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浙江正泰新能源开发有限公司企业标准

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# 太阳能组件安装手册

## Installation Instructions for Solar Module

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## Installation Instructions for Solar Module



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## **1. Introduction**

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## 1. Introduction

### 1.1 Purpose

This document provides detailed instructions and valuable safety information regarding the installation, electrical connection, and maintenance of following Chint Solar Crystalline Photovoltaic modules. These modules are complied with IEC 61215 and IEC 61730:

- ① CHSM6610P/HV, CHSM6612P/HV;
- ② CHSM6610M/HV, CHSM6612M/HV;
- ③ CHSM6610P, CHSM6612P, ASM6610P, ASM6612P; CHSM6612P (BL), CHSM6610P (BL);
- ④ CHSM6610M, CHSM6612M, ASM6610M, ASM6612M, CHSM6612M (BL); CHSM6610M (BL)
- ⑤ CHSM72P-HC, CHSM60P-HC, CHSM72M-HC, CHSM60M-HC, CHSM72M(BL)-HC, CHSM60M(BL)-HC, CHSM72P/LV-HC, CHSM60P/LV -HC, CHSM72M/LV -HC, CHSM60M/LV -HC

All the instructions should be read and understood before installation. The installers should be trained and conform to all safety precautions in this guide when installing the module. Keep this guide in a safe place for further reference.

### 1.2 Limitation of Liability

Because the use of this manual and the conditions or methods of installation, operation, use and maintenance of photovoltaic (PV) products are beyond Chint Solar's control, Chint Solar does not afford the 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. Chint Solar reserves the right to change the manual without prior notice.

### 1.3 Precautions of Installation

#### 1.3.1 Module's unpack and transfer

- a) When the whole pallet of modules are delivered to the site and unloaded, make sure the safety of the module especially if it needs to be lifted in the roof projects. Put it

into the protect device and then lift it to the roof in case of bumping against the wall during the lifting process.

- b) Firstly, tear the stretch film, then move away the top cover after cutting off each module packing strip while unpacking. Two operators work as a group, grasp the module frame tightly in the same direction and take out the module one by one. It is a must that the operators rive the adhesive tape of the fixed module one by one, rive one piece and then take out one piece of module. We don't allow to rive all the adhesive tape one time in case that the whole pack topples and falls down. The whole process must be taken very gently. Don't collide with any hard object or let any parts of the frame touch and drag on the ground.
- c) After unpacking the modules should be installed that day as far as possible. It's recommended to take the right amount of modules according to the progress of the project every day. Due to the modules piling on the ground after unpacking, in case of heavy rain and other inclement weather which has the potential risk to be a long soak in water can affect product reliability, such as typhoons and other modules in case of inclement weather is not installed which may be torn away. If the users need to store modules before installation, do not open the package, the goods should be stored in a room temperature, dark, dry and ventilated place.

### **1.3.2 Module's Stack**

- a) When a module is taken out of the box, cardboard bedding below should be applied, in order to avoid contacting cement surface / ground hard metal or steel tile shocked collision friction scratch.
- b) When stacking modules, it needs to be stacked neatly in the horizontal plane, under the condition of the glass facing down and the back way piled up, while the cardboard bedding need to be underside the modules. If the modules will be installed on the rooftop, the number of each stack is suggested no more than 20. In case of the poor load-bearing capacity, it's recommended that each stack number is no more than 10. During the whole process, the installation tools and other objects are avoided to be on the module surface.
- c) If the modules are requested to be classified by current, the handling personnel are required to carry out of the level of the current and make a mark separately according to the power on the list. (e.g. 265W-L, identifies the modules of the

packaging according to the power on the list, indicating a low current position; 265W-H, compared to high current position). Usually, the same series of modules in the same current position are required in accordance with the system design requirements.

- d) If the modules are color-coded and marked the corresponding logo on the carton due to the customer requirements, when modules are taken out and stacked, they should be labeled to avoid confusion. Usually the same row or the same square have the same color according to the system design requirements.
- e) Due to the complexity and difference of the construction site, these precautions may not cover all items, please refer to the specific construction standards.

## **2. Safety**

### **2.1 General Safety**

2.1.1 Consult and follow local codes and other applicable laws concerning required permitting as well as installation & inspection requirements, rules, and regulations.

2.1.2 PV modules should be installed and maintained by qualified personnel.

2.1.3 Use the same performance modules within a given series.

2.1.4 Follow all safety precautions of all components used in the system.

2.1.5 Do not shade portions of the PV module surface from the sun for a long period of time. The shaded cell may become hot (hot spot phenomenon), which can result in solder joints peeling off.

2.1.6 Do not clean the glass surface with chemicals.

2.1.7 Do not drop the PV module or drop objects onto the PV module.

2.1.8 Do not concentrate sunlight on the modules or panels and do not expose the artificially concentrated sunlight to a module or panel.

2.1.9 Do not attempt to disassemble the modules, and do not remove any attached components from the modules.

2.1.10 Do not scratch or hit at the back sheet, the glass, the terminal box. Do not pull the cables or touch them with bare hands.

