

Disclaimer

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For additional queries, please contact your local supplier or Solar Frontier directly.

PHOTOVOLTAIC MODULE

Installation Instruction

**SFK160-S SFK165-S SFK170-S SFK175-S
SFK180-S SFK185-S SFK190-S SFK195-S**

This document contains UL required installation instructions.

Electrical Rating

Electrical Data at Standard Test Conditions 25°C, AM1.5, 1000W/m²

		SFK160-S	SFK165-S	SFK170-S	SFK175-S	SFK180-S	SFK185-S	SFK190-S	SFK195-S
Maximum Power (W)	P _{max}	160	165	170	175	180	185	190	195
Tolerance of P _{max}		+10% /-5%							
Open circuit voltage (V)	V _{oc}	116	117	118	119	120	121	122	123
Short circuit current (A)	I _{sc}	2.14	2.15	2.16	2.17	2.18	2.19	2.21	2.25
Voltage at maximum power (V)	V _{mpp}	83.1	85.7	87.8	90.2	92.4	95.0	97.1	99.6
Current at maximum power (A)	I _{mp}	1.93	1.93	1.94	1.94	1.95	1.95	1.96	1.96

Irradiance 1,250W/m², 25°C, AM1.5

Open circuit voltage (V) at -10°C		127.0	128.1	129.2	130.2	131.3	132.4	133.5	134.6
Short circuit current (A) at 75°C		2.65	2.66	2.67	2.69	2.71	2.72	2.75	2.80

*Rated electrical characteristics are within 10% of the measured values at Standard Test Conditions of irradiance per ASTM E 892, of 1000 W/m², cell temperature of 25°C, and AM of 1.5 spectrum. The stated maximum power reflects both the initial measured value at the plant and stabilized performance of the product within the stated tolerance of +10%/ -5%.

System Design

Maximum system voltage	V _{sys}	1,500 V (IEC/UL), 1,000 V (cUL)
Limiting reverse current	I _r	7A
Maximum series fuse rating	I _{sf}	4A

Mechanical Data

Dimensions (L x W x H)	1,257 x 977 x 35 mm	
Weight	18.5 kg (40.8 lbs)	
Module operating temperature	-40°C to 85°C	
Application class on IEC61730	Class A	
Fire safety class on IEC61730	Class C*	
System Fire Class Rating on UL1703	Class A**	
Cable	2.5mm ² / 14AWG (Halogen Free)	

*The fire rating of this module is valid only when mounted in the manner specified in the mechanical mounting instructions.

**To maintain the System Fire Class rating, the mounting system shall be certified for System Class Fire Rating of Class A in combination with a PV module which is defined as Module Fire Performance "Type 1". See product label for Module Fire Performance Type of PV modules

General Safety

- Be sure to conform to all relevant local and national laws, regulations and codes when installing, wiring, operating and maintaining Solar Frontier PV modules. (hereafter referred to as PV modules).
- Installation, wiring, and maintenance of PV modules must only be carried out by licensed and trained persons.
- Artificially concentrated sunlight shall not be directed on the PV module.
- The front surface of PV modules must always be covered with an opaque material during installation to decrease the potential of electric shock.
- Do not disconnect operational PV modules or electrical arcing may occur. This may result in serious bodily harm or death.
- The PV module packaging is not waterproof material. Keep the junction box and the PV module connector away from any liquids when storing and transporting PV modules.
- Wear appropriate protection and take all necessary precaution to prevent electrical shock, especially when DC voltage exceeds 30VDC.
- Only interconnect PV modules with similar electrical characteristic in series or in parallel to prevent system imbalance conditions and module damage.
- Do not install PV module in areas expose to oil vapor, corrosive and flammable gases or fire.
- Avoid accumulation of grit or dust on the PV modules as it may influence the output yield.
- Do not disassemble or modify or stress PV modules.
- Ensure that all instructions and information related to PV modules and other balance of system components are fully understood prior to handling and installing a PV solar system.
- Do not use PV modules for purposes other than terrestrial power generation to prevent electrical shock, fire or other accidents.
- Do not use any light sources other than natural sunlight and general illumination for power generation.
- Only use equipment, connectors, wiring and support frames suitable for PV modules.

