



**Shenzhen Aiko Digital Energy  
Technology Co., Ltd.**

**PV Module Installation Manual**

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Applicable module models		Structure of modules
AIKO-Pxxx-MAH72Mw	AIKO-Pxxx-MAH72Mb	Single glass photovoltaic modules
AIKO-Pxxx-MAH60Mw	AIKO-Pxxx-MAH60Mb	
AIKO-Pxxx-MAH54Mw	AIKO-Pxxx-MAH54Mb	
AIKO-Axxx-MAH72Mw	AIKO-Axxx-MAH72Mb	
AIKO-Axxx-MAH60Mw	AIKO-Axxx-MAH60Mb	
AIKO-Axxx-MAH54Mw	AIKO-Axxx-MAH54Mb	
AIKO-Bxxx-MAH72Mw	AIKO-Bxxx-MAH72Mb	
AIKO-Bxxx-MAH60Mw	AIKO-Bxxx-MAH60Mb	
AIKO-Bxxx-MAH54Mw	AIKO-Bxxx-MAH54Mb	
AIKO-Gxxx-MCH72Mw	AIKO-Gxxx-MCH54Mw	



## **Important Safety Information**

- This installation manual provides information on the installation and safe use of photovoltaic modules (hereinafter referred to as "Modules") from Shenzhen Aiko Digital Energy Technology Co., Ltd. (hereinafter referred to as "Aiko"). During module installation and routine maintenance, please comply with all safety precautions and local laws and regulations specified in this manual.
- Professional skills and knowledge are required to install and maintain module systems. Only qualified personnel can install and maintain module systems. Installation personnel should be familiar with the mechanical and electrical requirements of the system. Please keep this manual for future maintenance or treatment.

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## 1、 Overview

First of all, thank you for choosing AIKO's products. This installation manual contains important electrical and mechanical installation information. Please understand this information before you install modules. In addition, the manual also contains some other safety information that you must be familiar with.

This installation manual does not have the meaning of any warranty, whether express or implied. There is no provision on the compensation scheme for the loss, module damage or other expenses directly caused by or related to the installation, operation, use or maintenance of modules. If the patent right or the rights of a third party are infringed due to the use of modules, AIKO will not bear any relevant responsibilities. AIKO reserves the right to change the product manual and this installation manual without prior notice.

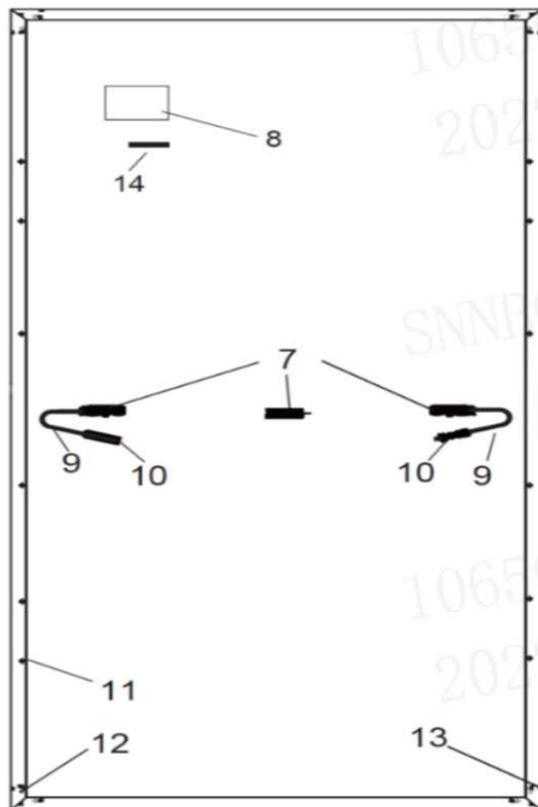
If the customer fails to follow the requirements listed in this manual during the installation of modules, the limited warranty provided to the customer will be invalid. At the same time, the recommendations in this manual are to improve the safety of modules during installation, and have been tested and verified by practice. Please provide this manual to the owners of photovoltaic system for reference, and inform them of all relevant safety, operation and maintenance requirements and suggestions.

## 2、 Regulation and rules

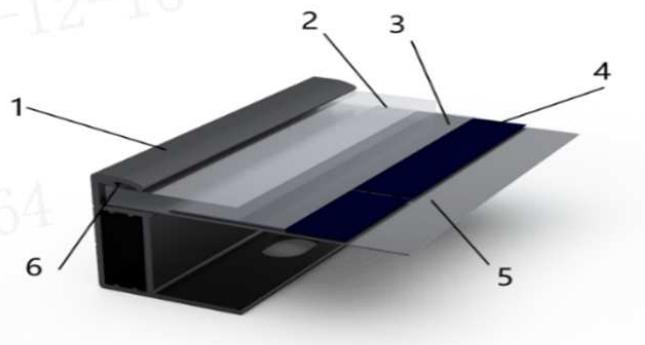
The mechanical installation and electrical installation of PV modules shall refer to corresponding regulations, including electrical law, building law and power connection requirements. These regulations vary from installation site to installation site, such as building roof installation, vehicle mounted applications, etc. Requirements may also vary depending on the voltage and current nature (DC or AC) of the installed system. Please contact the local authority for specific terms.

### 3、 General information

#### 3.1 Module identification



Single glass module structure diagram and component description



- |                         |                        |
|-------------------------|------------------------|
| 1 Aluminium alloy frame | 8 Nameplate            |
| 2 Photovoltaic glass    | 9 Electric cable       |
| 3 Film                  | 10 Connector           |
| 4 ABC cell              | 11 Mounting hole       |
| 5 Backsheet             | 12 Groud grouding hole |
| 6 Silicon               | 13 Water leakage hole  |
| 7 Junction box          | 14 Barcode             |

Three kinds of visual labels provided by AIKO's modules:

**Nameplate:** Product type, rated power under standard test conditions (STC), rated current, rated voltage, open circuit voltage, short circuit current under STC, certification mark, maximum system voltage and other information

**Serial number:** Each module has a unique serial number. This serial number is printed on the bar code and placed in the assembly before lamination, and cannot be torn or coated after lamination. In addition, an identical serial number can be found on or next to the module nameplate.

**Current grading label(if necessary):** The modules of the same gear are second graded by rated current and marked for differentiation on the modules.

