

# SOLARIA<sup>®</sup>



Power Unlocked

## SAFETY, INSTALLATION, AND OPERATIONS MANUAL

FOR US INSTALLATIONS

### Solaria PowerXT™-R Module

**Safety and Installation instructions**

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# SAFETY, INSTALLATION, AND OPERATIONS MANUAL

## 1.0 Introduction

This document provides safety and installation information for the Solaria PowerXT™ residential solar modules.

Read this document before installing, wiring, or using this product. Failure to comply with these instructions will invalidate the Solaria Limited Warranty and may cause loss, damage or injury.

### Limited Warranty

Module limited warranty is described in The Solaria Corporation PowerXT™ Warranty. Warranty details may be found at [www.solaria.com](http://www.solaria.com).

## 2.0 Safety Precautions

Before installing the modules, read all safety instructions in this document.

- ◆ Modules produce direct current (DC) when 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 exposed leads. Do not connect or disconnect modules when current from the modules or an external source is present.
- ◆ Do not operate the modules in a short circuit condition for extended periods of time.
- ◆ Do not artificially expose additional high intensity sunlight directly on the module.
- ◆ Do not disconnect modules while under load.
- ◆ All installations must be performed in compliance with local, regional, national and international statutory regulations, guidelines, norms and code requirements.

- ◆ There are no user serviceable parts within the module. Do not attempt to repair any part of the module.
- ◆ Installation should be performed by authorized personnel only.
- ◆ Use insulated tools to reduce risk of electric shock. Do not touch terminals with bare hands.
- ◆ Do not stand on, drop, or allow objects to fall on modules.
- ◆ Do not install or handle modules when they are wet or during periods of high wind.
- ◆ Before installing your system, contact local authorities to determine necessary permit, installation and inspection requirements.
- ◆ Module support structures should be wind rated per local code and approved for use by the local authorities.

## 2.1 FIRE RATING AND SAFETY

- ◆ Solaria PowerXT™ residential solar modules are UL1703 fire type 1 rated and certified by an independent third party testing laboratory.
- ◆ Refer to your local authority for guidelines and requirements for building or structural fire safety.
- ◆ The roof construction and installation may affect the fire safety of a building: improper installation may contribute to hazards in the event of fire.
- ◆ It may be necessary to use components such as earth fault circuit breakers, fuses and circuit breakers.
- ◆ Do not use modules near equipment or locations where flammable gases can be generated or can collect.



**Artificially concentrated sunlight shall not be directed onto the module.**

## 3.0 ELECTRICAL INSTALLATION



**Caution: Avoid all electrical hazards when installing, wiring, operating, and maintaining a module or module array.**

**Refer to Section 2 for more information.**

- ◆ The system must be installed, commissioned and maintained by a licensed electrician unless local electrical codes determine otherwise.
- ◆ Contact with DC voltage is potentially hazardous.
- ◆ Do not use modules of different electrical or physical configurations in the same DC string or inverter.
- ◆ Series Connection: The modules may be wired in series to produce the desired voltage output. Do not exceed the maximum system voltage indicated on the module label.
- ◆ Parallel Connection: The modules may be combined in parallel to produce the desired current output provided that each series string or module is fused prior to combining with other strings. The maximum fuse size allowed is noted on the module label.
- ◆ Connection cables and wiring shall be supported with plastic or rubber cable ties and clips to the module support structures. Metal clips specifically designed to be used in solar applications are allowed when used in accordance with the manufacturer's instructions. Module junction boxes and metal cable ties should not be used to support cables and wiring.
- ◆ Under normal conditions, a photovoltaic module is likely to experience conditions that produce more current and/or voltage than reported at Standard Test Conditions (STC). The requirements of the National Electrical Code (NEC) in Article 690 shall be followed to address these increased outputs. In installations not under the requirements of the NEC, 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 capacities, fuse sizes, and size of controls connected to the PV output.
- ◆ Refer to section 690-8 of the National Electric Code (NEC) for additional multiplying factor of 125% (80% de-rating), which may be applicable.