2.1.11 Do not drill holes in the frame or scratch the insulating coating of the frame.

2.1.12 Keep the PV module packed in the carton until installation.

2.1.13 Do not use modules near equipment or in places where flammable gases may be

generated.

2.1.14 Do not use modules in an environment with aliphatic, aromatic, phenols, ketones, halogenated substance or mineral oil, which may corrode the junction box by chemical attack.

2.1.15 The modules are qualified for the application class A: Modules rated for use in this application class may be used in systems operating at greater than 50 VDC or 240W, where general contact access is anticipated. Modules qualified for safety through this part of IEC61730 and with this application class are considered to meet the requirements for safety Class II according to IEC 61140.

## **2.2 Installation Safety**

2.2.1 Wear protective head gear, insulating gloves, safety shoes, and insulated tools when installing the modules.

2.2.2 Do not install the modules in rain, snow, or otherwise wet or windy conditions.

2.2.3 Completely cover the PV module surface with an opaque material during PV module installation and wiring to prevent accidental charge buildup.

2.2.4 Plug in connectors tightly when working on wiring.

2.2.5 Due to the risk of electrical shock, do not perform any work if the terminals of PV module are wet.

2.2.6 Do not touch the terminal box and the end of output cables (connectors) with bare hands.

2.2.6.1 Do not unplug the connector under load.

2.2.7 Do not work alone.

2.2.8 Wear a safety belt if working far above the ground.

2.2.9 Do not wear metallic jewelry, which can cause electric shock, while installing or troubleshooting the PV system.

2.2.10 Follow the safety regulations for any and all other system components, including wires, connectors, charging regulators, batteries, inverters, etc.

2.2.11 Do not expose wires to direct sunlight. Use UV-resistant cable.

2.2.12 Do not damage the surrounding PV modules or mounting structure when replacing a PV module.

2.2.13 Do not change any PV module components (diode, junction box, plug connectors, etc.).

2.2.14 Maximum reverse current is 20.25A for module with 6 inch cells. Application of the blocking diode and fuse in the combiner box are recommended for reverse current protection when more than two strings are connected in parallel.

2.2.15 A certain gap is maintained between the PV module and the mounting surface to prevent the mounting surface touching the junction box.

2.2.16 Standing on the solar PV module is forbidden and also prohibit installation tools or other objects hitting surface of the solar PV module.

2.2.17 The solar modules are recommended to be installed over a fireproof and insulating roof covering when installed on a roof.

2.2.18 PV cable connection cannot be too tight, it is recommended that the connector and the backsheet have a certain gap.

2.2.19 Region for sand blown, in order to avoid the sand into the connector, we suggest to short circuit module connectors before installation; If into the grains of sand, may cause internal live parts wear and tear, so there are some electrical safety hidden trouble.

### **3. Mechanical Installation**

#### **3.1 Installation Conditions**

3.1.1 Extreme environment temperature:  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$

3.1.2 Operating temperature:  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$

3.1.3 Sea level elevation: Below 4000 m

3.1.4 Mechanical load on panels:

Design Load/Safety Factors: 4000 Pa/ 1.5(Front)

2400 Pa/ 1.5(Rear)

Please refer to the detailed mounting instructions as Chapter 3.2.

3.1.5 Tilt Angle selection: The installation should be facing north in the southern hemisphere and facing south in the northern hemisphere.

3.1.6 To maintain the modules' Class C fire rating, the fire class of the roof and building materials should be higher than Class C.

3.1.7 To maintain the modules' fire performance type 1(for US market), it could be possible to achieve the Class A system fire rating, with the Class A class racking system.



## 3.2 Installation Methods

### 3.2.1 Inspection roof structure:

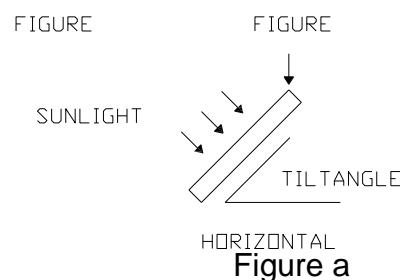
It is important to inspect the structural integrity of the roof and the durability of the roof materials. The mounting structure and solar modules require a strong base for durable and reliable operation in local environments. Always wear a safety harness when working on the roof. Inspect the roof surface in the area of the installation for cracks, water leakage, and roofing material quality and uniformity. PV modules shall be mounted over fire resistant roofs covering rated for the application and on any slope less than 5in/ft (127mm/305mm) to maintain a fire Class rating. A deep depression in the roof may indicate a structural weakness in the support system that may require correction. The roof covering has the Class C against light fire test exposures.

### 3.2.2 Wiring the solar modules:

Never step or sit on the glass surface of the solar modules. The glass may break. When you install the solar modules on the mount, never allow an output cable to become caught between the mount and a module frame. The solar modules generate electricity when exposed to sunlights, take care not to short circuit the output cables. The cables can become overheated and their cable sheaths can melt. Ensure the module connectors are fully inserted. There is a risk of malfunction if they are not pushed in all the way. Support output cables so that there is no slack. High winds can blow slack cable against the mount, damaging the cables. Modules are supplied with or without cables, according to the order placed. Should they be supplied without cables, it is recommended that cables with cross sections between 4 and 10 mm<sup>2</sup> be used. The use of cables formed by flexible Cu conductors, cross linked polyethylene insulated and with a polyvinyl chloride coat or similar, which allow easy handling while providing high performances against overloads and short-circuits is recommended. They must not be flame nor fire propagating and they must be low corrosive gas emitters and acid and alkali resistant.