Mechanical Installation

- The PV module is considered to be in compliance with UL 1703 only when the PV module is mounted in the manner specified by the mounting instructions below.
- Please refer to further instructions provided by the clamp, bolt, and screw manufacturer.
- Keep clearance of at least 100mm between the PV modules and the roof to allow cool air to circulate around the back of the PV module. This also allows condensation to dissipate.



- The PV modules have been evaluated by UL for a maximum positive or negative design loading of 1600 Pa (33.4 lbs/ft²)
- PV modules can be installed horizontally (landscape) or vertically (portrait).
- When installing, allow for 2 mm or greater spacing between PV modules.

Site Location

- Avoid installing PV modules in locations where they may be permanently covered by shadows. This may adversely affect their performance.

Module Handling Instructions

- Do not alter PV module's original mechanical specifications. This includes, but is not limited to, drilling of additional mounting holes into the aluminum frame. Only existing mounting holes should be used.
- Avoid placing any stress onto the PV modules, cables or connectors. (Minimum bending radius of 39 mm or 1.54in for module cables is recommended).
- Do not stand or step on PV modules. This may result damage to the PV module and/or bodily injury by falling.
- Do not drop PV modules or drop objects onto them. Both sides of the PV module (the glass surface and the back sheet) are fragile.
- Do not strike the terminal box or pull the cables of the PV modules.
- Do not scratch the backsheet, cables, or insulation coating of the frame (with the exception of the grounding connection).
- Do not cover the water drain holes on the frame.

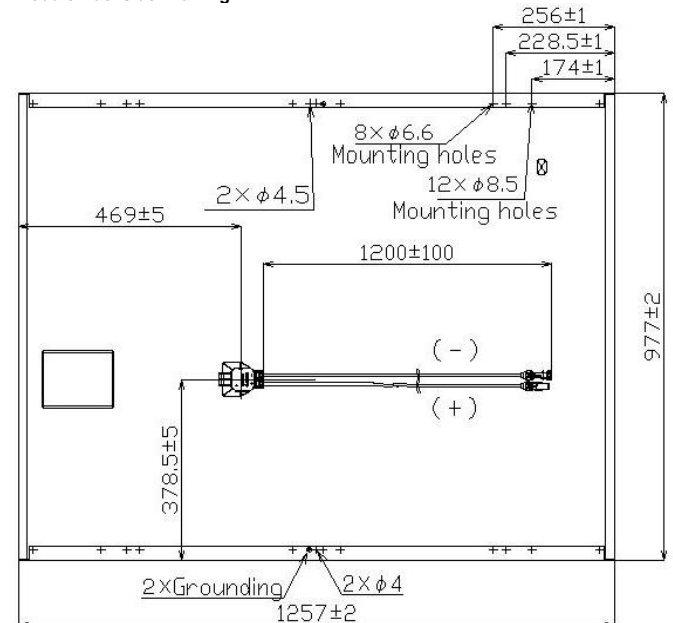
Mechanical Installation Cautions

- Observe all applicable health and safety regulations when installing PV modules.
- A safe distance should be cordoned off around the installation area.
- Fall protection equipment must be used.
- Installation in windy or wet conditions may require additional precaution. Please follow your local safety regulation.
- Keep PV modules out reach of children.
- Ensure that the PV modules are securely fastened to a mounting structure that is durable, and made of corrosion and UV resistant materials. Pay attention to the electrochemical series when selecting mounting structure material to avoid galvanic corrosion. Solar Frontier will not be responsible for damage to the PV modules that is due to the durability of the mounting structure.
- In the case of rooftop installations, PV modules should be installed over a fire-resistant roof covering.

Mounting with Screws

- PV modules should be fastened to the support structure using the mounting holes on the frame. (refer to the "Module Backside Drawing")
 - Mounting with screws - 745mm pitch:
 - 4 mounting holes are provided 256mm±1mm distance from corner of the longer module frame and use M6 (or 1/4 in) bolts with washers, lock washers and nuts to fasten. Recommended tightening torque is 5.2 N-m minimum.
 - Mounting with screws – 800mm pitch:
 - 4 mounting holes are provided 228.5mm±1mm distance from the corner of the longer module frame and use M8 (or 5/16 in) bolts with washers, lock washers and nuts to fasten. Recommended tightening torque is 12.5 N-m minimum.
 - Mounting with screws – 909mm pitch:
 - 4 mounting holes are provided 174mm±1mm distance from the corner of the longer module frame and use M8 (or 5/16 in) bolts with washers, lock washers and nuts to fasten. Recommended tightening torque is 12.5 N-m minimum.