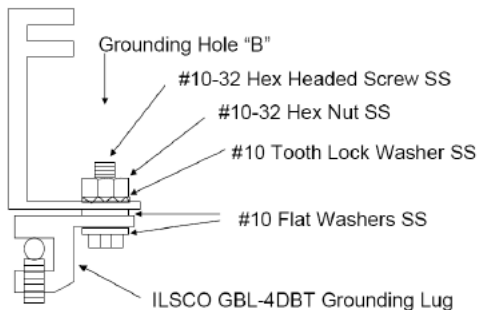
- ◆ All Solaria modules are equipped with factory locking connecting cables. Modules have been designed to be easily connected. **The locking connectors are not to be disconnected under load.** The proper procedure to disconnect the module locking connectors is as follows: Turn off the inverter(s), shut off the module DC disconnect(s) and then disconnect the locking connectors using an approved tool set. To re-install, connect the module locking connectors, turn on the module DC disconnect(s) and turn on the inverter(s).
- ◆ Match the polarities of the cables and terminals when making connections; failure to do so may result in damage to the modules and other electrical equipment.
- ◆ A properly rated and certified over-current device must be connected in series with each module or string of modules when reverse currents can exceed the value of the maximum protective fused value noted on the module label. The rating of the over-current device shall not exceed the value of the maximum protective fuse rating specified on the module label.
- ◆ All Solaria modules are factory supplied with bypass diodes located in the junction box. These diodes protect the shaded cells within a module. Partial shading of a single module in a string of modules causes reverse voltage across the shaded cells. This results in current being forced through the shaded cells causing module heating and severe power loss. The bypass diodes provide a low-resistance current path through the shaded cells thus minimizing module heating and array current loss.
- ◆ The junction box is not designed or certified to be field accessible or maintainable and should under no circumstances be opened. Opening the junction box may void the module warranty.

### 3.1 Grounding (Grid-tied applications)

- ◆ Before installing your solar system, contact local authorities to determine the necessary system hardware grounding requirements.
- ◆ Module frames should be electrically connected to an earth ground for safety and protection from lightning in accordance to the National Electric Code (NEC). *Refer to NEC article 250 on grounding PV arrays for specific requirements.*
- ◆ Solaria PowerXT residential solar modules may be installed on a mounting system certified to UL 2703 with approval of the mounting system manufacturer.
- ◆ When using a mounting system, grounding of modules must be accomplished by the method prescribed by the mounting system manufacturer.
- ◆ Where common grounding hardware (nuts, bolts, star washers, split-ring lock washers, flat washers and the like) are used to attach the solar module to a listed grounding/bonding device, the attachment must be made in conformance with the grounding device manufacturer's instructions.
  - Common hardware items such as nuts, bolts, star washers, lock washers, and the like have not been evaluated for electrical conductivity or for use as grounding devices and should be used only for maintaining mechanical connections and holding electrical grounding devices in the proper position for electrical conductivity. Such devices, where supplied with the module and evaluated through the requirements in UL1703, may be used for grounding connections in accordance with the instructions provided with the module.
- ◆ Follow these instructions to ground the module.
  - The module frame has four 4.5 mm grounding holes shown on the module label. Attach a 10 AWG (2.588 mm diameter) bare copper ground conductor to a grounding lay-in lug mounted at one of the four grounding holes on the module frame. Use a grounding lug such as the ILSCO GBL-4DB with tin plating and stainless steel

hardware (#10-32 hex head screw at 4 mm diameter, flat washers, tooth lock washer and nut).

- A #10 flat washer must be used between the screw head and the grounding lug to prevent damage to the tin plating on the lug. Insert a #10 flat washer between the grounding lug and the module frame. A #10 tooth lock washer must be inserted between the nut and the module frame to break the anodized layer of the frame. This mechanical bond between the tooth lock washer and the frame of the module will ensure a good electrical bonding path.
- The #10-32 assembly attachment screw must be tightened between 20-25 inch-pound. A 10 AWG bare copper ground conductor must be attached to the ground lug using the stainless-steel set screw provided by the lug manufacturer. Tighten the set screw between 10-15 inch-pound to ensure a strong mechanical and electrical bond.
- Recommended stainless steel hardware, grounding lug and assembly:



Stainless-steel hardware (McMaster-Carr Part Numbers):	
#92314A831	¾" long #10-32 hex headed screw
#91841A195	#10-32 hex nut
#98438A230	#10 tooth lock washer
#90107A011	#10 flat washer

### 3.2 Non Grid-Tied Applications

- ◆ Contact Solaria for appropriate grounding guidelines.

## 4.0 Module Mounting

The Solaria Corporation PowerXT™ Warranty is contingent upon modules being mounted in accordance to the requirements described in this section.

### 4.1 Site Considerations

Solaria modules should be mounted in locations that meet the following requirements.

- ◆ Module should not be mounted in locations where it will be in direct contact with salt water.
- ◆ When choosing a site, avoid obstructions that could cast shadows on the modules.