Determine the wind loads for the installation site. Check with your local building and safety department for the specific requirements. Make certain that the roof structure can support the live and dead loads resulting from the installation of the PV array. Consult with a professional engineer if additional assistance is required. Get latest definitions from local building code. Determine total pressure by compiling basic wind speed, exposure and roof height. Check with technical support if your total pressure exceeds 45 PSF.

For wiring through walls, protect the cables with metal conduits, flexible metal conduits, or other protection. Failure to do so can result in shock and short circuits. Always use conduit to protect sections of array output cables that are exposed to sunlight. For wiring outdoors, protect cables with PVC conduits, metal conduits or flexible conduits. Prevent water from entering or building up in conduit by using water proof fittings or duct seal. To prevent shock, tape and label the cut ends of array output extension cables (the side opposite to the connector side) before connecting to solar module output cables. Further, tape them again after measuring the voltage of each array. To prevent shock when you connect the array output cables to the inverter, remove the tape of one cable at a time when you connect the cables. The installation of project must be facing north in the southern hemisphere, and facing south in the northern hemisphere, the electricity will be comparatively lower when the project facing west or east. The incorrect installation will lead to the loss of power. The modules, which are connected in series, must be in the same angle, otherwise, it will lose power because of the difference in sunlight intensity. Solar modules generate the power to the maximum when they are pointed directly at the sun. For installations where the solar modules are mounted to a permanent structure, the solar modules should be tilted for optimum winter performance. As a rule, if the system power output is adequate in the winter, it will be satisfactory during the rest of the year. The module tilt angle is measured between the solar modules and the ground.



### 3.3 Clamping on the frame surface

#### 3.3.1 Single glass module

Modules can be laid either across the supporting bars (Figure b) or parallel to the

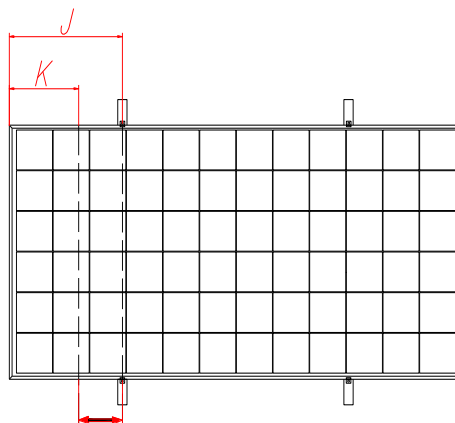


Figure b

## Remark:


- a) The length of supporting bars must be longer than the length of module frame, otherwise please confirm with our product team to get approval.
- b) As for above figure b, the solid red rectangles indicate primary clamp installation positions and the center positions of long frames where clamps can be added for additional support.
- c) Illustrations (figure b) of the four different methods for clamping modules on the frame with aluminum clamps. “” means the aluminum clamp’s permissible clamping range. The recommended installation position shows as below table.

Table 1

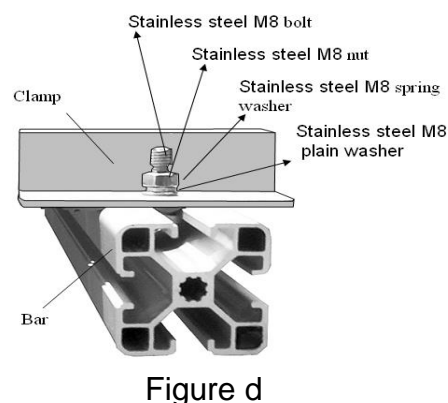
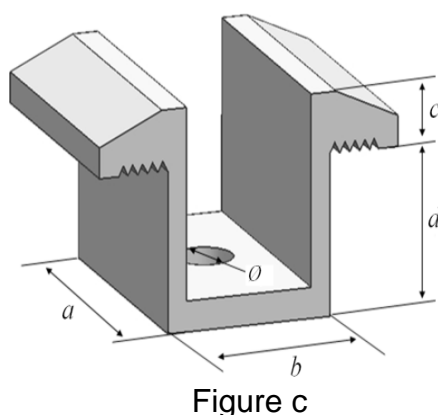
Module Series	Dimension A*B*C	J	K	Note
CHSM6610P/HV CHSM6610M/HV CHSM6610P CHSM6610M ASM6610P ASM6610M	1648*990*40/35   1650*992*40/35	408   408	198   198	
CHSM6610P (BL) CHSM6610M (BL)	1659*1002*40/35	408	198	

CHSM6612P/HV CHSM6612M/HV CHSM6612P CHSM6612M ASM6612P ASM6612M CHSM6612P (BL) CHSM6612M (BL)	1954*990*40	489	299	
	1960*992*40	489	299	
	1981*1002*40	489	299	
CHSM60P-HC CHSM60M-HC CHSM60M(BL)-HC	1666*992*35	408	207	
	1675*992*35	408	207	
	1692*1002*35	408	207	
	1765*1048*35	490	390	
CHSM72M-HC CHSM72P-HC	1986*992*40	505	315	
	2000*992*40	505	315	
	2018*1002*40	505	315	
	2108*1048*40 2108*1048*35	577	477	

