

Maxeon

Performance Solar Panels

Safety and Installation Instructions

United States and Canada

Maxeon Performance

Photovoltaic panels



Safety and Installation Instructions

539821 Revision E

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This document applies to Performance modules listed below:

- SPR-P5-XXX-UPP
- SPR-P6-XXX-UPP

These modules do not have grounding restrictions and all are compatible with high-efficiency transformer less inverters.

This document describes the limited warranty, mounting configuration, handling, maintenance and cleaning of modules. Save this documentation for future reference and comply with all provided instructions.



For the latest revision, please refer to

www.maxeon.com/us/PSeriesInstallGuide

Contents of this manual are subject to change without notice.

Maxeon Solar Technologies, Ltd.

www.maxeon.com

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POWERING POSITIVE CHANGE

Safety and Installation Instructions

(United States and Canada)

1.0 Introduction

These instructions provide safety and installation instructions for CSA/TUV Listed Maxeon photovoltaic (PV) modules that have the CSA/TUV logo on the product label:



IMPORTANT! Please read these instructions in their entirety before installing, wiring, or using this product in any way. Failure to comply with these instructions will invalidate the Maxeon Limited Warranty for PV Modules.

1.1 Disclaimer of Liability

The installation techniques, handling, and use of this product are beyond company control. Therefore, Maxeon assumes no responsibility for loss, damage or expense resulting from improper installation, handling, or use.

1.2 Listing Information

This product meets or exceeds the requirements set forth by UL 61730 and UL 61215. These Standards cover flat-plate PV modules and panels intended for installation on buildings or those intended to be freestanding. To satisfy the Listing for this product the modules must be mounted with a rack or standoff structure. The Listing does not include integration into a building surface because additional requirements may apply. This product is not intended for use where artificially concentrated sunlight is applied to the module.

1.3 Limited Warranty

Module limited warranties are described in full in the Maxeon warranty certificates obtainable at www.maxeon.com/us. In summary, the Limited Warranties do not apply to any of the following:

PV Modules subjected to: (i) misuse, abuse, neglect or accident; (ii) alteration or improper installation (improper installation includes, without limitation, installation that does not comply with all Maxeon installation instructions and operations and maintenance instructions of any type, as may be amended and updated from time to time at Maxeon's sole discretion, and all national, state, and local laws, codes, ordinances, and regulations); (iii) repair or modification by someone other than an approved service technician of Maxeon; (iv) conditions exceeding the voltage, wind, snow load, and any other operational specifications; (v) power failure or surges; (vi) indirect or direct damage from lightning, flood, fire or other acts of nature; (vii) damage from persons, biological activity, or industrial chemical exposure; or (viii) damage from impact or other events outside Maxeon's control.

2.0 Safety Precautions

Before installing this product, read all safety instructions in this document.

DANGER! Module interconnection cables pass direct current (dc) and are sources of voltage when the module is under load and when it is exposed to light. **Direct current can arc across gaps and may cause injury or death if improper connection or disconnection is made; or if contact is made with module leads that are frayed or torn.** Do not connect or disconnect modules when a current source is energizing the conductors. Modules may contain high voltage when interconnected with other modules.