### 4.2 Mechanical Installation

Solaria module mounting configurations must meet the following requirements:

- ◆ For most installations, including rooftop and tracker installations, modules should be secured with bolts or PV module specific clamps at the four outermost 7 mm mounting hole locations on the frame (refer to the holes marked “B” on the module diagram shown in Section 8).
  - When using bolts, use M6 (1/4”-20) stainless steel bolts, with nuts, two washers, and a locking washer, tightened to a minimum torque of 13.6-16.3 N·m (10-12 ft·lb).
  - When using clamps, follow the manufacturers recommended hardware and torque requirements for solar installations. Various clamp systems specifically designed for PV module mountings are available and compatible with Solaria PowerXT modules. Solaria recommends stainless steel clamps of 40 mm (1.57”) minimum.
- ◆ Structural rails supporting the bolted or clamped connections should run perpendicular to the length of the module.



- ◆ Do not remove or alter the module frame. Creating additional mounting holes may damage the module and reduce the strength of the frame.
- ◆ The Solaria modules must be mounted using industry standard ground mount hardware roof mount hardware, or single and dual axis PV trackers. *If other mounting means are employed, then product certification or fire class ratings may be affected.*
- ◆ For roof mounting, the modules should be mounted over a fire-resistant covering rated for the application.
- ◆ Clearance of 7 mm or more between modules is required to allow for thermal expansion of the frames.
- ◆ Clearance of 100 mm or more is recommended between the modules and the rooftop or nearest surface.
- ◆ Always keep the back surface of the module free from any foreign objects or structural elements which could come into contact with the module.
- ◆ Ensure that the modules are not subject to wind or snow loads in excess of the maximum permissible loads and are not subject to excessive forces due to thermal expansion of the support structure.
- ◆ Modules have been tested to Mechanical Loading Test requirements of UL1703.
- ◆ The fire rating of this module is valid only when mounted in the manner specified in the mechanical mounting instructions.
- ◆ The module is considered to be in compliance with UL1703 only when the module is mounted in the manner specified by the mounting instructions.
- ◆ A 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 in this document and the requirements of the National Electrical Code.
- ◆ Any module without a frame (laminated) shall not be considered to comply with the requirements of UL1703 unless the module is mounted with hardware that has been tested and evaluated with the module under this standard or by a field inspection certifying that the installed module complies with the requirements of UL1703.

### 4.3 Module Direction and Tilt Angle

- ◆ Modules produce maximum energy when they are pointed directly to the Sun. Modules get maximum sunlight throughout the year if they face South in Northern Hemisphere and they face North in Southern Hemisphere.
- ◆ When mounted on a single axis tracker, modules may be tilted or kept horizontal. Tilting will produce more annual energy.

### 4.4 Module Orientation

- ◆ **Horizontal Single Axis Tracker:** Modules can be mounted in either “portrait” or “landscape” orientation on a tracker. For best performance, the axis should be aligned with the North-South direction. If the axis is not aligned with the North-South direction, it is critical that the controller of the tracker corrects for this misalignment.

## 5.0 Maintenance

Solaria modules are virtually maintenance free. Following simple maintenance steps will ensure reliable production of DC electric power for the expected life of the product.

- ◆ Inspect electrical and mechanical connections for safety and corrosion at least once every year.
- ◆ Under most weather conditions, normal rainfall is sufficient to keep the module glass surface clean.
  - Modules that are mounted at a small tilt angle will not self-clean as easily as modules that are mounted at large tilt angles. If dirt build-up becomes excessive, clean glass surface with water and soft cloth. Do not use harsh cleaning materials.
- ◆ Cleaning the back surface of the module is not necessary for proper operation. Should it be deemed necessary to clean the back surface, avoid penetrating the back sheet.

## 6.0 Disclaimer of Liability

- ◆ Since the use of this Safety, Installation and Operation Manual and the conditions or methods of installation, operation, use and maintenance of the module are beyond The Solaria Corporation control, The Solaria Corporation does not assume responsibility and expressly disclaims liability for loss, damage, injury or expense arising out of or in any connection with such installation, operation, use or maintenance of the module.
- ◆ The Solaria Corporation assumes no responsibility for any infringement of patents or other rights of third parties that may result from the use of the module. No license is granted by implication or otherwise under any patent or patent rights.
- ◆ The information in this Manual is based on The Solaria Corporation knowledge and experience and is believed to be reliable; but such information, including the product specifications (without limitations) and suggestions, do not constitute a warranty, expressed or implied. The Solaria Corporation reserves the right to make changes to the product specifications or this manual without prior notice.
- ◆ This document may be provided in multiple languages. If there is a conflict among versions, the English language version dominates.