Nameplate

**Model:**

---

**Rated Maximum Power (Pmax)**  
**Power Tolerance**  
**Voltage at Pmax (Vmp)**  
**Current at Pmax (Imp)**  
**Open-Circuit Voltage (Voc)**  
**Short-Circuit Current (Isc)**  
**Voc & Isc Tolerance**  
**Maximum System Voltage**  
**Maximum Series Fuse Rating**  
**Operating Temperature**  
**Protection Class**

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STC: AM=1.5, E=1000W/m<sup>2</sup>, Tc=25°C

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Shenzhen Aiko Digital Energy Technology Co., Ltd.  
 Add : Room 607, Building B, Tengfei Industrial Building, No.6 Taohua Road,  
 Fubao Community, Fubao Street, Futian District, Shenzhen 518045 Guangdong,  
 P.R.China  
 Web: [www.aikosolar.com](http://www.aikosolar.com)

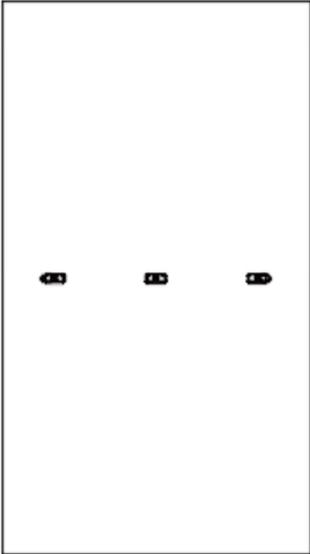
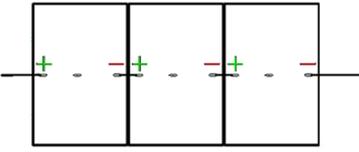
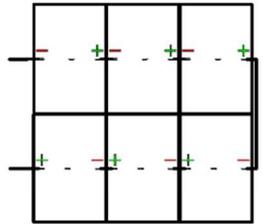
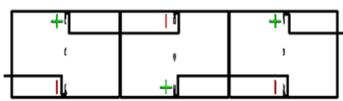
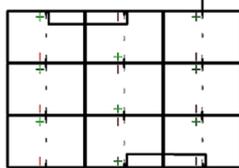
**Made in China**

Bar code label



### 3.2 Wiring mode

The junction box of AIKO ABC photovoltaic module is located in the middle. Please refer to the following table for the series connection mode of various modules.

Junction box location	Module Installation type	Wiring diagram	
	Long side mounting for single row		Transverse adjacent modules are connected directly with the shortest distance; If the wire is too long, the wire can be placed in the secondary beam for connection.
	Long side mounting for double rows		<p>1) Transverse adjacent modules are connected directly with the shortest distance; If the wire is too long, the wire can be placed in the secondary beam for connection.</p> <p>2) When connecting two adjacent rows of modules, the opposite polarity on the same side should be considered in the design and installation, as shown in the figure. The adjacent modules should be connected on the side, and the wires should not be exposed.</p>
	Short side mounting for single row		For longitudinal installation, when two rows of modules are connected longitudinally, the polarity of the adjacent modules in the design and installation is opposite as shown in the figure. At the same time, the extension wire can be put into the secondary beam.
	Short side mounting for double rows		<p>1) Vertically adjacent modules as shown in the figure are connected directly at the shortest distance ;</p> <p>2) When two columns of adjacent modules are connected, the opposite polarity on the same side should be considered in the design and installation, as shown in the figure. The adjacent modules are connected on the side, and the wires can be put into the secondary beam.</p>

### 3.3 General safety

The design of AIKO PV module complies with IEC-61215、IEC-61730、CSA C22.2 No. 61730 and UL 61730 international standards. The application level is class A. the module can be used for systems with DC 50V or above 240W that the public may contact. The safety level of the module is class II and the fire protection level is class C. Fire type can be classified as Type 4 based on the construction and fire performance.

No matter whether the PV module is connected to the system or not, appropriate protective measures shall be taken when contacting the module, such as insulating tools, safety helmets, insulating gloves, safety belts and safety insulating shoes. When you need to install, ground, wire and clean modules, please be sure to use appropriate electrical safety protection tools.

Under the sunlight, whether the module is connected with the electrical system or not, it can generate direct current, and touching the live parts of the module (such as connectors) may cause casualties. Avoid direct contact with photovoltaic modules, which may cause electric shock or cuts.

The installation of PV modules shall comply with the laws and regulations clearly stipulated by the relevant regions and countries where the PV modules are installed. If necessary, the construction permit and other certificates shall be obtained first.

The installation of PV modules shall be carried out by qualified professionals who have professional skills and knowledge and are familiar with the mechanical and electrical requirements of the system. The risk of possible injury during installation, including electric shock or cuts, shall be known in advance.

The roof system can only be installed on the roof with formal and complete structural analysis results after evaluation by construction experts.

Observe the safety rules for all installed modules. For example, wires and cables, connectors, charging controllers, inverters, batteries, etc., only equipment, connectors, wires and supports matching the solar power system can be used. If the photovoltaic system uses batteries, it shall follow the opinions of the battery manufacturer.

PV modules of the same size and model can be interconnected.

Please do not artificially focus light on modules.

### **3.4 Electrical safety**

Please strictly follow the following electrical safety provisions to avoid any form of electrical safety accidents.

Please do not install or operate PV modules when it is wet or windy.

The DC voltage of photovoltaic modules may exceed 30V, and direct contact shall be avoided.

It is necessary to ensure that the connecting cable is fixed on the support frame for the installation of PV modules.

Where animals and children can reach, cables must be protected with conduits.

Please do not artificially modify or remove any modules and labels of PV modules.

Please do not install PV modules without safety precautions.

Do not use any means other than connectors for electrical connection.

The damaged PV module has the risk of electric shock and fire and should be replaced immediately.

The installation of PV module array must be carried out under the condition of electrical safety. During installation, the voltage of PV modules in series shall not exceed the maximum system voltage.

It is forbidden to plug connectors of different manufacturers and models into each other.

Please do not use conventional PV modules to replace roof and wall materials.

When there is current or external current in the PV module, the PV module shall not be connected or disconnected.

Please do not use corrosive chemicals to coat the surface of photovoltaic modules.

Please do not touch the PV module when it is wet.

### **3.5 Operational safety**

Before the PV modules arrive at the installation site, please do not open the packaging box. Please put the packaging box in a ventilated and dry environment.

During all handling, please ensure that the PV module will not be subject to large vibration. Improper handling and placement may cause the glass of photovoltaic modules to break or lose electrical performance, and lose the use value of photovoltaic modules.