- All installations must be performed in compliance with the National Electrical Code (NEC) and any applicable local codes.
- For Canadian jurisdictions, installations shall be in accordance with CSA C22.1, Safety Standard for Electrical Installations, Canadian Electrical Code, Part 1
- Modules certified to UL 61730 are Safety Class 2 for protection against electric shock
- There are no user-serviceable parts within the module. Do not attempt to repair any part of the module.
- Only qualified personnel should perform installation.
- Do not stand on, drop, scratch, or allow objects to fall on modules as doing so may damage them and void the warranty.
- Do not place anything on the modules, even for a moment because resulting residue may damage or stain the glass surface.
- If the front glass is broken, or the backsheet is torn, contact with any module surface or module frame can cause electric shock. Damaged modules should be immediately disconnected from the electric system. The module should be removed from array as soon as possible and contact the supplier for disposal instructions.
- Broken J-boxes or connectors are electrical hazards as well as laceration hazards. Installers should remove any such module from the array and contact Maxeon for disposal instructions.
- Do not install or handle the modules when they are wet or during periods of high wind.
- Do not block drain holes or allow water to pool in or near module frames.
- Maxeon recommends a conservative minimum cable bend radius of equal to or greater than 40 mm (1.5").
- Unconnected connectors must always be protected from pollution (e.g dust, humidity, foreign particles, etc), prior to installation. Do not leave unconnected (unprotected) connectors exposed to the environment. A clean assembly environment is therefore essential to avoid performance degradation.
- Do not allow the connectors to come in contact with chemicals such as greases, oils and organic solvents, which may cause stress cracking.
- Do not disconnect any modules when its inverter is feeding in to the grid. Switch off the inverter before disconnecting, reinstalling or making any action with the modules.
- For connectors, which are accessible to untrained people, it is imperative to use the locking connectors and safety clips, if applicable, in order to defend against untrained personnel disconnecting the modules once they have been installed.
- Cover all modules in the PV array with an opaque cloth or material before making or breaking electrical connections.
- As the modules bend under the load, do not mount sharp objects (e.g. screws) near the module backside.
- Do not mount rails under the junction boxes
- Do not attach or adhere items at the backsheet of the modules.
- Contact Maxeon if maintenance is necessary.
- Save these instructions!

2.1 Fire Rating

The module fire rating is Type 29 per UL1703, 2013 edition. Fire rating classification for any PV system using UL1703:2013 can only establish a fire rating in combination with the mounting system ratings normally found in the mounting system installation instructions.

3.0 Electrical Characteristics

Electrical characteristics of the modules are described in Table 1 below. Rated electrical characteristics are within 10 percent of measured values at Standard Test Conditions of: 1000 W/m², 25°C cell temperature and solar spectral irradiance per IEC 60904-3 or irradiation of (air mass) AM 1.5 global (G) spectrum. Each module contains three bypass diodes. The maximum series fuse rating is 25A.

Under normal conditions, a photovoltaic module may experience conditions that produce more current and/or voltage than reported at Standard Test Conditions. Accordingly, the values of ISC and VOC marked on UL Listed modules should always be multiplied by a factor of 1.25 when determining component voltage ratings, conductor capacities, fuse sizes and size of controls connected to the module output. Refer to Section 690-8 of the NEC for an additional 1.25 Safety factor which may be applicable.

Table 1: Electrical Characteristics¹

Module	Rated Power (W)	Voltage at Rated Power Vmp (V)	Current at Rated Power, Imp (A)	Open Circuit Voltage Voc (V)	Short Circuit Current, Isc (A)	Maximum System Voltage UL Vmax (V)
SPR-P6-555-UPP	555	40.0	13.89	47.3	14.73	1500
SPR-P6-550-UPP	550	39.7	12.85	47.1	14.68	1500
SPR-P6-545-UPP	545	39.5	13.80	46.9	14.64	1500
SPR-P6-540-UPP	540	39.3	13.76	46.7	14.59	1500
SPR-P6-535-UPP	535	39.0	13.71	46.5	14.54	1500
SPR-P6-530-UPP	530	38.8	13.67	46.3	14.49	1500
SPR-P6-525-UPP	525	38.5	13.62	46.1	14.44	1500
SPR-P6-520-UPP	520	38.3	13.58	46.1	14.42	1500
SPR-P6-515-UPP	515	38.1	13.52	46.0	14.41	1500
SPR-P6-510-UPP	510	37.8	13.5	45.9	14.39	1500
SPR-P6-505-UPP	505	37.5	13.47	45.8	14.38	1500
SPR-P6-500-UPP	500	37.2	13.45	45.7	14.35	1500
SPR-P6-495-UPP	495	36.9	13.42	45.6	14.34	1500
SPR-P5-545-UPP	545	39.5	13.81	47.8	14.83	1500
SPR-P5-540-UPP	540	39.2	13.78	47.6	14.80	1500
SPR-P5-535-UPP	535	38.9	13.76	47.4	14.79	1500
SPR-P5-530-UPP	530	38.6	13.73	47.1	14.78	1500
SPR-P5-525-UPP	525	38.3	13.71	46.8	14.77	1500
SPR-P5-520-UPP	520	38.0	13.69	46.6	14.76	1500
SPR-P5-515-UPP	515	37.7	13.66	46.3	14.75	1500