## 7.0 Electrical Specifications

### ELECTRICAL PARAMETERS

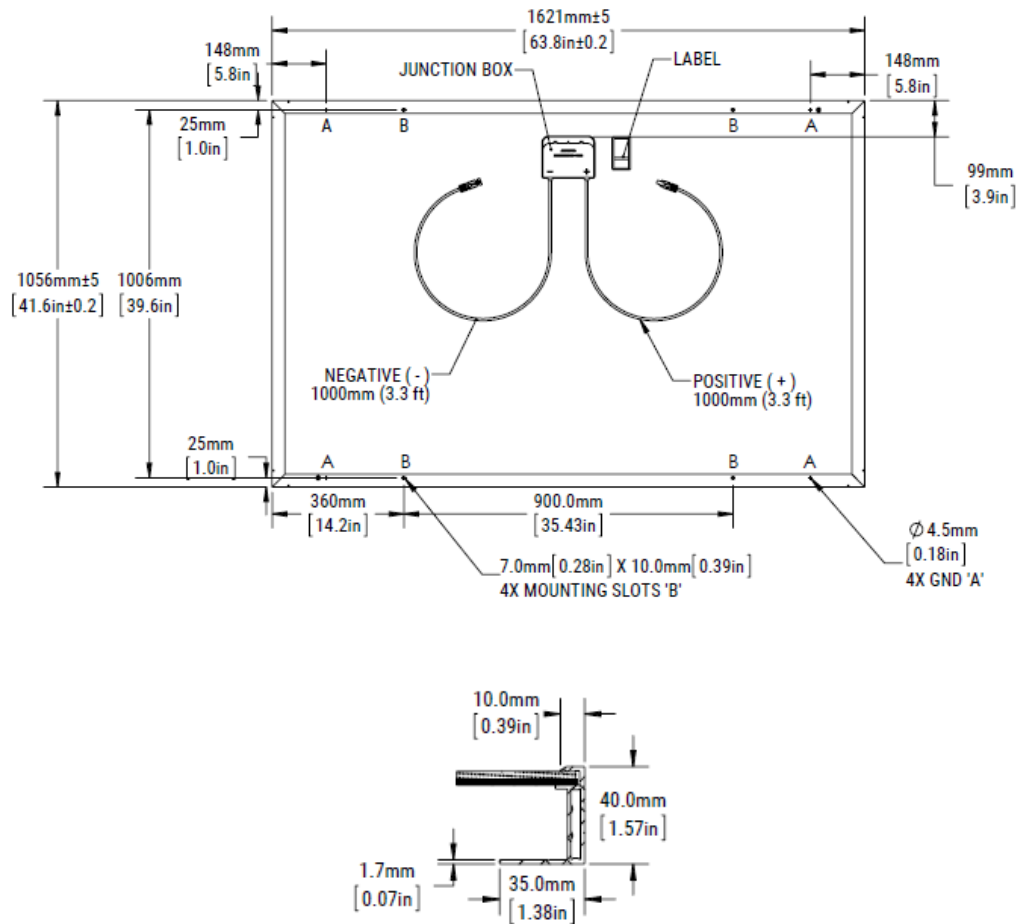
Peak Power, Pmax (Watts)	330
Open Circuit Voltage, Voc (V)	44.5
Short Circuit Current, Isc (A)	9.49
Voltage at Pmax (V)	36.6
Current at Pmax (A)	9.2
Max Series Fuse Rating (A)	15
UL Max System Voltage (V)	1000

### TEMPERATURE SPECIFICATIONS

Coefficient of Power	-0.40 %/°C
Coefficient of Voltage	-0.32 %/°C
Coefficient of Current	+0.05 %/°C

- ◆ Specified power rating is +3/-2% of indicated value of Pmax under STC\*
- ◆ All other electrical specifications are ± 10% of indicated values under STC\*
- ◆ \*STC: Irradiance 1000 W/m<sup>2</sup>, AM 1.5 spectrum, Cell Temperature 25 °C
- ◆ Module is rated for Application Class A

## 8.0 Mechanical Dimensions



- ◆ Module Weight: 20.1 kg (44.31 lbs.)
- ◆ Nominal dimensions in millimeters and [inches] - Not Drawn to Scale



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