To fasten the module:

- Place the module on the two supporting bars (not provided). The bars should be made with stainless material and treated with an anti-corrosion process (e.g., anodic oxidation treatment) or aluminum profile. Each solar PV module needs at least four clamps to fix. Do not make the clamp contact the glass directly or make the aluminum frame deformation in the installation process, and avoid the shadow of solar PV components.
- The bar's top surface contacted with module frame should come with grooves compatible with an M8 bolt.
- If the bars do not come with grooves, holes of a suitable diameter may need to be drilled to allow bolts to be attached to the bars at the same locations as mentioned above.

- d) Secure each clamp by attaching plain washer, spring washer, and nut, in that order.
- e) Both of close-ups of Figure c, indicating the middle clamps and Figure d, indicating the side clamps for reference. Suggest the dimensions for middle clamps are:  $a \geq 40$  mm,  $b \geq 26$  mm,  $c = 8$  mm,  $d \geq 28$  mm, and  $\varnothing = 9$  mm. The torque for tightening the nut and bolts are recommended 28Nm when the property class of bolts and screws is Class 8.8.



## 4. Electrical Installation and Grounding

### 4.1 Installation Condition

4.1.1 The electrical characteristics are within  $\pm 10\%$  of the indicated values of  $I_{sc}$ ,  $V_{oc}$  and  $P_{mpp}$  under the standard test conditions (irradiance of  $1000 \text{ W/m}^2$ , AM1.5 spectrum, cell temperature of  $25^\circ\text{C}$ ).

4.1.2 The maximum system voltage of all the IEC & UL standard module series is 1000V. (The 1500V standard products are also available according to the requirements).

4.1.3 Connect quantity of modules that match the voltage specifications of the inverters used in system. The maximum series/parallel PV module configurations must be calculated according to the requirements of the relevant regulations. The sum of open circuit voltage ( $V_{oc}$ ) at the predictable lowest temperature shall not exceed the maximum system voltage and the values required by other DC components.

4.1.4 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

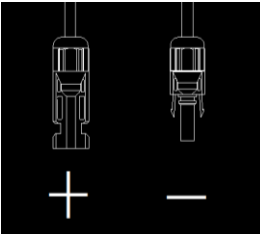
factor of 1.25 when determining component voltage ratings, conductor ampacities, fuse sizes, and size of controls connected to the PV output.

4.1.5 Refer to Section 690-8 of the National Electrical Code for an additional multiplying factor of 125% (80% derating) which may be applicable.

4.1.6 Each module (or series-connected string of modules) shall be provided with the maximum series fuse, specified 15A for the 6 inch cell module series.

4.1.7 Use a special solar cable (e.g., PV1-F 1×4 mm<sup>2</sup>/approved) and plugs for installing the PV system and make sure that all connections are safe and tight. The cable should be 4 mm<sup>2</sup>, temperature rating is -40°C up to +90°C. And it is able to withstand the maximum possible system open-circuit voltage.

Table 2

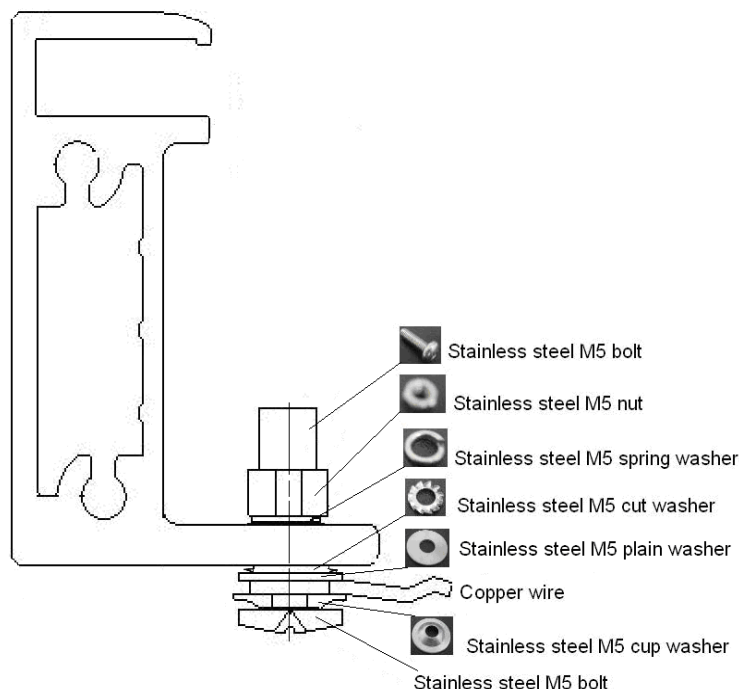
Connector Type	Manufacturer	Standard	Polarity of terminals
MH5	Ningbo Minghe New Energy Technology Co., Ltd	IEC 62852:2014	
PV-KST4-EVO2/XY; PV-KBT4-EVO2/XY	Stäubli Electrical Connectors AG	IEC 62852:2014	
PV-HCB40	Chint Solar (Zhejiang) Co., Ltd.	IEC 62852:2014	
PV-KST4/6II-UR; PV-KBT4/6II-UR	Muti-contact Essen GmbH	IEC 62852:2014	
PV-KST4/xy; PV-KBT4/xy	Muti-contact Essen GmbH	IEC 62852:2014	
PV-KST4-EVO2/XY-UR; PV-KBT4-EVO2/XY-UR	Stäubli Electrical Connectors AG	IEC 62852:2014	
PV-CY03L	Zhejiang Chuang Yuan Photovoltaic Technology Co., Ltd .	IEC 62852:2014	

4.1.8 Bypass diodes are included in module junction boxes to avoid decreased module performance in the event of shade or shelter. Please check the relevant product datasheet for the specific diodes of J-box.

Table 3

Diode Type	If	Vds
GFS2045	20A	45V

## 4.2 Grounding



### (n) Grounding the aluminum frame with copper wire

4.2.1 The grounding requirements must be checked in accordance with the applicable regulations and standards before work is started.

4.2.2 Use the marked 5.5 mm grounding holes to ground the anodized frame. Use one M5 nut, two M5 cut washers, one M5 plain washer, one M5 spring washer, and one M5 bolt and the copper wire. All nuts, bolts, and washers are type M5 and should be made of stainless steel (Fig. (n) ).

4.2.3 Put the bolt through the cup washer and wrap the copper wire around the bolt. (Note that the copper wire cannot be attached directly to the aluminum.)

4.2.4 Put the bolt through the cut washer and then through the hole in the aluminum frame.

4.2.5 Add the spring washer and nut on the other side of the bolt and tighten to secure all parts. The tightening torque should be  $210 \pm 20 \text{ N} \cdot \text{cm}$ .

4.2.6 Approve the use of UL-467 certified bonding and grounding devices, including Burndy (formerly Wiley Electronics) Washer Electrical Equipment Bonding (WEEB) and similar devices, such as barbed washers, that meet the requirements of UL-467 as suitable for electrical bonding and grounding PV modules to PV mounting systems.

## 5. Maintenance

5.1 Regularly carry out a visual inspection for dirt, dust, bird dropping, leaves, and other detritus covering the modules.

5.2 If snow is present, a soft-bristled brush with soft bristles may be used to clean the surface of the modules.

5.3 Regular electrical and mechanical inspection by a licensed professional will keep the system safe and operating at maximum efficiency.

### 5.4 Cleaning

In order to obtain optimal output performance, we recommend cleaning the PV module periodically as stated below:

5.4.1 (a) In Normal Condition: Once a month

(b) Dusty Weather: Clean immediately

5.4.2 Maintenance personnel shall determine based on actual photos and daily weather conditions/records, to determine the cleaning period which also considers the condition of weather and pollution.

### 5.5 Condition of Cleaning

5.5.1 Use clean water or filtered water with soft type material (a sponge) to wipe the PV module. Never use chemicals on the surface of the module.

5.5.2 Cleaning after sunset or before sunrise is recommended for safety of O&M operator shock from heat stroke.

5.5.3 Do not use abrasive powder, abrasive cleaners, scrubber cleaners, polishers, sodium hydroxide, benzene, nitro-thinners, acid or alkali and other chemical substances.

5.5.4 Do not clean broken glass or modules with broken lines or exposed wires, as it may cause the electric shock.

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## Annex1: The electric data

Type Name or Model No. ....	CHSM6612P/HV-xxx (6" poly 72cells)	CHSM6610P/HV-xxx (6" poly 60cells)
Maximum System Voltage [VDC]	1500	1500
Rated Maximum Power [W].....	310, 315, 320, 325, 330, 335, 340, 345, 350, 355, 360, 365, 370, 375, 380, 385, 390	260, 265, 270, 275, 280, 285, 290, 295, 300, 305, 310, 315, 320, 325
Rated Short Circuit Current [A] .....	8.92, 9.04, 9.25, 9.48, 9.52, 9.57, 9.62, 9.67, 9.72, 9.78, 9.79, 9.86, 9.93, 10.00, 10.07, 10.14, 10.20	8.95, 9.18, 9.45, 9.52, 9.59, 9.68, 9.75, 9.83, 9.79, 9.86, 9.81, 9.99, 10.13, 10.22
Rated Open Circuit Voltage [V] .....	45.15, 45.30, 45.45, 45.67, 45.86, 45.98, 46.16, 46.37, 46.57, 46.70, 47.01, 47.26, 47.51, 47.76, 48.01, 48.26, 48.51	37.72, 37.87, 38.00, 38.45, 38.69, 38.94, 39.18, 39.42, 39.51, 39.64, 39.56, 39.82, 40.04, 40.31
Tolerance of Rating Pmax / Isc / Voc [%].....	3 / 5 / 3	3 / 5 / 3
Over-current protection rating[A]:	15/20	15/20
Application Class (IEC 61730).....	Class A	Class A
Classification (IEC 61730) .....	Class II	Class II
Fire rating .....	Class C	Class C
Dimensions (l x w x h) [mm].....	1954x990x40(45/35), 1960x992x40(45/35), 1956 x 991 x 40(45/35), 1979 x1002 x40(45/35) 1981 x1002 x40(45/35)	1648x990x40(35), 1650x992x40(35), 1654x989x40(35), 1650 x 991 x40(35), 1659 x1002 x35(40)
Module area [m²] .....	1.93 / 1.94 / 1.98	1.63 / 1.64 / 1.66
Min- creepage distance [mm] .....	16	16
Number of solar cells	72	60
Cells per bypass diode	24	20
Serial/parallel connection of cells	S	S
Type Name or Model No. ....	CHSM6612P-xxx (6" poly 72cells)	CHSM6610P-xxx (6" poly 60cells)
	ASM6612P-xxx (6" poly 72cells)	ASM6610P-xxx (6" poly 60cells)
	CHSM6612P (BL)-xxx (6" poly 72cells)	CHSM6610P (BL)-xxx (6" poly 60cells)
Maximum System Voltage [VDC]	1000	1000
Rated Maximum Power [W].....	310, 315, 320, 325, 330, 335, 340, 345, 350, 355, 360, 365, 370, 375, 380, 385, 390	260, 265, 270, 275, 280, 285, 290, 295, 300, 305, 310, 315, 320, 325

Rated Short Circuit Current [A] .....	8.92, 9.04, 9.25, 9.48, 9.52, 9.57, 9.62, 9.67, 9.72, 9.78, 9.79, 9.86, 9.93, 10.00, 10.07, 10.14, 10.20	8.95, 9.18, 9.45, 9.52, 9.59, 9.68, 9.75, 9.83, 9.79, 9.86, 9.81, 9.99, 10.13, 10.22
Rated Open Circuit Voltage [V] .....	45.15, 45.30, 45.45, 45.67, 45.86, 45.98, 46.16, 46.37, 46.57, 46.70, 47.01, 47.26, 47.51, 47.76, 48.01, 48.26, 48.51	37.72, 37.87, 38.00, 38.45, 38.69, 38.94, 39.18, 39.42, 39.51, 39.64, 39.56, 39.82, 40.04, 40.31
Tolerance of Rating Pmax / Isc / Voc [%].....	3 / 5 / 3	3 / 5 / 3
Over-current protection rating[A]:	15/20	15/20
Application Class (IEC 61730).....	Class A	Class A
Classification (IEC 61730) .....	Class II	Class II
Fire rating .....	Class C	Class C
Dimensions (l x w x h) [mm].....	1954x990x40(45/35), 1960x992x40(45/35), 1956 x 991 x 40(45/35), 1979 x1002 x40(45/35) 1981 x1002 x40(45/35)	1648x990x40(35), 1650x992x40(35), 1654x989x40(35), 1650 x 991 x40(35), 1659 x1002 x35(40)
Module area [m²] .....	1.93 / 1.94 / 1.98	1.63 / 1.64 / 1.66
Min- creepage distance [mm] .....	16	16
Number of solar cells	72	60
Cells per bypass diode	24	20
Serial/parallel connection of cells	S	S
Type Name or Model No. ....	CHSM6612M/HV-xxx (6" mono 72cells)	CHSM6610M/HV-xxx (6" mono 60cells)
Maximum System Voltage [VDC]	1500	1500
Rated Maximum Power [W].....	330, 335, 340, 345, 350, 355, 360, 365, 370, 375, 380, 385, 390, 395, 400, 405	275, 280, 285, 290, 295, 300, 305, 310, 315, 320, 325, 330, 335
Rated Short Circuit Current [A] .....	9.29, 9.38, 9.41, 9.48, 9.53, 9.60, 9.66, 9.75, 9.91, 9.94, 9.99, 10.04, 10.09, 10.14, 10.19, 10.24	9.38, 9.41, 9.46, 9.54, 9.59, 9.68, 9.72, 9.86, 9.98, 10.05, 10.12, 10.22, 10.30
Rated Open Circuit Voltage [V] .....	45.89, 45.98, 46.38, 46.70, 47.01, 47.31, 47.62, 47.82, 48.36, 48.45, 48.61, 48.78, 48.94, 49.10, 49.26, 49.43	38.36, 38.83, 39.15, 39.45, 39.81, 39.90, 40.05, 40.18, 40.33, 40.48, 40.63, 40.78, 40.93
Tolerance of Rating Pmax / Isc / Voc [%].....	3 / 5 / 3	3 / 5 / 3
Over-current protection rating[A]:	15/20	15/20
Classification (IEC 61730) .....	Class II	Class II
Fire rating .....	Class C	Class C
Dimensions (l x w x h) [mm].....	1954x990x40(45/35),	1648x990x40(35),

	1960x992x40(45/35), 1956x991x40(45/35), 1979x1002x40(45/35), 1981x1002x40(45/35)	1650x992x40(35), 1654x989x40(35), 1650 x 991 x40(35), 1659 x1002 x35(40)
Module area [m <sup>2</sup> ] .....	1.93 / 1.94 / 1.98	1.63 / 1.64 / 1.66
Min- creepage distance [mm] .....	16	16
Number of solar cells	72	60
Cells per bypass diode	24	20
Serial/parallel connection of cells	S	S
Type Name or Model No. ....	CHSM6612M -xxx (6" mono 72cells)	CHSM6610M -xxx (6" mono 60cells)
	ASM6612M -xxx (6" mono 72cells)	ASM6610M -xxx (6" mono 60cells)
	CHSM6612M (BL)-xxx (6" mono 72cells)	CHSM6610M (BL)-xxx (6" mono 60cells)
Maximum System Voltage [VDC]	1000	1000
Rated Maximum Power [W] .....	330, 335, 340, 345, 350, 355, 360, 365, 370, 375, 380, 385, 390, 395, 400, 405	275, 280, 285, 290, 295, 300, 305, 310, 315, 320, 325, 330, 335
Rated Short Circuit Current [A] .....	9.29, 9.38, 9.41, 9.48, 9.53, 9.60, 9.66, 9.75, 9.91, 9.94, 9.99, 10.04, 10.09, 10.14, 10.19, 10.24	9.38, 9.41, 9.46, 9.54, 9.59, 9.68, 9.72, 9.80, 9.89, 10.05, 10.12, 10.22, 10.30
Rated Open Circuit Voltage [V] .....	45.89, 45.98, 46.38, 46.70, 47.01, 47.31, 47.62, 47.82, 48.36, 48.45, 48.61, 48.78, 48.94, 49.10, 49.26, 49.43	38.36, 38.83, 39.15, 39.45, 39.81, 39.90, 40.05, 40.20, 40.33, 40.48, 40.63, 40.78, 40.93
Tolerance of Rating Pmax / Isc / Voc [%] .....	3 / 5 / 3	3 / 5 / 3
Over-current protection rating[A]:	15/20	15/20
Classification (IEC 61730) .....	Class II	Class II
Fire rating .....	Class C	Class C
Dimensions (l x w x h) [mm] .....	1954x990x40(45/35), 1960x992x40(45/35), 1956x991x40(45/35), 1979x1002x40(45/35), 1981x1002x40(45/35)	1648x990x40(35), 1650x992x40(35), 1654x989x40(35), 1650 x 991 x40(35), 1659 x1002 x35(40)
Module area [m <sup>2</sup> ] .....	1.93 / 1.94 / 1.98	1.63 / 1.64 / 1.66
Min- creepage distance [mm] .....	16	16
Number of solar cells	72	60
Cells per bypass diode	24	20
Serial/parallel connection of cells	S	S

Type Name or Model No.....	CHSM72P-HC-xxx (6" poly 144cells)	CHSM60P-HC-xxx (6" poly 120cells)
	CHSM72P/LV-HC-xxx (6" poly 144cells)	CHSM60P/LV-HC-xxx (6" poly 120cells)
Maximum System Voltage [VDC] .....	1500V for CHSM72P-HC-xxx 1000V for CHSM72P/LV-HC-xxx	1500V for CHSM60P-HC-xxx 1000V for CHSM60P/LV-HC-xxx
Rated Maximum Power [W] .....	315, 320, 325, 330, 335, 340, 345, 350,355,360,365,370,375,380,385,39 0,395,400,405	260, 265, 270, 275, 280, 285, 290, 295,300,305,310,315,320,325,330,33 5
Rated Short Circuit Current [A].....	8.98, 9.08, 9.18, 9.28, 9.37, 9.47, 9.57, 9.65, 9.74,9.76,9.81,9.87,9.93,10.00,10.08, 10.16,10.23,10.28,10.36	8.91, 9.00, 9.09, 9.18, 9.27, 9.34, 9.43, 9.52,10.01,10.05,10.08,10.12,10.17,1 0.21,10.23,10.25
Rated Open Circuit Voltage [V] .....	45.23, 45.53, 45.74, 45.86, 46.04, 46.25, 46.45,47.15,47.36,47.63,47.87,48.15, 48.37,48.55,48.66,48.78,48.87	37.45, 37.69, 37.93, 38.17, 38.41, 38.65, 38.90, 39.14,38.52,38.75,39.01,39.27,39.52, 39.78,40.07,40.37
Tolerance of Rating Pmax / Isc / Voc [%] .....	3 / 5 / 3	3 / 5 / 3
Over-current protection rating[A]:	15/20	15/20
Classification (IEC 61730).....	Class II	Class II
Fire rating .....	Class C	Class C
Dimensions (l x w x h) [mm].....	1986x992x40(45/35), 2000 x 992 x40(45/35), 2018 x1002 x40(45/35)	1666x992x35(40), 1675 x 992 x35(40) 1692 x1002 x35(40)
Module area [m <sup>2</sup> ].....	1.97/1.98/2.02	1.65/1.66/1.70
Min- creepage distance [mm] .....	11	11
Number of solar cells	144	120
Cells per bypass diode	48	40
Serial/parallel connection of cells	SP	SP
Type Name or Model No.....	CHSM72M-HC-xxx (6" poly 144cells)	CHSM60M-HC-xxx (6" poly 120cells)
	CHSM72M/LV-HC-xxx (6" poly 144cells)	CHSM60MLV-HC-xxx (6" poly 120cells)
Maximum System Voltage [VDC] .....	1500V for CHSM72M-HC-xxx 1000V for CHSM72M/LV-HC-xxx	1500V for CHSM60M-HC-xxx 1000V for CHSM60M/LV-HC-xxx
Rated Maximum Power [W] .....	330, 335, 340, 345, 350, 355, 360, 365, 370, 375, 380,385,390,395,400,405,410,415,42 0,425,430,435,440,445,450,455	275, 280, 285, 290, 295, 300, 305, 310, 315,320,325,330,335,340,345,350,35 5,360,365,370,375,380
Rated Short Circuit Current [A].....	9.30, 9.36, 9.41, 9.46, 9.52, 9.57, 9.64, 9.71, 9.80, 9.88,	9.28, 9.36, 9.43, 9.51, 9.59, 9.64, 9.73, 9.82,