4.0 Electrical Connections and System Monitoring

Modules may be connected in series and/or parallel to achieve the desired electrical output as long as optimum design parameters are achieved certain conditions are met. Please use only the same type of modules in a combined source circuit. Do not mix the modules with different nameplates without authorization by Maxeon.

Even if allowed by local regulation, Plug and Socket connectors mated together in a PV system must be of the same type (model, rating) from the same manufacturer i.e. a plug connector from one manufacturer and a socket connector from another manufacturer, or vice versa, shall not be used to make a connection.

¹ For models not shown here, please contact Maxeon technical support or visit www.maxeon.com/us. Electrical parameters are measured at Standard Test Conditions (STC). The series fuse must have an interrupting rating that is equal to or greater than the

Maxeon recommends a conservative minimum bending radius (R) 5x cable diameter must be maintained and must not be bent on the direct exit of the connector or junction box. Avoid exposure of electrical connections to direct sunlight and do not place the connector in a location where water could easily accumulate. Installers must refer to connector manufacturer's instruction for further installation and connection requirements. Connectors are factory assembled with intentional gaps between the cable nut and the body of the connector. Do not retighten module connector nuts as this may lead to stress cracking of the connector assembly and will void the warranty.

4.1 Equipment Grounding

To reduce the possibility of electrical shock, ground the frame of the module or array per NEC before wiring the circuit. In order to install in accordance with their CSA Listing, Maxeon modules must be grounded using grounding hardware that meets requirements for grounding systems in UL 61730 and UL 61215 on anodized aluminum frames. Maxeon recommends to refer to the applicable regional and local codes and requirements on grounding PV arrays and mounting frames in conjunction with your racking supplier.

In addition, to avoid corrosion due to the use of dissimilar metals Maxeon recommends stainless steel between copper and aluminum.

4.2 System Grounding

Review Table 2 below for the proper grounding techniques for the installation of your particular Maxeon modules.

4.3 Series Connection

The modules may be wired in series to produce the desired voltage output. Do not exceed the maximum system voltage shown in module datasheets and product label.

4.4 Parallel Connection

The modules may be combined in parallel to produce the desired current output. Each series string or module may be required to be fused prior to combining with other strings if the resulting maximum fuse size allowed (number of modules which can be connected in parallel and protected by one fuse) exceeds the fuse rating as shown in the module datasheet and product label. Please refer to the NEC Article 690 for additional fusing requirements.

Table 2: Module Grounding Key

Module Model Grounding Key
Maxeon P-Series modules have no grounding restrictions:
All model numbers starting with SPR-Py-xxx-UPP
IMPORTANT! P-Series can be grounded with either polarity. <i>Failure to comply with this requirement will reduce system performance and invalidate Maxeon's Limited Power Warranty for PV Modules.</i>

5.0 Module Mounting

The Maxeon Limited Warranty for PV Modules is contingent upon modules being mounted in accordance with the requirements described in this section.

5.1 Site Considerations

Maxeon modules should only be mounted in locations that meet the following requirements:

maximum fault current that the fuse is required to interrupt, including contributions from all connected sources of energy. Refer to NEC Article 100, Part II as to what type of series fuse is acceptable for modules rated at higher than 600 V dc system voltage.

Operating Temperature: All Maxeon modules must only be mounted in environments that ensure they will operate within the following temperatures:

Operating Temperature range (ambient)	-40°C to +85 °C -40°F to +185 °F
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Adequate ventilation should be provided behind or underneath the modules, especially in hot environments.

