM)66(210)/xxxD(HPM)60(210)/xxxD(HPM)54(210)/xxxD(HBD)66(210)

/xxxD(HBD)60(210)/xxxD(HBD)54(210) series is: 3600 Pa for positive side; 1600 Pa for negative side.

The safety factor is 1.5.

➤ The module may be supplied by the diode below according to each design:

1. TM3045-25 from Suzhou UKT New Energy Technology Co, Ltd, with Max current: 45A, Tj max:200°C;

➤ The module may be supplied by one the connector below according to each design:

1.PV-CO02-1A from Suzhou UKT New Energy Technology Co, Ltd,,with Max current: 45A.

2.PV-KST4-EVO2/xy\_UR/ PV-KBT4-EVO2/xy\_UR from Stäbli Electrical Connectors AG,with Max current:

45A.

## **Declaration**

Our company has received and read carefully "Component User Installation and Maintenance Guide", and knows well the content. Hereunder, we declare to comply with the Installation Guide, to consider the suggestions in this Guide according to the real installation conditions.

Signature:

Date: