

## SoliTek Standard Photovoltaic module (PV) Documentation and Installation Manual

### SoliTek Standard Photovoltaic Modules

Please read carefully the following product documentation and safety instructions.

Non-compliance with these instructions may void the module warranty.

#### 1. Purpose of this documentation

This guide contains basic information regarding JSC “SoliTek Cells” standard photovoltaic modules, their installation and safe handling. All instructions should be read and understood before attempting installation. If there are any questions, please contact your dealer or JSC “SoliTek Cells” for further information.

This documentation refers to the PV-modules themselves and is not meant to be a complete installation manual for personnel not specifically trained to PV-modules. It serves as a general but strictly mandatory to the Installer reference. Infringement or inaccurate observance of any clause of this documentation voids the warranty.

Generally, the installer must conform to all safety precautions in this documentation, as well as the applicable national codes and standards when installing PV-modules. Before installing a solar photovoltaic system, the installer should become familiar with the mechanical and electrical requirements for photovoltaic systems. Keep this documentation in a safe place for future reference.

#### 2. System components (modules and mounting system; standard scope of delivery)

- SoliTek Standard photovoltaic modules (type designation Standard xxxW M(P).60 or HC.120, where xxx stands for nominal power values up to 375 Wp), IEC 61215ed. 2 and IEC 61730 certified framed glass/foil laminates with crystalline solar cells, permanently attached junction box, and double insulated 4mm<sup>2</sup> wires

terminated in touch safe specific PV DC-connectors.

- The mounting system does not form part of JSC “SoliTek Cells” supply.

#### 3. General safety relevant aspects

**Do not attempt to disassemble the module, and do not remove any attached nameplates or components. Doing so will void the warranty.**

- The modules are qualified for application class A: Hazardous voltage (IEC 61730: higher than 50V DC; EN 61730: higher than 120V), hazardous power applications (higher than 240W) where general contact access is anticipated.
- Installing solar photovoltaic systems requires specialized skills and knowledge. It should be performed only by qualified and specially instructed personnel. The installer assumes all risk of injury, including risk of electric shock.
- Use only equipment, connectors, wiring and mounting hardware specifically designed for use in a photovoltaic system.
- System has to be designed taking into account that the panels are fire class C rated according to IEC 61730 standard.

#### 3.1. Precautions for mechanical installation

- Standard modules are designed for installation with specific photovoltaic mounting systems. Other use lies within the full responsibility of the installer. If the Installer is not fully aware that other mounting system that is intended to be used will be fully applicable to JSC SoliTek cells modules, the Installer before the installation can contact the Manufacturer for his opinion in written form. Manufacturer represented by director can express his opinion if the intended solution is applicable. However, the full responsibility for usage of mounting systems different in any form than described in

chapter 4 is covered by the Installer and it will void the Warranty. Manufacturer can decide to extend this Warranty for modules used with other mounting systems than described in chapter 4, if the Installer provides:

- Positive calculation and test results from laboratory certified according to IEC 17025 of modules including mounting system mechanical loading according to standard IEC 61215.
- Mechanical loading test protocol according to IEC 61215 from independent laboratory certified according to IEC 17025 of intended to use mounting system with identical to ordered module.

Extension of Warranty for modules used with other mounting systems that described in chapter 4 must be written and signed by the director of JSC SoliTek cells.

Manufacturer reserves a right not to extend Warranty without any major arguments if the Installer will use mounting solution different than described in chapter 4.

- The mounting system must be capable of securely fixing modules exposed to uplift or load pressures of more than module's maximum load.
- The mounting structure and hardware must be made of durable, corrosion- and UV-resistant material.
- Observe all instructions and safety precautions included with the mounting system to be used with the module.
- If modules are installed on roofs (non-integral modules or panels), a fireproof underlay is needed. If modules are installed in roofs, all applicable local, regional and national codes and regulations have to be observed.
- It is strictly forbidden to install SoliTek Standard M(P).60 series modules by mounting them on a short side of frame without having prior written approval of the Manufacturer signed by the director of JSC SoliTek cells. SoliTek Standard HC.120 series modules can be installed by

mounting them on a short side of frame if steps in installation manual are followed strictly.

### **3.2. Precautions for electrical installation**

- Before any manipulation at an installed PV plant, switch it of first on AC-side after on DC-side of the inverter or the charge controller.
- When disconnecting wires connected to a photovoltaic module that is exposed to light, an electric arc may occur. Arcs can cause burns, start fires or otherwise create safety (up to lethal electric shock) problems.
- Check for remaining voltage before starting, and observe the local safety relevant regulations for such working conditions.
- Under normal conditions, a photovoltaic module can produce more current and/or voltage (here: 30V DC) than reported at standard test conditions.
- Accordingly, the values of ISC and VOC marked on this module should be multiplied by a factor of 1,25 when determining component voltage ratings, conductor current ratings, fuse sizes, and size of controls connected to the PV output. In the USA, refer to Section 690-8 of the National Electrical Code (NEC) for an additional multiplying factor of 125 percent (80 percent de-rating) which may be applicable.
- Contact with a DC voltage of 30 V or more is potentially hazardous. Exercise caution when wiring or handling modules exposed to sunlight.
- Only connect modules with the same rated output current in series. If modules are connected in series, the total voltage is equal to the sum of the individual module voltages.
- Only connect modules or series combinations of modules with the same voltage in parallel. If modules are connected in parallel, the total current is equal to the sum of individual module or series combination currents.
- Always use the same type of module within a particular photovoltaic system.

- The maximum voltage of serial interconnection of the modules must be less than the maximum certified module's system voltage. Also the maximum input voltage of the inverter and of the other electrical devices in the system must be taken in to account. The open circuit voltage of the array string needs to be calculated at the lowest expected ambient temperature for the location. The maximal system voltage for module is indicated in the modules datasheet.
- If the sum of short circuit currents of the parallel connected modules passes over the reverse current string diodes or fuses have to be used in each string of modules connected in parallel. These string diodes or fuses have to be qualified for the maximum expected current and voltage. The fuse rating value is also corresponding to the maximum reverse current that a module can withstand. The reverse current value can be found on the product label, in the product datasheet or chapter 9 of installation manual.
- Observe the instructions and safety precautions for all other components used in the system, including wiring and cables, connectors, DC-breakers, inverters, etc.
- Use appropriate safety equipment (insulated tools, dielectric gloves and shoes, etc.) approved for use on electrical installations.

### 3.3. General prescriptions for installation

- Do not apply paint or adhesive to the modules.
- Do not use mirrors or other hardware to artificially concentrate sunlight on the module.
- When installing modules, observe all applicable local, regional and national codes and regulations. Obtain a building and/or electrical permit where required.
- Keep children well away from the system while transporting and installing mechanical and electrical components.
- Do not wear metallic rings, watchbands, ear, nose, or lip rings or other metallic devices while installing or troubleshooting photovoltaic systems.

- Do not drill holes in the glass surface of the module. Doing so will destroy the module and void the warranty.
- Do not drill additional mounting holes in the module frame. Doing so will void the warranty.
- Do not lift the module by grasping the module's junction box or electrical leads.
- Do not apply paint or adhesive to the module.
- **Do not stand or step on module. Danger of breaking the glass or slipping off with possibility of severe injury or death!**
- Do not drop the module or allow objects to fall on the module.
- Do not place any heavy objects on the module.
- Inappropriate transportation and installation may damage the module glass or the solar cells inside the module.
- If module frame is with film, remove it before installation.

## 4. Mechanical Installation

### 4.1. Robustness of modules and mounting system

Standard M(P) 60 modules have been tested to withstand 1600 Pa wind load and 2400 Pa snow load, with safety factor of 1,5 value included. Maximum load values without safety factor – 2400 Pa for wind load and 3600 Pa for snow load.

For long side clamping, Standard HC.120 modules have been tested to withstand 2400 Pa wind load and 3600 Pa s load, with safety factor of 1,5 value included. Maximum load values without safety factor – 3600 Pa for wind load and 5400 Pa for snow load.

For short side clamping, Standard HC.120 modules have been tested to withstand 1066 Pa wind load and 1600 Pa snow load, with safety factor of 1,5 value included. Maximum load values without safety factor – 1600 Pa for wind load and 2400 Pa for snow load.

The whole support structure needs to be strong enough to cope with above loads.

Load calculations to check for the applicability for the actual installation are within the responsibility of the system planner or installer.

Any damage to the modules done due to the load miscalculations of the system planner or installer is not within the scope of warranty.

#### 4.2. Selecting the location

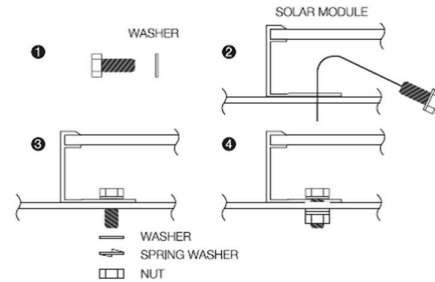
- Select only suitable locations for installation of the modules.
- In most cases, optimum performance is achieved if the modules face true south in northern latitudes and true north in southern latitudes.
- For detailed information on optimal module orientation, refer to standard solar photovoltaic installation guides or a reputable solar installer or systems integrator.
- The module should not be shaded at any time of the day.
- Do not install the module near equipment or in locations where flammable gases can be generated or collected.

Any damage to the modules done due to the wrong pick of the location for installation of the modules is not within the scope of warranty.

#### 4.3. Mounting methods

##### 4.3.1. Mounting with bolts

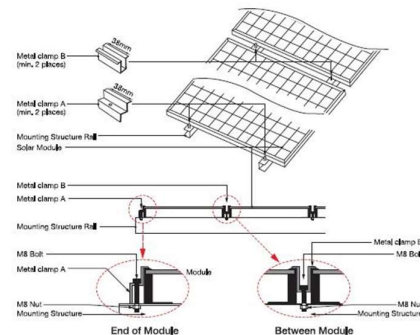
- The module must be attached and supported by four M8 stainless steel bolts through the indicated mounting holes (Figure 1). Torque on the clamp bolt has to be in range of 8-10 Nm.
- If additional mounting points are required depending on the local wind and snow loads then mounting solution with clamping hardware has to be chosen.



**Figure 1.** Mounting using bolts.

##### 4.3.2. Mounting with clamping hardware

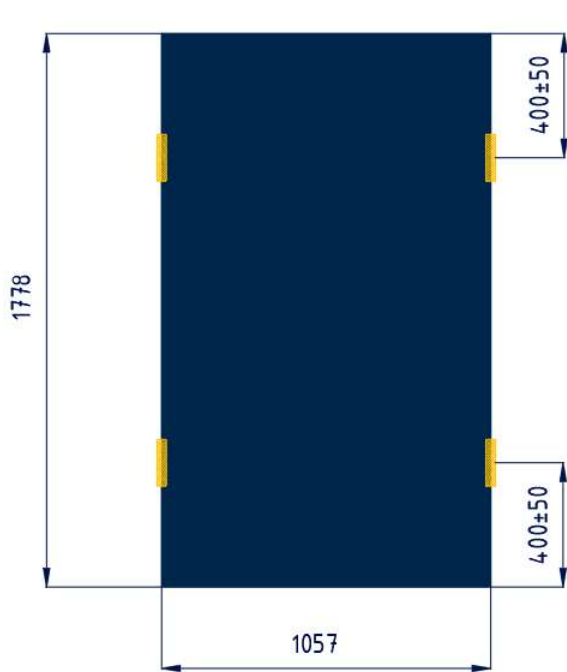
- If module clamps are used to secure the module, the torque on the clamp bolt has to be in range of 8-10 Nm (Figure 2).
- A minimum of four module clamps should be used, two on each long frame side, in the general clamping areas denoted by the wide arrows on the drawing (Figure 3).




**Figure 2.** Mounting using clamps.

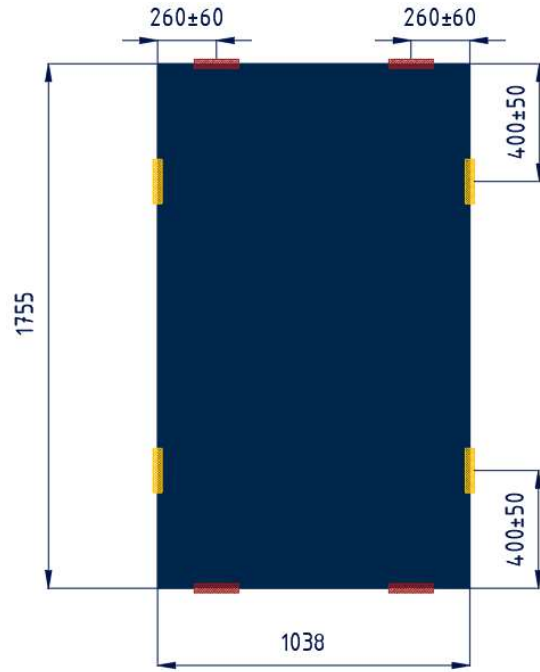
##### 4.3.3. Other



- Other specific photovoltaic mounting methods are acceptable as long as they:
  - Meet minimum requirements as described in chapter 4.1
  - Meet requirements for other mounting systems usage as described in chapter 3.1.1



 Clamping area for clamping on <b>LONG</b> side of PV Panel
Wind 1600 Pa (test 2400 Pa) Snow 2400 Pa (test 3600 Pa)
Dimensions are provided in millimeters

**Figure 3.** Mounting points for Standard M(P).60 modules.



 Clamping area for clamping on <b>LONG</b> side of PV Panel	 Clamping area for clamping on <b>SHORT</b> side of PV Panel
Wind 2400 Pa (test 3600 Pa) Snow 3600 Pa (test 5400 Pa)	Wind 1066 Pa (test 1600 Pa) Snow 1600 Pa (test 2400 Pa)
Dimensions are provided in millimeters	

**Figure 4.** Mounting points for Standard HC.120 modules.

Any responsibility for inspection if additional mounting points and/or module clamps are required due to the local wind and snow loads or due to the particular features of mounting system or its parts lies within the installer.

Any damage to the modules done due to the lack of mounting points and/or module clamps or wrong placement of them is not within the scope of warranty.

## 5. Electrical Installation

### 5.1. Grounding

- All module frames must be properly grounded. Observe all local electric codes and regulations.
- A bolted connection is required, it incorporates:
  - A screw size of M4 or greater;
  - A star washer under the screw head or a serrated screw must penetrate nonconductive coatings like anodized frame;
  - Screw and star washer has to be made of stainless steel;
  - Grounding screw has to go through all the connecting elements and protrude outside by two threads.
- Devices listed and identified for grounding metallic frames of PV modules are permitted to ground the exposed metallic frames of the module to grounded mounting structures.
- Functional grounding is not foreseen for the modules. If it is performed, local electric codes and regulations have to be observed and used grounding means have to be isolated from live parts by reinforced insulation.
- In any case the grounding screws or other parts have to be used separately from mounting parts of the module.
- Grounding resistance of grounding structure shall be reached according to local regulations, Eurocodes or other legal normative references.

### 5.2. General electrical installation

**WARNING!** Electrical shock hazard! Do not touch bare conductors or other potentially energized parts.

- Photovoltaic modules convert light energy to direct-current electrical energy. **They are designed for outdoor use.**
- Do not use modules of different configurations in the same system.
- Modules are supplied with IEC certified cables and connectors for serial electrical connections.
- Use only additional cables which are qualified for the expected maximum current, maximum voltage and environmental conditions.

Minimum cross section 4 mm<sup>2</sup> (#12 AWG) (5,2 mm diameter with insulation layers cable). Conductor have to withstand temperature variations from -40 to +90°C.

- The PV-DC-connectors must never be disconnected under load! Stick to the first rule of chapter **3.2.**
- Refer to the relevant standards in your country to determine over current, conductor ampacity and size requirements.
- For best performance, ensure that positive and negative DC wires run closely together avoiding loops, which will also reduce the strength of inductive impacts of nearby lightning strikes.
- Following the installation of a module string, its performance is checked to ensure proper functioning. At least, ISC and VOC need to be checked with appropriate equipment and circuit breakers.