Shading: Modules should be installed so that permanent shading of cells is avoided and partial shading that may occur during certain times of the day or year is minimized. Permanent shading is defined as shade that is cast over the same position (of constant area) of the solar module throughout the generation hours of the day. Shading may induce in certain cases strong energy production reduction, even in case of small shading and should be avoided as much as possible, especially at mid-day when the production is maximum.

Design Strength: Maxeon modules are designed to meet a positive (downward) and/or negative (upward) withstanding test pressure when mounted as per the guidelines in Section 5.2 and configurations in Appendix. Test loads are for information purposes only; design loads should be considered for the project design.

When mounting modules in snow prone or high wind environments, special care should be taken to mount the modules in a manner that provides sufficient design strength while meeting local code requirements.

Excluded Operating Environments

Certain operating environments are not recommended for Maxeon modules, and are excluded from the Maxeon Limited Warranty. Modules are designed for a maximum altitude of 2000 m. No Maxeon module should be mounted at a site where it may be subject to direct contact with salt water, or other aggressive environment. Modules should not be installed near flammable liquids, gases, or locations with hazardous materials; or moving vehicles of any type.

Performance Series Mounting Orientation

Commercial Performance Series (P-Series) modules are designed to perform better if installed in landscape orientation. In landscape orientation, P-series modules maintain higher power in conditions of row-to-row shading and/or edge soiling.

5.2 Mounting Configurations

Modules integrated into or mounted over a roofing system must be mounted over a fire-resistant roof covering rated for the application. Modules may be mounted at any angle, from horizontal to vertical. To reduce soiling, modules should be mounted at a minimum of 5 degrees.

Specific information on module dimensions and the location of mounting and grounding holes is provided in Appendix. The system installer is responsible for the determination of location-specific load requirements.

It should be noted that watertightness is not ensured by Maxeon, therefore, if water management is required, the mounting system should be designed accordingly.

The module is only CSA Listed for use when its factory frame is fully intact. Do not remove or alter the module frame, and do not create additional mounting holes because doing so may compromise the integrity of the frame.

Modules may be mounted using the following methods only:

- 1) **Frame Holes:** Secure the module to the structure using the factory mounting holes. Four 1/4" stainless steel bolts, with nuts, washers, and lock washers are recommended per module; tightened to a min. torque of 10 in-lb. This method has been certified by a third-party organization according to UL 1703. For frame hole mounting, modules must be secured using the holes shown in Appendix.
- 2) **Clamps:** Mount the module with the opposite clamps on the longer and/or shorter sides of the module. Installers should ensure the clamps are of sufficient strength to allow for the maximum design pressure of the module. Clamps are not provided by Maxeon. Clamps that secure to the top of the frame must not deform the top flange. Clamps must apply force collinear with the 'wall' of the module frame and not only to the top flange.

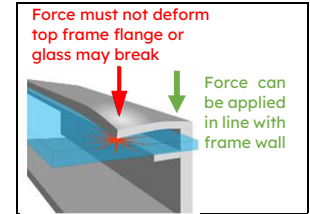


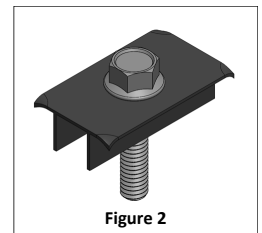
Figure 1a: Clamp Force Locations

Clamps or installation procedures that put excessive force on the top flange will deform the frame, void the module warranty and risk glass breakage. **Figure 1a** illustrates locations for top frame clamp force. When clamping to the module frame, torque should never exceed 132 in-lbs (15 Nm) to reduce chances of frame deformation and/or glass breakage. If the clamp manufacturer recommends a specific torque value which is lower than 132 in-lbs (15 Nm), the installer should use the clamp manufacturer's torque value. If the clamp manufacturer recommends a specific torque value which is higher than 132 in-lbs (15 Nm), the installer should contact the clamp manufacturer for acceptance of the 132 in-lbs (15 Nm) maximum torque value or to find alternative clamps. A calibrated torque wrench must be used. Mounting systems should be evaluated for compatibility before installing specially when the system is not using Clamps.