Handle and install PV modules with care. In any case, it is forbidden to lift the PV module by pulling the junction box or cable. Two or more people must hold the edge of the PV module with both hands.

It is forbidden to step on, stand on or sit on the PV module, which will damage the PV module and pose a risk of injury to people.

It is forbidden to place any heavy object on the front and back of the PV module, and do not place the PV module on the sharp object surface.

It is forbidden to attempt to disassemble the PV module, remove the nameplate of the PV module or the modules on the PV module.

It is strictly prohibited to brush paint or apply any other adhesive on the surface of photovoltaic modules.

Avoid scratching the back plate and glass surface of PV module.

It is strictly prohibited to drill holes on the frame of PV modules, which will reduce the load resistance of the frame and lead to the corrosion of the frame, which will lead to the invalidation of the limited warranty of PV modules.

Except for grounding, it is forbidden to scratch the anodic oxide layer on the surface of the

aluminum alloy frame, which may lead to frame corrosion and affect the load resistance and long-term reliability of the frame.

It is strictly prohibited to repair or refit PV modules by yourself.

The surface of the touching photovoltaic module should be smooth, without sharp edges, burrs, etc.



Do not dispose of electrical appliances as unsorted municipal waste, use separate collection facilities.

Contact your local government for information regarding the collection systems available. If electrical appliances are disposed of in landfills or dumps, hazardous substances can leak into the groundwater and get into the food chain, damaging your health and well-being.

When replacing old appliances with new ones, the retailer is legally obligated to take back your old appliance for disposals at least free of charge.

### 3.6 Fire safety

Please consult local laws and regulations before installing PV modules, and comply with the requirements on building fire resistance.

When installing on the roof, the roof must be covered with a layer of fireproof materials suitable for this grade, and sufficient ventilation between the back plate and the installation surface must be ensured.

Different roof structures and installation methods will affect the fire safety performance of buildings. Improper installation may cause fire.

In order to ensure the fire rating on the roof, the minimum distance between the PV module frame and the roof surface is 10cm.

Please use appropriate PV module accessories such as fuse, circuit breaker and grounding connector according to local regulations.

Do not use PV modules if exposed flammable gases are present nearby.

## 4、 Installation conditions

### 4.1 Installation site and working environment

AIKO PV modules are recommended to be installed in an environment where the operating ambient temperature is  $-20\text{ }^{\circ}\text{C} \sim 50\text{ }^{\circ}\text{C}$ . the limiting operating ambient temperature of PV modules is  $-40\text{ }^{\circ}\text{C} \sim 85\text{ }^{\circ}\text{C}$  and the humidity is lower than 85%rh.

AIKO PV modules are applicable to the operating environment below 2000m above sea level.

Do not directly irradiate the artificial spotlight on the solar PV module.

When installing solar PV modules on the roof, a safe working area must be reserved between the edge of the roof and the outer edge of the PV module array.

When photovoltaic modules are stacked on the roof, the load of the roof shall be rechecked and the construction organization plan meeting the specification requirements shall be formulated.

When selecting the installation position of PV modules, the position where the sun can fully shine shall be selected to avoid partial or total shielding (trees, buildings, clothes, tools, packaging materials and other obstacles) on the surface of PV modules.

A safety factor (1.25) regarding the open circuit voltage (Voc) and short circuit current (Isc) needs to be set, considering that the irradiance of the installation site can sometimes be higher than  $1000\text{W}/\text{m}^2$  and the temperature may be lower than  $25^{\circ}\text{C}$ .

The PV module shall be installed in a well ventilated position to ensure sufficient air circulation at the back and side of the PV module, so that the heat generated during the working state of the PV module can be dissipated in time.

When used in areas with high wind pressure and snow pressure, the support and fixed structure shall be designed in strict accordance with local design codes to ensure that the external load does not exceed the mechanical strength limit that the PV module can withstand.

In salt spray, sulfide and ammonia environments (coastal, factory, volcanic and farm), corrosion may occur at the connection between modules and supports, or at the position where the grounding is connected.

Corrosion resistant materials (stainless steel or aluminum materials, etc.) must be used to contact the PV module, and the installation position shall be subject to anti-corrosion treatment.

## 4.2 Inclination angle selection

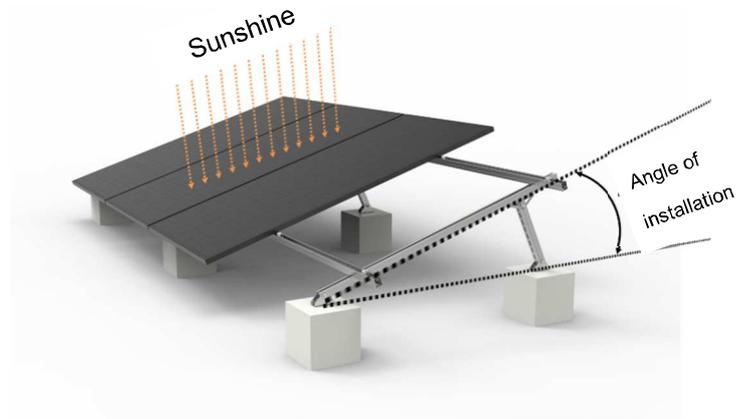
The inclination angle of PV module refers to the included angle between PV module and horizontal ground.

Different projects choose different installation inclination angles according to local conditions.

Each PV module of the same array must have the same direction and angle. Different installation directions and angles will lead to

the difference in the total amount of solar radiation absorbed by photovoltaic modules, resulting in the mismatch loss of output power, thus reducing the operating efficiency of the system.

In order to achieve the maximum annual power generation of PV modules, the optimal orientation and inclination of PV modules in the installed area shall be selected to ensure that even on the day with the shortest sunshine throughout the year, the sunlight can still shine on the PV modules during the period from 9:00 to 15:00. The optimal inclination design of photovoltaic array shall comprehensively consider the climatic conditions such as monthly average irradiance, direct irradiance, scattering irradiance, wind speed, etc. of the installation site for many years. The inclination of photovoltaic modules shall maximize the annual radiation received on the photovoltaic modules. The selection of angle shall also consider the influence of natural conditions, such as local wind load, snow load, avoiding ponding and ash deposition on the surface of photovoltaic modules, etc.



## 5、 Mechanical installation

### 5.1 General requirements

Ensure that the PV module installation method and support system are firm enough. The PV module mounting bracket must be made of corrosion-resistant and UV resistant materials.

The PV module must be firmly fixed to the bracket.

In areas with heavy snowfall, a higher support system shall be selected to avoid the lowest point of PV module being covered by snow for a long time. The lowest point of the PV module shall

be at a certain height to prevent the PV module from being covered by weeds and trees on the ground.

When the PV module is installed parallel to the roof, the minimum gap between the PV module frame and the roof is 10cm.

The minimum installation distance between two adjacent PV modules is 10mm.

The maximum static test load passed by the PV module is front 3600/ back 1600 with Safety factor 1.5.

The specific load depends on the installation mode of the PV module (please refer to the following). All load values mentioned in this manual are static test loads. Note: according to IEC 61215-2, 1.5 times of safety factor shall be considered when calculating the maximum design load; When calculating the wind load, the design maximum instantaneous gust load shall consider 3 times the safety factor.

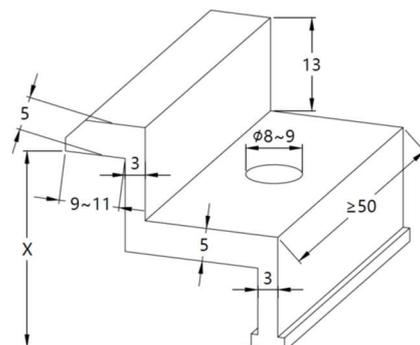
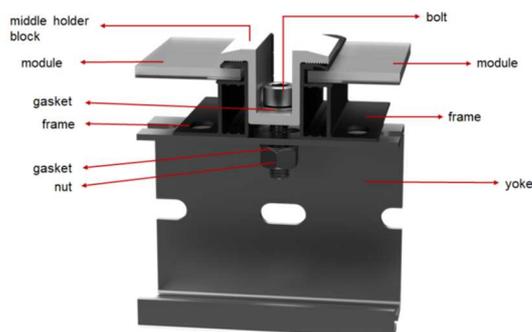
The loads of the modules described in this manual are test loads. According to the installation requirements of IEC 61215-2, the corresponding maximum design load should be divided by at least with safety factor 1.5. The design load of the project needs to depend on the project location, climate, support structure, and relevant specifications. The support supplier and professional engineers are responsible for determining the design load, in accordance with local laws and regulations and the instructions of the structural engineer.

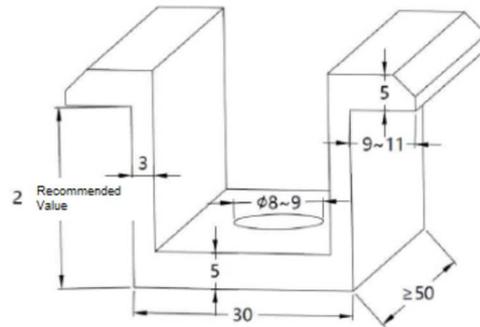
## 5.2 Mechanical installation

The connection between AIKO single glass photovoltaic modules and the support system can be installed by pressing blocks. PV modules must be installed according to the following suggestions and examples. If there are other installation methods, please consult Shenzhen AIKO digital energy in advance and obtain written consent, otherwise the warranty will be invalid.

### 5.2.1 Mounting pressure clamps

Specialized pressure clamps are used to mount modules as shown below.





Pressure clamps should not come into contact with the glass surface of the module and must not deform the frame. Be sure to avoid shadowing effect from the pressure clamp.

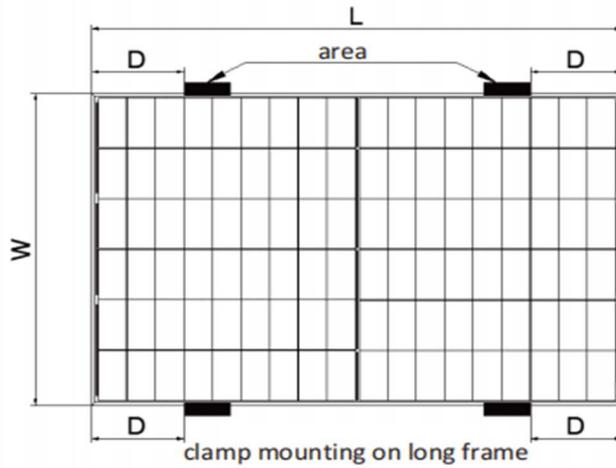
Be sure that pressure clamps will not fail due to deformation or corrosion while the entire module is under load. Pressure clamps  $> 50$  mm in length and  $>3$  mm in thickness are recommended. The overlapped distance between the pressure clamp and the module frame,  $D$ , shall be at least 7 mm but no more than 10 mm.

When choosing clamp-mounting, please be sure to use at least four clamps on each module. Depending on the local wind and snow loads, if excessive pressure load is expected, at least six clamps should be required to ensure the module can bear the load (more details, please contact AIKO technical personal)

The applied value of torque should refer to mechanical design standard and the bolt type customer is using, for example: M8: 16-20 N·m.

## 5.2.2 Clamp mounting diagram and corresponding loads

Single glass modules can be installed by clamps base on rails. Following are the installation diagram and corresponding loads. Here,  $L$  stand for long side of module,  $W$  stand for short side of module, black shadowing area stand for the installation area of the middle of clamp. Distance and length are provided in mm; pressure is provided in Pa.



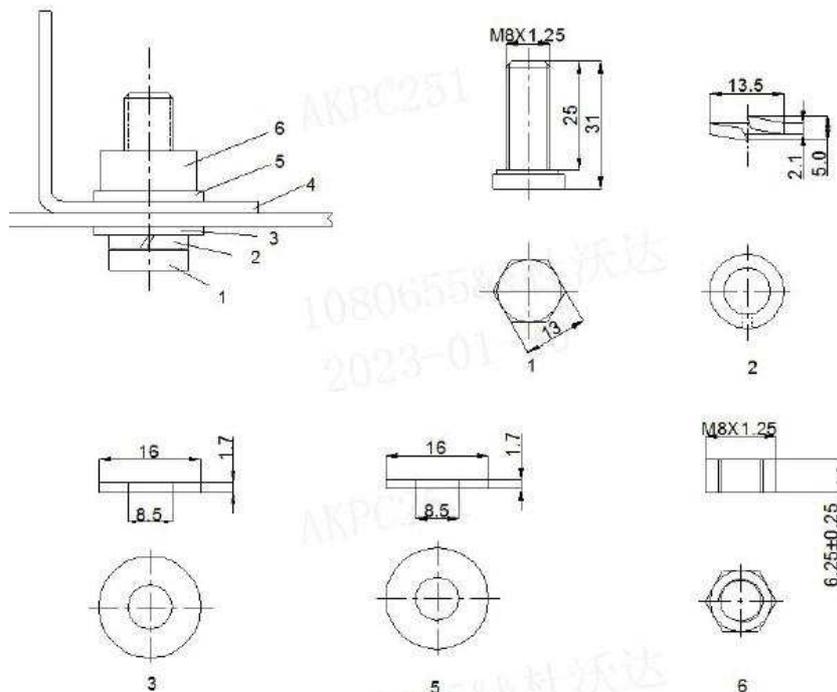
Installation Method	PV module model	PV module size L*W*H(mm)	Load	Installation area D	
				30mm frame	35/40mm frame
Long side clamp installation	AIKO-Gxxx-MCH54Mw	1802*1134*30/35/40	+5400/-2400	305≤D≤405	360≤D≤460
	AIKO-Axxx-MAH54Mb AIKO-Axxx-MAH54Mw	1757*1134*30/35/40	+5400/-2400	305≤D≤405	360≤D≤460
	AIKO-Axxx-MAH54Mb AIKO-Axxx-MAH54Mw	1722*1134*30/35/40 1706*1134*30/35/40	+5400/-2400	295≤D≤395	350≤D≤450
	AIKO-Bxxx-MAH54Mb AIKO-Bxxx-MAH54Mw AIKO-Pxxx-MAH54Mb AIKO-Pxxx-MAH54Mw	1722*1134*30/35/40 1706*1134*30/35/40	+5400/-2400	295≤D≤395	350≤D≤450
	AIKO-Axxx-MAH60Mb AIKO-Axxx-MAH60Mw	1946*1134*35/40 1907*1134*35/40 1889*1134*35/40	+5400/-2400	/	355≤D≤455
	AIKO-Bxxx-MAH60Mb AIKO-Bxxx-MAH60Mw AIKO-Pxxx-MAH60Mb AIKO-Pxxx-MAH60Mw	1907*1134*35/40 1889*1134*35/40	+5400/-2400	/	355≤D≤455
	AIKO-Gxxx-MCH72Mw	2382*1134*35/40	+5400/-2400	/	450≤D≤500
	AIKO-Axxx-MAH72Mb AIKO-Axxx-MAH72Mw	2323*1134*35/40	+5400/-2400	/	450≤D≤500

	AIKO-Axxx-MAH72Mb	2278×1134×35/40	+5400/-2400	/	400≤D≤500
	AIKO-Axxx-MAH72Mw	2255×1134×35/40			
	AIKO-Bxxx-MAH72Mb	2278×1134×35/40	+5400/-2400	/	400≤D≤500
	AIKO-Bxxx-MAH72Mw	2255×1134×35/40			
	AIKO-Pxxx-MAH72Mb	2278×1134×35/40			
	AIKO-Pxxx-MAH72Mw	2255×1134×35/40			

Note: The installation method shown in the above table is based on the test results.

### 5.2.3 Bolts mounting

Single glass modules can be installed by bolts base on rails. Using bolts to fix the module on the bracket through the mounting holes at the back of module's frame. Modules come standard with 4 or 8 mounting holes, matching M8 bolts, as figure below:

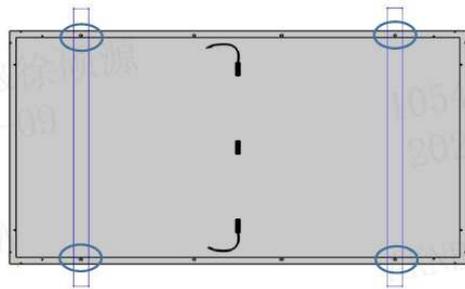


No	Name	Model	Material
1	Bolt	M8*1.25	S35C
2	Spring shim	13.5*2.1	Mn65
3	Gasket	16*1.7	Fe
4	Bracket	5	Q235
5	Gasket	16*1.7	Fe
6	Nut	M8*1.25	S35C

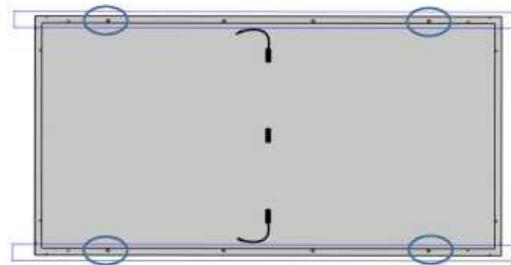
Be sure that the bolts will not fail due to deformation or corrosion while the assembly is under full load. It is recommended that the thickness of the gasket be at least 1.7mm and that the bolts and nuts of the M8 be installed. For the M8 coarse teeth bolts, the fastening torque should be between 16 nm and 20Nm according to the bolt class.

#### 5.2.4 Single glass module bolt installation diagram and corresponding load

Single glass modules bolt mounting diagram and corresponding loads as below diagram, pressure unit is Pa.



The beam is perpendicular to the long frame



The beam is parallel to the long frame

Module type	PV Module size L*W*H(mm)	4 inner mounting holes	4 outer mounting holes
AIKO-Gxxx-MCH54Mw	1802×1134×30/35/40	+5400/-2400	External 4-hole bolt installation
AIKO-Axxx-MAH54Mw	1757×1134×30/35/40		
AIKO-Axxx-MAH54Mb	1722×1134×30/35/40 1706×1134×30/35/40		
AIKO-Axxx-MAH60Mw	1946×1134×35/40	+5400/-2400	External 4-hole bolt installation
AIKO-Axxx-MAH60Mb	1907×1134×35/40		

	1889 × 1134 × 35/40		
AIKO-Gxxx-MCH72Mw	2382 × 1134 × 35/40	+5400/-2400	External 4-hole bolt installation
AIKO-Axxx-MAH72Mw	2323 × 1134 × 35/40		
AIKO-Axxx-MAH72Mb	2278 × 1134 × 35/40 2255 × 1134 × 35/40		
AIKO-Bxxx-MAH54Mb	1722 × 1134 × 30/35/40 1706 × 1134 × 30/35/40	+5400/-2400	External 4-hole bolt installation
AIKO-Bxxx-MAH54Mw			
AIKO-Pxxx-MAH54Mb			
AIKO-Pxxx-MAH54Mw			
AIKO-Bxxx-MAH60Mb	1907 × 1134 × 35/40 1889 × 1134 × 35/40	+5400/-2400	External 4-hole bolt installation
AIKO-Bxxx-MAH60Mw			
AIKO-Pxxx-MAH60Mb			
AIKO-Pxxx-MAH60Mw			
AIKO-Bxxx-MAH72Mb	2278 × 1134 × 35/40 2255 × 1134 × 35/40	+5400/-2400	External 4-hole bolt installation
AIKO-Bxxx-MAH72Mw			
AIKO-Pxxx-MAH72Mb			
AIKO-Pxxx-MAH72Mw			

Note: The installation method shown in the above table is based on the test results.

## 6、Electrical installation

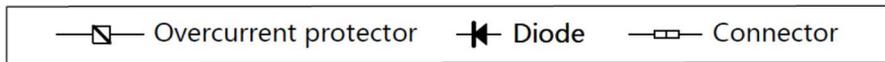
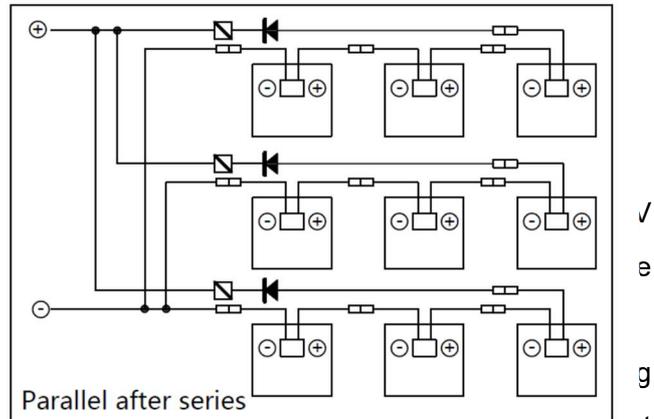
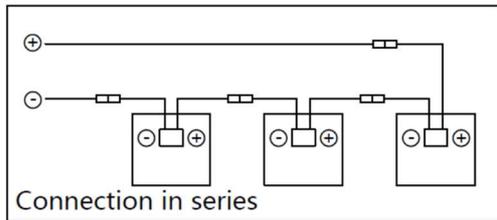
### 6.1 Electrical performance

Please see the PV module product specifications for the electrical performance parameters of PV modules of AIKO digital energy. There is  $\pm 3\%$  tolerance between the nominal values of the electrical performance parameters of photovoltaic modules such as  $I_{sc}$ ,  $V_{oc}$  and  $P_{max}$  at the standard test conditions. Standard test conditions (STC) for photovoltaic modules: irradiance 1000w/m<sup>2</sup>, cell temperature 25 °C, air quality AM1.5. The maximum system voltage of AIKO digital energy photovoltaic modules is 1500V

When the PV modules are connected in a series, the final voltage is the sum of the single PV modules.

When the PV modules are connected in parallel, the final current is the sum of the single PV modules, as shown in the figure below. Photovoltaic modules of different electrical performance

models cannot be connected in a string.



The voltage of the string shall not be higher than the maximum voltage that the system can withstand and the maximum input voltage of the inverter and other electrical equipment installed in the system. To ensure this, the open circuit voltage of the array needs to be calculated at the lowest expected ambient temperature at that location. The following formula can be used for calculation

$$\text{Maximum system voltage} \geq N \times V_{oc} \times [1 + \beta * (T_{min} - 25)]$$

Of which:

N—Number of PV modules in series.

V<sub>oc</sub>—Indicates the open circuit voltage of each PV module (refer to the product label or data sheet).

TC<sub>voc</sub>—Temperature coefficient indicating open circuit voltage of PV module (see data sheet).

T<sub>min</sub>—Indicates the minimum ambient temperature.

## 6.2 Cables and wiring

The protection grade of junction box of PV module is IP68, which is composed of connected cable and connector with IP68 protection grade. The PV module has a dedicated PV output cable with a positive pole and a negative pole connected to the inside of the junction box, and the other end is connected with a plug and play connector. The two PV modules can be connected in series by connecting the positive connector of the

PV module with the negative connector of the adjacent PV module.

According to the electrical design and construction specifications, regulations and corresponding regulatory requirements of the installation site, special solar cables and appropriate connector models shall be used to ensure good electrical and mechanical properties of the cables.

The solar PV module of AIKO adopts special PV cables with a cross-sectional area of 4mm<sup>2</sup> or more and UV protection. All other cables used to connect the DC system shall have similar (or higher) specifications. AIKO recommends that all cables should be laid in appropriate pipelines or trunking and away from places prone to ponding.

For field wiring, PV special copper core cable with a minimum temperature resistance of 90 ° C, light resistance and a cross section of not less than 4mm<sup>2</sup> shall be used as the PV connecting wire.

### **6.3 Connector**

Please ensure that the connector is dry and clean. Confirm that the connector nut is tightened before wiring.

Do not connect when the connector is wet or in other abnormal conditions. The premise that the connector meets the IP68 protection grade is that the positive and negative poles are fully inserted, so the PV modules need to be connected as soon as possible after installation, or appropriate measures should be taken to avoid water vapor and dust infiltration inside the connector.

Avoid direct sunlight and immersion in water. Avoid direct contact between the connector and the ground or roof.

Please ensure that all electrical connections are secure. Incorrect connections may cause arc and electric shock risks.

It is forbidden to plug connectors of different models into each other.

## **7、 Grounding**

In the design of PV modules, anodized corrosion-resistant aluminum alloy frame is used as a rigid support. In order to use safely and avoid lightning and electrostatic damage to PV modules, the PV module frame must be grounded. When grounding, the grounding device must be in full contact with the interior of the aluminum alloy to penetrate the oxide film on the frame surface.

The grounding hardware includes: grounding screw, flat washer, puncture gasket and grounding wire.

Except for the grounding wire, other related hardware shall be made of stainless steel. The grounding conductor or grounding wire adopts copper core wire, and the grounding conductor must be connected to the earth through a suitable grounding electrode. The third-party grounding device that meets the requirements of the installation ground electrical equipment specification can be used for the grounding of AIKO digital energy photovoltaic modules. The grounding device shall be installed and operated in accordance with the operation manual specified by the manufacturer.

The following are the recommended grounding methods:

On side C of PV module frame, there are  $\Phi$  4.2mm grounding hole, use separate grounding wire and relevant accessories to connect the aluminum alloy frame of the solar photovoltaic module and connect the grounding wire to the earth. It is recommended to use m4x12mm grounding bolt and M4 nut, star washer and flat washer.