## 6. Lightning protection

- For safe operation of PV modules proper lightning protection equipment has to be installed.
- Lightning protection has to be achieved by passive Franklin grounding rods installed in a location of solar power plant.
- Please make sure that lightning sphere will not reach PV modules, mounting system, inverters or other parts. Radius of sphere has to be selected according to local regulations, Eurocodes or other legal normative references.
- Lightning protection equipment has to be directly connected to grounding structure. Grounding resistance of grounding structure shall be reached according to local regulations, Eurocodes or other legal normative references.

## 7. Maintenance

JSC "SoliTek Cells" recommends the following maintenance items to ensure optimum performance of the module:

- Clean the glass surface of the modules as necessary. Use water and a soft sponge or cloth for cleaning. A mild, non-abrasive cleaning agent can be used if necessary. Do not use dishwasher detergent.
- Electrical and mechanical connections and the general condition of an installed PV-system should be checked periodically by qualified personnel to verify that they are clean, secure and undamaged.
- Eventually occurring problems must only be investigated by qualified personnel.
- Observe also the maintenance instructions for all other components used in the system.

## 8. Shutting down the system

- Disconnect system from all power sources in accordance with instructions for all other components used in the system.
- The PV-DC-connectors must never be disconnected under load! Use switches designed for being disconnected under the prevailing DC-load or stick to the first rule of chapter 3.2.
- The system should now be out of operation and can be dismantled. In doing so, observe all safety instructions as applicable to installation.

## 9. Typical electrical ratings of the concerned modules:

Parameters	Standard 365W M.60	Standard 370W M.60
Maximum Power at STC ( $P_{MPP}$ )	365 Wp	370 Wp
Maximum power point voltage at STC ( $V_{MPP}$ )	34,65 V	34,86 V
Maximum power point current at STC ( $I_{MPP}$ )	10,55 A	10,62 A
Open Circuit voltage at STC ( $V_{OC}$ )	40,39 V	40,58 V
Short Circuit current at STC ( $I_{SC}$ )	11,16 A	11,21 A
Maximum System Voltage	1'000 V	1'000 V
Fire Class (IEC 61730)	C	C
NMOT, °C	45	45
Maximum reverse current	20 A	20 A
Current temperature coefficient $\alpha$ [%/°C]	0,06	0,06
Voltage temperature coefficient $\beta$ [%/°C]	-0,347	-0,347
Power temperature coefficient $\delta$ [%/°C]	-0,40	-0,40

Parameters	Standard 365W Half-Cut	Standard 375W Half-Cut
Maximum Power at STC ( $P_{MPP}$ )	365 Wp	375 Wp
Maximum power point voltage at STC ( $V_{MPP}$ )	34,00 V	34,20 V
Maximum power point current at STC ( $I_{MPP}$ )	10,74 A	10,96 A
Open Circuit voltage at STC ( $V_{OC}$ )	41,30 V	41,50 V
Short Circuit current at STC ( $I_{SC}$ )	11,30 A	11,53 A
Maximum System Voltage	1'500 V	1'500 V
Fire Class (IEC 61730)	C	C
NMOT, °C	45	45
Maximum reverse current	20 A	20 A
Current temperature coefficient $\alpha$ [%/°C]	0,049	0,049
Voltage temperature coefficient $\beta$ [%/°C]	-0,33	-0,33
Power temperature coefficient $\delta$ [%/°C]	-0,36	-0,36

The electrical characteristics are within  $\pm 5$  % of the indicated values of  $I_{SC}$ ,  $V_{OC}$ , and  $P_{MPP}$  under Standard Test Conditions (irradiance of 1000 W/m<sup>2</sup>, AM 1.5 spectrum, and a cell temperature of 25°C / 77°F).

## 10. Disclaimer of liability

Because the use of this documentation and the conditions or methods of installation, operation, use and maintenance of photovoltaic products are beyond JSC "SoliTek Cells" control, JSC "SoliTek Cells" does not accept responsibility and expressly disclaims liability for loss, damage, or expense arising out of or in any way connected with such installation, operation, use or maintenance. No responsibility is assumed by JSC "SoliTek Cells" for any infringement of patents or other rights of third parties, which may result from use of the PV product. No license is granted by implication or otherwise under any patent or patent rights.

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Please consult your dealer or the manufacturer concerning the warranty of your modules. If you have any further questions, your dealer will gladly assist you.