Minimum clamp width allowance is $\geq 35\text{mm}$, and for corner clamping the minimum clamp width is: $\geq 50\text{mm}$. Clamps should not be in contact with the front glass and clamps should not deform the frame.

Maxeon does not recommend nor endorse the application on the modules of clamps which, as part of their grounding or earthing function, have teeth or claw features (see Figure 2) which may, individually or cumulatively, cause the module breakage due to (and without limitation):

- i. the grounding features touching the front glass which is incorporated into the module due to the position of such grounding feature,
- ii. the shape, the position or the number of the grounding features deforming the module top frame, or
- iii. the clamp being over-torqued during the installation.



5.3 Ground Mount Applications for Bifacial modules

Various environmental and installation parameters affect bifacial gain. Albedo is a measure of the amount of light reflected from the ground surface. A higher albedo factor will increase irradiance on the backside and result in higher bifacial gain of the module. The surface conditions, month of the year, time of day, GHI and DNI both influence the amount of incident rear side irradiance.

Maxeon recommends to check with solar module mounting hardware supplier in order to determine the Structure Shading factor of your particular installation. The Structure Shading Factor varies with racking system design, irradiance, albedo and height of

module installation above ground and has an overall impact on the rear side irradiance mismatch.

The Rearside mismatch losses are proportional to the albedo, height of the modules above ground and structure shading factor. The irradiance non-uniformity on the rear side results in mismatch generally as the albedo increases and installation height of the modules are lower to the ground.

5.4 Rooftop Applications for Bifacial modules

Bifacial modules use direct, reflected or diffuse sunlight at the rear side to generate additional power. Therefore, it is recommended to use bifacial modules installed on flat roof applications.

In order to maximize the bifacial gain at the rooftop applications the following parameters listed below should be considered:

- Surface Albedo
- Roof Integrity
- Module Tilt Angle
- Module Elevation
- Structural Backside Shading

The bifacial modules can be mounted both landscape or portrait orientation as shown in Appendix section.

When installing a bifacial module on a roof, ensure that the roof construction and the structural load calculations of the building are suitable.

Bifacial gain tends to be most effective with a higher tilt angle. As the tilt angle and the module elevation from the underlying surface increases, more reflected light and diffuse light can be captured by the module.

The mounting rails shall be designed to limit the rear side shading as much as possible.

5.5 Bifacial Electrical Considerations

The overall electrical bifacial gain is determined by the combination of surface albedo, irradiance, module tilt angle, shading losses from the rear side, rear side mismatch and module elevation above ground. Please refer to the Maxeon datasheet for the electrical outputs with respect to the overall bifacial gain. Please utilize a suitable performance software package to simulate the overall bifacial gain

5.6 Handling of Modules during Installation

Do not place modules face forward in direct contact with abrasive surfaces like roofs, driveways, wooden pallets, railings, stucco walls, etc...

The module front surface glass is sensitive to oils and abrasive surfaces, which may lead to scratches and irregular soiling.

During storage, modules need to be protected from rain or any kinds of liquids. Required storage temperature is between 10°C to 40°C in a dry environment (humidity between 30 to 80%). Do not store modules outdoor to avoid moisture and wet conditions.

Modules that feature antireflective coated glass are prone to visible finger print marks if touched on the front glass surface. Maxeon recommends handling modules with anti-reflective glass with gloves (no leather gloves) or limiting touching of the front surface. Any finger print marks resulting from installation will naturally disappear

over time or can be reduced by following the washing guidelines in Section 6.0 below. Any module coverage (colored plastic tarps or similar) during installation can lead to permanent front glass discoloration and is not recommended. The use of vacuum lifting pads can cause permanent marks on the front glass.