Module Backside Drawing



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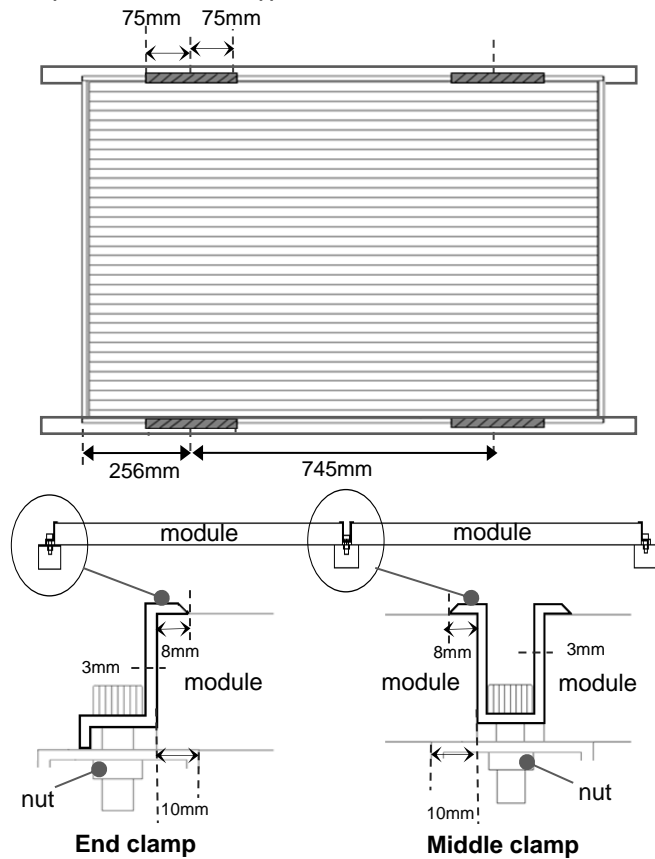
Mounting with Clamps

- a) Mounting with clamps – PV module perpendicular to support rails:
4 clamps shall be secured within 256mm±75mm distance from the corner of the longer module frame.
- b) Mounting with clamps – PV module parallel to support rails:
4 clamps shall be secured within 256mm±75mm distance from the corner of the longer frame. The width of overlap between PV module and rail shall be 10 mm (0.4 in) minimum.

Specification of clamp and bolt used for d) and e) shall be as below.

- Mid Clamp: Aluminum, length of minimum 30mm, height of 33mm, bottom width of 19mm, minimum 3mm thick, width of capture area is 8mm minimum. The distance from the center of bolt-hole and the edge of the clamping side is 9.5mm.
- End Clamp: Aluminum, length of minimum 30mm, height of 35mm (from underside of top of clamp to bottom of clamp), bottom width of 20mm, minimum 3mm thick, width of capture area is 8mm minimum. The distance from the center of bolt-hole and the edge of the clamping side is 10mm.
- Bolt: Stainless-steel M8 bolts with a minimum length of 20mm. Recommended tightening torque is 12.5 N-m minimum
- Clamps must not create shadow nor cover the front glass, and shall not deform the module frames during installation.