The recommended torque value of grounding bolt is  $3\sim 7n \cdot m$ , and the grounding wire adopts 4mm<sup>2</sup> copper core wire.

Unused PV module mounting holes on the frame can also be used for grounding.

## **8、 PV module maintenance**

The PV modules must be regularly inspected and maintained, especially within the warranty period, which is the responsibility of the user. And notify AIKO' customer service personnel as soon as possible in case of any damage or other significant abnormalities of PV modules.

### **8.1 Clean**

The power output of photovoltaic modules is related to the incident light intensity. Dust accumulation or other obstructions will reduce the power output of photovoltaic modules. The dirt on the PV module shall be cleaned in time.

As for cleaning frequency, it depends on the accumulation rate of dirt. If the PV module has enough inclination angle, the rainwater will clean the surface of the PV module, which can reduce the cleaning frequency.

It is recommended to use a sponge moistened with clean water to wipe the glass surface of photovoltaic modules. It is strictly prohibited to use cleaning agents containing acid or alkali to clean PV modules. It is forbidden to use brush and other tools with rough surface for cleaning.

It is recommended to clean PV modules in the early morning or evening when the light is weak and the temperature of PV modules is relatively low.

## 8.2 Visual inspection

Visually inspect the PV module for appearance defects, such as:

Whether the photovoltaic module glass is broken;

Whether the photovoltaic module backplane is cracked or otherwise abnormal;

Whether the junction box is damaged and whether the cable is damaged;

Whether the PV module is covered by foreign matters and shadows;

Check whether the bolts fixing PV module and bracket are loose or rusted, and adjust or replace them in time;

Check whether the PV module is well grounded.

## 8.3 Connector and cable inspection

It is recommended to carry out preventive inspection once every six months, such as:

Check the tightness of the connector and the firmness of the cable;

Check the junction box sealant for cracks.

## 9、 Revision version and date

Rev 1.0, issued in May 2022;

Rev 1.1, revised in November 2022;

Rev 1.2, revised in December 2022;

Rev 1.3, revised in February 2023;

Rev 1.4, revised in March 2023;

Rev 1.5, revised in April 2023;

Rev 1.6, revised in July 2023;

Rev 1.7, revised in Sep 2023;

Rev 1.8, revised in Nov 2023.

Appendix: Electrical performance parameters of modules

Type of module	Maximum power (Pmax) [W]	Open-circuit voltage (Voc) [V]	Operating voltage at the maximum power (Vmp) [V]	Short-circuit current (Isc) [A]	Operating current at the maximum power (Imp) [A]	Fuse current (A)	Maximum system voltage (Vsys) [V]
AIKO-Axxx-MAH72Mw	550	52.10	44.21	13.51	12.44	25	1500
	555	52.20	44.31	13.52	12.53	25	1500
	560	52.30	44.41	13.53	12.61	25	1500
	565	52.50	44.51	13.54	12.69	25	1500
	570	52.80	44.61	13.55	12.78	25	1500
	575	52.90	44.71	13.61	12.86	25	1500
	580	53.00	44.81	13.67	12.94	25	1500
	585	53.10	44.91	13.73	13.03	25	1500
	590	53.79	44.48	14.03	13.27	25	1500
	595	53.89	44.58	14.11	13.35	25	1500
	600	53.99	44.68	14.20	13.44	25	1500
	605	54.09	44.78	14.28	13.52	25	1500
	610	54.19	44.88	14.36	13.60	25	1500
	615	54.29	44.98	14.44	13.68	25	1500
	620	54.39	45.08	14.52	13.76	25	1500
625	54.49	45.18	14.60	13.84	25	1500	
AIKO-Axxx-MAH72Mb	550	52.30	44.41	13.31	12.38	25	1500
	555	52.50	44.51	13.32	12.47	25	1500
	560	52.80	44.61	13.33	12.55	25	1500
	565	52.90	44.71	13.36	12.64	25	1500
	570	53.00	44.81	13.42	12.72	25	1500
	575	53.10	44.91	13.48	12.80	25	1500
	580	53.79	44.48	13.82	13.04	25	1500
	585	53.89	44.58	13.90	13.13	25	1500
	590	53.99	44.68	13.98	13.21	25	1500
	595	54.09	44.78	14.06	13.29	25	1500
	600	54.19	44.88	14.14	13.37	25	1500
	605	54.29	44.98	14.22	13.46	25	1500
	610	54.39	45.08	14.30	13.54	25	1500
615	54.49	45.18	14.38	13.62	25	1500	
AIKO-Bxxx-MAH72Mw	540	51.30	43.50	13.36	12.41	25	1500
	545	51.40	43.60	13.37	12.50	25	1500

	550	51.50	43.70	13.38	12.59	25	1500
	555	51.90	43.80	13.40	12.67	25	1500
	560	52.00	43.90	13.46	12.76	25	1500
	565	52.10	44.00	13.53	12.84	25	1500
	570	52.20	44.10	13.59	12.93	25	1500
	575	52.30	44.20	13.65	13.01	25	1500
	580	52.40	44.30	13.72	13.09	25	1500
AIKO-Bxxx-MAH72Mb	540	52.23	43.70	13.31	12.36	25	1500
	545	52.24	43.80	13.32	12.44	25	1500
	550	52.25	43.90	13.33	12.53	25	1500
	555	52.26	44.00	13.34	12.61	25	1500
	560	52.27	44.10	13.35	12.70	25	1500
	565	52.30	44.20	13.40	12.78	25	1500
	570	52.40	44.30	13.46	12.87	25	1500
	575	52.50	44.40	13.53	12.95	25	1500
AIKO-Pxxx-MAH72Mw/ AIKO-Pxxx-MAH72Mb	525	48.95	41.00	13.69	12.84	25	1500
	530	49.15	41.20	13.75	12.90	25	1500
	535	49.35	41.40	13.81	12.96	25	1500
	540	49.55	41.60	13.87	13.02	25	1500
	545	49.75	41.80	13.93	13.08	25	1500
	550	49.90	41.96	14.00	13.14	25	1500
	555	50.10	42.16	14.06	13.20	25	1500
	560	50.30	42.36	14.12	13.26	25	1500
AIKO-Gxxx-MCH72Mw	615	53.70	44.40	14.70	13.86	25	1500
	620	53.80	44.50	14.76	13.94	25	1500
	625	53.90	44.60	14.82	14.02	25	1500
	630	54.00	44.70	14.88	14.10	25	1500
	635	54.10	44.80	14.94	14.18	25	1500
	640	54.20	44.90	15.00	14.26	25	1500
	645	54.30	45.00	15.06	14.34	25	1500
	650	54.40	45.10	15.12	14.42	25	1500
	655	54.50	45.20	15.18	14.50	25	1500
	660	54.60	45.30	15.24	14.57	25	1500
AIKO-Axxx-MAH60Mw	460	43.70	36.87	13.43	12.47	25	1500
	465	43.80	36.97	13.49	12.58	25	1500
	470	43.90	37.07	13.55	12.68	25	1500
	475	44.00	37.17	13.61	12.78	25	1500
	480	44.10	37.27	13.67	12.88	25	1500