	9.95,10.02,10.10,10.17,10.24,10.31,10.38,10.45,10.95,11.03,11.10,11.16,11.24,11.30,11.37,11.44	9.90,9.98,10.06,10.14,10.22,10.30,10.38,11.08,11.15,11.21,11.29,11.35,11.42,11.49
Rated Open Circuit Voltage [V] .....	45.30, 45.61, 45.91, 46.21, 46.52, 46.83, 47.13, 47.44, 47.64, 47.89, 48.18,48.47,48.70,48.98,49.25,49.53, 49.80,50.06,47.48,47.73,47.99,48.25, 48.50,48.80,49.05,49.35	38.18, 38.50, 38.79, 39.09, 39.39, 39.75, 39.84, 40.11, 40.42,40.72,41.03,41.32,41.61,41.88, 42.16,39.49,39.80,40.14,40.41,40.75, 41.05,41.34
Tolerance of Rating Pmax / Isc / Voc [%] .....	3 / 5 / 3	3 / 5 / 3
Over-current protection rating[A]:	15/20	15/20
Classification (IEC 61730).....	Class II	Class II
Fire rating .....	Class C	Class C
Dimensions (l x w x h) [mm].....	1986x992x40(45/35), 2000 x 992 x40(45/35), 2018 x1002 x40(45/35) 2108 x1046 x40(45/35) 2108 x1048 x40(45/35)	1666x992x35(40), 1675 x 992 x35(40) , 1692 x1002 x35(40) 1768 x1046 x35(40) 1765 x1048 x35(40)
Module area [m <sup>2</sup> ].....	1.97/1.98/2.02/2.20	1.65/1.66/1.70/1.85
Min- creepage distance [mm] .....	11	11
Number of solar cells	144	120
Cells per bypass diode	48	40
Serial/parallel connection of cells	SP	SP
Type Name or Model No.....	CHSM72M(BL)-HC-xxx (6" poly 144 cells)	CHSM60M(BL)-HC-xxx (6" poly 120 cells)
Maximum System Voltage [VDC] .....	1000	1000
Rated Maximum Power [W] .....	330, 335, 340, 345, 350, 355, 360, 365, 370, 375, 380, 385, 390, 395, 400,405,410,415,420,425,430,435	275, 280, 285, 290, 295, 300, 305, 310, 315, 320, 325,330,335,340,345,350,355,360
Rated Short Circuit Current [A].....	9.30, 9.36, 9.41, 9.46, 9.52, 9.57, 9.64, 9.71, 9.80, 9.88, 9.95, 10.02, 10.10, 10.17,10.24,10.31,10.38, 10.45,10.95,11.03,11.10,11.16	9.28, 9.36, 9.43, 9.51, 9.59, 9.64, 9.73, 9.82, 9.90, 9.98, 10.06,10.14,10.22,10.30,10.38,11.08, 11.15,11.21
Rated Open Circuit Voltage [V] .....	45.30, 45.61, 45.91, 46.21, 46.52, 46.83, 47.13, 47.44, 47.64, 47.89, 48.18, 48.47, 48.70, 48.98, 49.25,49.53, 49.80,50.06,47.48,47.73,47.99,48.25	38.18, 38.50, 38.79, 39.09, 39.39, 39.75, 39.84, 40.11, 40.42, 40.72, 41.03, 41.32,41.61,41.88, 42.16,39.49,39.80,40.14
Tolerance of Rating Pmax / Isc / Voc [%] .....	3 / 5 / 3	3 / 5 / 3
Over-current protection rating[A]:	15	15

Classification (IEC 61730).....	Class II	Class II
Fire rating .....	Class C	Class C
Dimensions (l x w x h) [mm].....	1986x992x40(45 /35), 2000 x 992 x40(45 /35), 2018 x1002 x40(45 /35) 2108 x1046 x40(45 /35) 2108 x1048 x40(45 /35)	1666x992x35(40) 1675 x 992 x35(40) 1692 x1002 x35(40) 1768 x1046 x35(40) 1765 x1048 x35(40)
Module area [m <sup>2</sup> ].....	1.97/1.98/2.02	1.65/1.66/1.70
Min- creepage distance [mm] .....	11	11
Number of solar cells	144	120
Cells per bypass diode	48	40
Serial/parallel connection of cells	SP	SP

Pmp ~ Ima are measured under STC (irradiance = 1000 mW/cm<sup>2</sup>, AM = 1.5, and cell temperature = 25°C)