Example: Module Parallel to Support Rails



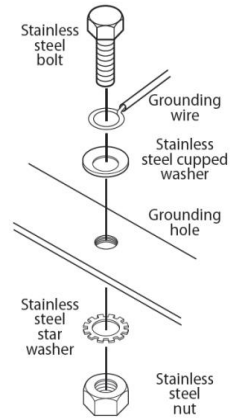
Electrical Installation

- Under normal conditions, a photovoltaic module may experience conditions that produce more current and/or voltage than reported at Standard Test Conditions. The requirements of the National Electrical Code (NEC) in Article 690 shall be followed to address these increase outputs.
- In the installations not under the requirements of the NEC, the values of Isc and Voc marked on the PV modules should be multiplied by a factor of 1.25 when determining component voltage ratings, conductor ampacities, overcurrent device ratings, and size of controls connected to the PV module output.
- Avoid installation when PV modules, installation tools, or installation area are exposed to water or other liquids. If the connectors are covered with a connector cap, remove and discard only when connectors are mated during installation.
- Wiring should be in accordance with the NEC, and that the grounding method of the frame of arrays shall comply with the NEC, article 250.
- Installation shall be in accordance with CSA C22.1, Safety Standard for Electrical Installations, Canadian Electrical Code, Part 1.
- The PV array open-circuit voltage must never exceed the maximum system voltage (including in low temperature conditions).
- PV modules installed in parallel will be provided with the specified maximum series fuse.
- Minimum cable diameter: 2.5mm².
- The sum of Voc of PV modules in series must not exceed the maximum system voltage of the PV module under any condition.
- Do not connect the PV modules directly to loads such as motors. Variation in output power may damage the motor.
- Cables should be adequately protected from damage by wildlife.

Grounding

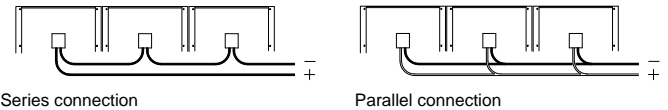
The PV module with exposed conductive parts is considered to be in compliance with UL1703 only when it is electrically grounded in accordance with the instructions presented below and the requirements of the NEC.

- Verify necessary grounding requirements prior to installation. Your local authorities could help you further.
- Grounding holes (ø4mm/0.15in) with a grounding mark are provided on each longer module frame to accommodate grounding.
- For a reliable grounding connection to the module frame, combination of a stainless steel cupped washer, a stainless star washer, a M4 or 4mm diameter bolt and nut (recommended tightening torque of 1.5 N-m), or a #6 bolt and nut (recommended tightening torque of 1.0N-m). Use a copper grounding wire no less than 2mm² (14AWG) with a temperature rating of -40° to 85°C (-40° to 185°F).
- Module frames and other system components should be connected to an earth ground for lightning protection, in accordance with local, and national standards and regulations. Install any other appropriate lightning protection tools as needed.



Electrical Wiring

- Do not open the junction box on the back side of the PV module.
- Fasten module cables to the frame or to the mounting system in order to avoid any drooping of the cable or other potential stress to the connectors.
- Cables should be secured so they are not exposed to direct sunlight (such as behind the PV module).



Operation

- Prior to connecting the PV system to the grid, make sure the entire system has been checked, tested and approved in accordance with the applicable regulations.
- Depending on local regulations and utility policies, connection to the grid and start up of the PV system may only be performed by authorized personnel.

Maintenance

- Periodic visual check is highly recommended in order to maintain the efficiency of PV modules and the security of the mounting.
- Remove any dirt, fallen leaves or bird droppings from the surface, and check that there is no damage to the surface.
- Use tap water with low mineral content for removing dirt from the surface of PV modules. If necessary, please use soft cloths or sponges. Avoid use of hard or abrasive objects. Please consult with Solar Frontier in advance before using detergents or chemicals for cleaning.
- When replacement parts are required, be sure to use parts specified by the manufacturer.
- Stop using PV modules when any damage or unusual phenomena are observed. Have them immediately replaced or removed by a qualified technician.
- Clean PV modules only when in open circuit or when the inverter is not operational. To minimize the risk of electric shock and power production loss, it is recommended that cleaning be conducted in low light conditions, such as between dusk and dawn.

Disposal

- PV modules must be disposed of in a responsible manner. Please contact your local supplier or disposal company for further information. For health and safety reasons, PV modules should not be disposed of with household garbage, and must be dealt with in accordance with local codes and regulations.
- Solar Frontier is a member of PV Cycle, marking its commitment to the environment and public safety. PV Cycle's initiatives can be found at: <http://www.pvcycle.org/>

REVISION HISTORY			
Version No.	Date	Section	Details
1	2017/9/15	-	New Issue
2	2017/10/18	Electrical Rating	Add 190W and 195W
3	2018/1/25	Mechanical Installation	Minimum clamp length
		Contact	End clamp height
4	2018/2/19	Contact	Address of Solar Frontier EU

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Allowable mating connectors manufacture	Allowable mating connectors model number	Contact information: Company website address
Hosiden Corporation	HSC2013,HSC2014,HSC2015	http://www.hosiden.com