	485	44.20	37.37	13.73	12.98	25	1500
	490	44.79	37.03	14.04	13.24	25	1500
	495	44.89	37.13	14.13	13.34	25	1500
	500	44.99	37.23	14.22	13.44	25	1500
	505	45.09	37.33	14.31	13.54	25	1500
	510	45.19	37.43	14.40	13.63	25	1500
	515	45.29	37.53	14.49	13.73	25	1500
	520	45.39	37.63	14.58	13.83	25	1500
AIKO-Axxx-MAH60Mb	460	43.80	36.97	13.33	12.44	25	1500
	465	43.90	37.07	13.39	12.54	25	1500
	470	44.00	37.17	13.45	12.64	25	1500
	475	44.10	37.27	13.51	12.74	25	1500
	480	44.79	37.03	13.74	12.97	25	1500
	485	44.89	37.13	13.84	13.07	25	1500
	490	44.99	37.23	13.94	13.17	25	1500
	495	45.09	37.33	14.04	13.27	25	1500
	500	45.19	37.43	14.13	13.37	25	1500
	505	45.29	37.53	14.22	13.46	25	1500
	510	45.39	37.63	14.31	13.56	25	1500
AIKO-Bxxx-MAH60Mw	450	42.98	36.23	13.30	12.42	25	1500
	455	43.08	36.33	13.36	12.52	25	1500
	460	43.18	36.43	13.42	12.63	25	1500
	465	43.28	36.53	13.49	12.73	25	1500
	470	43.38	36.63	13.55	12.83	25	1500
	475	43.48	36.73	13.61	12.93	25	1500
	480	43.58	36.83	13.68	13.02	25	1500
AIKO-Bxxx-MAH60Mb	450	43.08	36.33	13.20	12.39	25	1500
	455	43.18	36.43	13.27	12.49	25	1500
	460	43.28	36.53	13.33	12.59	25	1500
	465	43.38	36.63	13.39	12.69	25	1500
	470	43.48	36.73	13.45	12.80	25	1500
	475	43.58	36.83	13.52	12.90	25	1500
	480	43.68	36.93	13.58	13.00	25	1500
AIKO-Pxxx-MAH60Mw/ AIKO-Pxxx-MAH60Mb	440	40.55	34.40	13.63	12.87	25	1500
	445	40.75	34.60	13.69	12.93	25	1500
	450	40.95	34.80	13.75	12.99	25	1500
	455	41.15	35.00	13.81	13.05	25	1500
	460	41.35	35.20	13.87	13.11	25	1500
	465	41.55	35.40	13.93	13.17	25	1500

AIKO-Axxx-MAH54Mw	415	39.45	33.21	13.49	12.50	25	1500
	420	39.55	33.31	13.55	12.61	25	1500
	425	39.65	33.41	13.61	12.72	25	1500
	430	39.75	33.51	13.67	12.83	25	1500
	435	39.85	33.61	13.73	12.94	25	1500
	440	40.29	33.30	14.01	13.22	25	1500
	445	40.39	33.40	14.11	13.33	25	1500
	450	40.49	33.50	14.21	13.44	25	1500
	455	40.59	33.60	14.31	13.55	25	1500
	460	40.69	33.70	14.41	13.66	25	1500
AIKO-Axxx-MAH54Mb	415	39.60	33.36	13.30	12.44	25	1500
	420	39.70	33.46	13.36	12.55	25	1500
	425	39.80	33.56	13.42	12.67	25	1500
	430	40.29	33.30	13.69	12.92	25	1500
	435	40.39	33.40	13.8	13.03	25	1500
	440	40.49	33.50	13.91	13.14	25	1500
	445	40.59	33.60	14.02	13.25	25	1500
	450	40.69	33.70	14.12	13.36	25	1500
	455	40.79	33.80	14.22	13.47	25	1500
	460	40.89	33.90	14.32	13.57	25	1500
AIKO-Bxxx-MAH54Mw	405	38.83	32.65	13.34	12.41	25	1500
	410	38.93	32.75	13.40	12.52	25	1500
	415	39.03	32.85	13.46	12.63	25	1500
	420	39.13	32.95	13.53	12.75	25	1500
	425	39.23	33.05	13.59	12.86	25	1500
	430	39.33	33.15	13.65	12.98	25	1500
	435	39.43	33.25	13.72	13.08	25	1500
AIKO-Bxxx-MAH54Mb	405	38.93	32.75	13.23	12.37	25	1500
	410	39.03	32.85	13.29	12.48	25	1500
	415	39.13	32.95	13.35	12.60	25	1500
	420	39.23	33.05	13.41	12.71	25	1500
	425	39.33	33.15	13.48	12.82	25	1500
	430	39.43	33.25	13.54	12.93	25	1500
	435	39.53	33.35	13.60	13.04	25	1500
AIKO-Pxxx-MAH54Mw/ AIKO-Pxxx-MAH54Mb	395	36.50	30.90	13.62	12.88	25	1500
	400	36.70	31.10	13.68	12.94	25	1500
	405	36.90	31.30	13.74	13.00	25	1500
	410	37.10	31.50	13.80	13.06	25	1500

	415	37.30	31.70	13.86	13.12	25	1500
	420	37.50	31.90	13.92	13.18	25	1500
AIKO-Gxxx-MCH54Mw	465	40.27	33.38	14.80	13.94	25	1500
	470	40.37	33.48	14.86	14.05	25	1500
	475	40.51	33.58	14.93	14.15	25	1500
	480	40.65	33.68	15.00	14.26	25	1500
	485	40.79	33.78	15.07	14.37	25	1500
	490	40.93	33.88	15.14	14.47	25	1500
	495	41.07	33.98	15.21	14.58	25	1500