Never lift or move the module using the cables or the junction box under any-circumstances. Ties or tapes used to secure cables are designed for transportation. They are not designed to comply with local requirements for securing PV cable to the array, and may cause shading on bifacial panels reducing performance.

System energization and shutdown procedures need to be followed based on respective National guidelines and local regulations. Safe site operational practices must be adhered before energizing the PV system (e.g. electrical continuity, avoiding direct contact with electrical/framing equipment, wearing safety PPE, etc.). System should be electrically disconnected during maintenance, upgrades, and modification works which can affect the operation of PV system.

6.0 Maintenance and Cleaning

Trained Maxeon dealer or trained Maxeon support personnel should inspect all modules annually for safe electrical connections, sound mechanical connections, and freedom from corrosion.

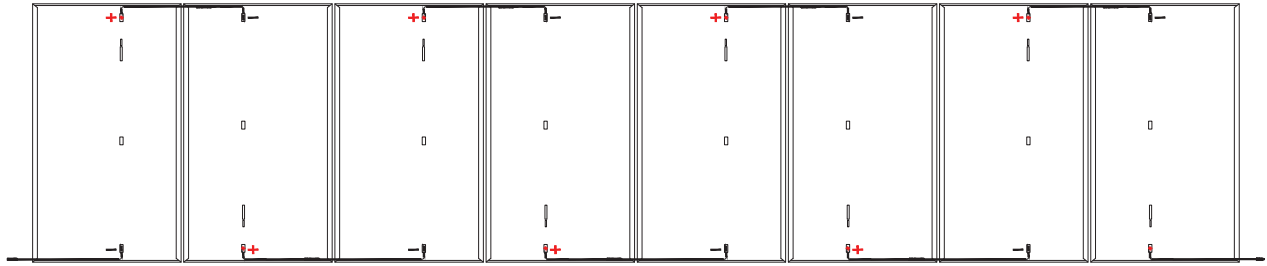
Periodic cleaning of module glass has resulted in improved performance levels, especially in regions with low levels of annual precipitation; therefore Maxeon recommends periodic cleaning of the modules.

To clean a module, wash its glass surface with potable, non-heated water. Normal water pressure is more than adequate when cleaning the AR glass. Maxeon recommends using a large hosepipe and not to perform cleaning at high outside temperatures. Some fingerprints, stains, or accumulations of dirt on the glass may be removed with over-the-counter glass cleaners (such as Windex® or equivalent), or with a 3% soap-and-water solution. For smaller systems, wet the module glass with the solution, let it stand for five minutes, and then wet them again and use a soft sponge or seamless cloth to wipe the glass surface in a circular motion. For large systems, wet the modules with the cleaning solution, let them stand for five minutes, and then rinse them with high-pressure water or a soft sponge. Do not use harsh industrial-strength cleaning materials such as scouring powder, steel wool, scrapers, blades, or other sharp instruments to clean the module glass. Use of such materials will void the product warranty.

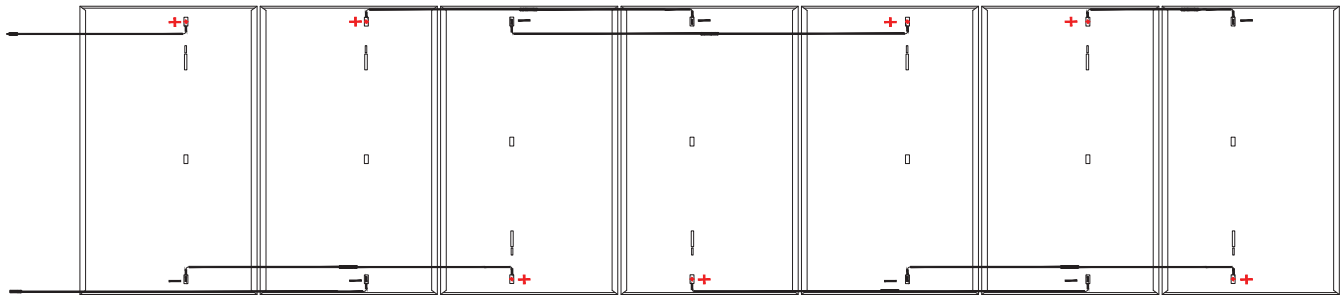
Recommended Cable Management

Performance Product Line:

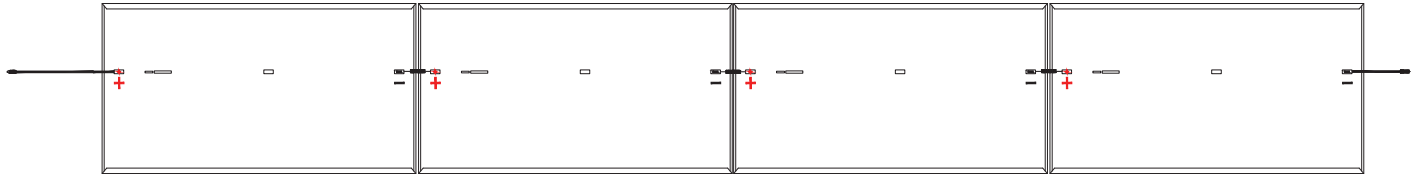
Portrait Stringing



Leapfrog Stringing (Portrait)



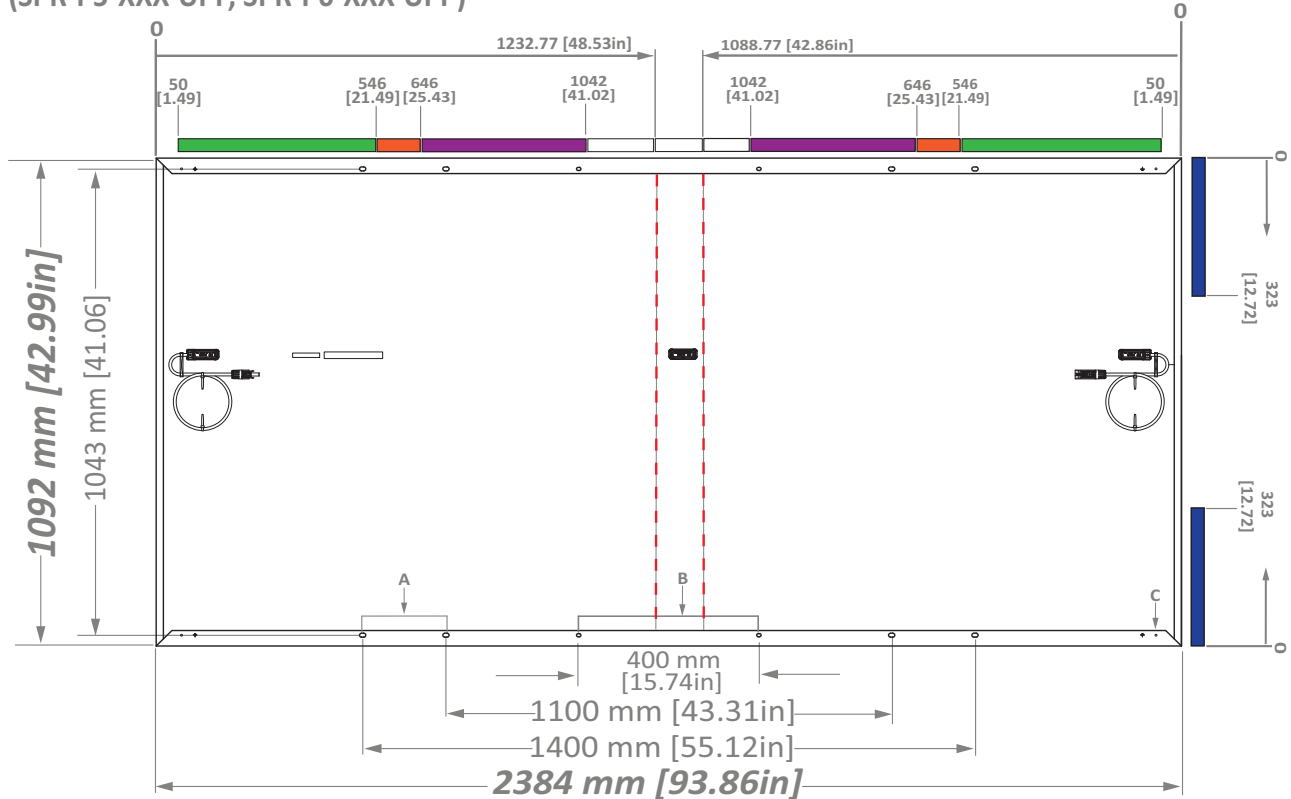
Landscape Stringing



*The images are solely for illustration purposes only.

Appendix: Mounting Loads and Configurations

Performance 5/6 Bifacial Solar Panel (SPR-P5-XXX-UPP, SPR-P6-XXX-UPP)



Measurement Tolerances are +/-3 mm for the Length and Width of the Module.

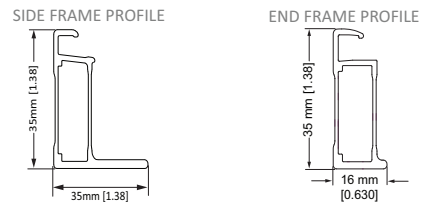
- A - SLOT HOLES (8X 14mm (L) x 9mm (W), R3.5mm)
- B - Mounting Holes (4X 10mm (L) x 7mm (W), R6.8mm)
- C - Ground Holes (4X Ø 4.2mm)

TOP CLAMPS

Mounting Configuration Description	Mounting Configuration Diagram		Mounting Zone Locations (distance from corner in mm)	Test Load ² Downward/Upward (Pa)	Design Load ¹ Downward/Upward (Pa)
	Front View	Back View			
Long Side Mounting, Rails Perpendicular to Mounting Frame ⁴			50 - 546	+2400/-1200	+1600/-800
			546 - 646	+5400/-2400	+3600/-1600
			646 - 1042	+2400/-2000	+1600/-1333
Long Side Mounting, Point Supported ⁵			50 - 100	+1800/-1800	+1200/-1200
			546 - 646	+3000/-2400	+2000/-1600
Long Side Mounting, Rails Parallel to Mounting Frame			50 - 546	+2400/-1200	+1600/-800
Short Side Mounting, Point Supported (End Mount)			0 - 323	+1400/-1400	+933/-933
Short Side Mounting, Point Supported with Rail (End Mount)			0 - 323	+3600/-2400	+2400/-1600
Short Side Mounting, Rails Parallel to Mounting Frame (End Mount)			0 - 323	+1400/-1400	+933/-933

¹ Design Load considers 1.5 Factor of Safety, Test load = Design load x 1.5. Product Warranty covers only design load values. The design loads listed in this table supersede all other loads that may be defined by other parties, unless there is a formal authorization by Maxeon.
² Test loads are for information purposes only, design loads should be considered for the project design.

GEN 4.3 FRAME PROFILE



BOLTS³

Mounting Configuration Description	Mounting Configuration Diagram		Mounting Zone Locations (distance from corner in mm)	Test Load ² Downward/Upward (Pa)	Design Load ¹ Downward/Upward (Pa)
	Front View	Back View			
Long Side Mounting, Rails Perpendicular to Mounting Frame			1400mm Holes	+5400/-2400	+3600/-1600
			1100mm Holes	+5400/-2400	+3600/-1600
			400mm Holes	+2400/-2000	+1600/-1333
Center Mounting (1x Portrait Tracker)			400mm Holes	+1800/-1800	+1200/-1200

³ Minimum of 24mm in diameter washer size is required.
⁴ Rails must not be under the junction box.
⁵ Bottom Flange Mounting