This installation manual applies to the following Prism Solar bifacial glass/glass models:

# IEC/UL (1000V) Bi Series

**IMPORTANT: Please contact us to receive the latest revision of the Prism Solar Design Guide (www.prismsolar.com/contact-us/) for modeling/energy/sizing estimation. Read the design guide and this document in their entirety before handling, installing or wiring these products. Failure to comply with these instructions will invalidate any warrantees.**

## 1. Introduction

### *1.1. Disclaimer & Liability*

Prism Solar disclaims all liability for any losses, damages or expenses arising in connection with improper installation, handling or use, or any failure to comply these instructions. Specifications included in this manual are subject to change without notice.

### *1.2. Limited Warranty*

Module limited warranties are described in the Prism module warranty certificate obtainable at ***www.prismsolar.com***.

### *1.3 UL1703 Compliance*

The module is considered to be in compliance with UL 1703 only when the module is mounted in the manner specified by the installation manual.

## 2. Warnings & Safety Precautions

**WARNING! Solar modules product DC voltage and current when exposed to sunlight of other light sources. This risk increases as modules are connected in series or parallel. Contact with live parts can cause arcing or sparks that could result in burns or death.**

**To avoid injury or damage:**

- Cover all modules (front and back) with an opaque material such as a heavy cloth or cardboard.
- Installations should be performed by trained and authorized personnel only.
- All installation should be in compliance with the National Electrical Code (NEC) and any applicable local codes.
- Do not attempt to repair or service this product. This product has no user serviceable parts.
- Do not stand on, drop, scratch, place tools on, or place heavy objects on modules.
- Do not use the module if front or back glass is broken. Contact with a module that has broken glass could result in electric shock or arcs, and/or mechanical failure. Remove broken modules from usage.
- Work only in fair weather conditions. Do not handle modules when they are wet, or with wet tools.
- Do not allow liquids to pool on, or on the edges of the module. Do not submerge the module in liquids.
- Use two people to carry the modules. Use non-slip gloves. Do not hold the module by the junction box or the cables. Appropriate glazing industry equipment (suction bars, safety goggles, etc.) is recommended.
- Do not allow soiling to impede electrical connections and make sure all electrical connections are properly attached to avoid arching.
- Keep Prism Solar products in their original packaging until they are ready to be installed.
- Do not stack modules on top of each other or allow the glass surfaces to come into contact with hard surfaces or objects.
- See the module specifications for specific module maximum voltage ratings.
- Do not allow the modules/glass to come into contact with cement, tile, metal or other hard, abrasive or conductive surfaces, as they might damage the frameless module.
- Use a minimum wire bend radius of 2 inches/50mm, or as specified by code.
- Support all module wiring and use an appropriate cable management as specified by all applicable codes and the mounting system supplier, and ensure wires are not in contact with sharp edges.
- See section 7 "**Guidelines for Handling Tempered Glass"** for handling information**.**

### 2.1. CAUTION!

**Prism modules use high efficiency bifacial monocrystalline solar cells. These modules produce power from both the front and back of the module. Because of this additional energy, Prism modules may produce significantly more power than their STC rating. This additional power is dependent on the amount of available light to the back of the module, which is determined by the site installation characteristics.**
**See the Prism Solar Design Guide (www.prismsolar.com/contact-us/) for information on how to maximize the amount of additional power generated.**

**Tempered Glass Precautions: It is recommended that you familiarize yourself with our Guidelines for Handling Tempered Glass (section 7 of this guide) before attempting any frameless module installation. The edges and especially the corners are the most vulnerable part of tempered glass and if it is not handled correctly it could cause the tension to be released and the glass to shatter.**

## 3. Electrical Characteristics

### *3.1. Example Bi Module Electrical Specifications. For up to date specifications see www.prismsolar.com*

| | Bi60-368BTSC | Bi60S-343BSTC | Bi72S-445BSTC | Bi48-292BSTC | Bi36-203BSTC |
|---|---|---|---|---|---|
| **Front PWR (STC) [W]** | 290 | 270 | 350 | 230 | 160 |
| **Back PWR (STC) [W]** | 261 | 243 | 315 | 207 | 144 |
| **BSTC (+300 W/m$^2$) [W]** | 368 | 343 | 445 | 292 | 203 |
| **Cells** | 60 | 60 | 72 | 48 | 36 |
| **Cells/Diode** | 20 | 20 | 24 | 16 | 18 |
| **Active Diodes** | 3 | 3 | 3 | 3 | 2 |
| **Power/Cell [W]** | 4.83 | 4.5 | 4.86 | 4.79 | 4.5 |
| **Vmp [V]** | 32.4 | 31.7 | 38.9 | 25.9 | 19.0 |
| **Imp [A]** | 8.95 | 8.52 | 9.0 | 8.87 | 8.41 |
| **Voc [V]** | 40.2 | 38.8 | 48.3 | 32.2 | 23.3 |
| **Isc [A] @STC** | 9.48 | 8.98 | 9.53 | 9.39 | 8.87 |
| **Isc [A] @BSTC** | 12.0 | 11.4 | 12.1 | 11.9 | 11.3 |
| **L (mm)** | 1695.0 | 1656.0 | 1979 | 1695.0 | 1613.0 |
| **W (mm)** | 984.0 | 984.0 | 984.0 | 984.0 | 762.0 |
| **Efficiency [%]** | 17.4% | 16.6% | 18.0% | 13.8% | 13.1% |
| **BSTC Efficiency [%]** | 22.0% | 21.0% | 22.9% | 17.5% | 16.7% |
| **Power Tolerance [%]** | -1.5%/+3% | +10% | -1.5%/+3% | -1.5%/+3% | +10% |
| **Electrical Par. Toler. [%]** | +/- 6% | +/- 10% | +/- 6% | +/- 6% | +/- 10% |

Maximum System voltage of 1000VDC (UL/IEC)
Series fuse rating/limiting reverse current: 20A
See module specifications (www.prismsolar.com/our-products/) or contact Prism Solar (www.prismsolar.com/contact-us/) for specific module power classes.
Specifications may change without notice. Under normal conditions, a bifacial module is likely to experience conditions that produce more current and/or voltage than reported at standard test conditions. Accordingly, the values of $I_{sc}$ (STC) and $P_{max}$ (STC) marked on these modules should be multiplied by a factor of 127% for determining component ratings, conductor ampacities, and fuse sizes connected to the PV output. This 127% is based on STC conditions plus an additional 300W/m^2 to the backside of the module. Refer to Section 690-8 of the NEC for an additional multiplying factor of 125%, which may be applicable.

**Under standard test conditions (irradiance of 1000 W/m2, AM 1.5 spectrum, and a cell temperature of 25 °C), the electrical characteristics of the modules shall meet the manufacturer's stated accuracy and tolerance for short-circuit current (Isc), rated open-circuit voltage (Voc), and maximum power (Pmax).**

3.2. Fire Rating
IEC/UL (1000V) Dual Rated modules have a classifications of Spread of Flame=A, Burning brand=A, and Type 13 Fire Safety Class.
All modules are Application Class A.

The fire rating of this module is valid only when mounted in the manner specified in the mechanical mounting instructions. For a non-integral module installations such as roofs, the PV module/support assembly is to be mounted over a fire resistant roof covering rated for the application. A slope lesser than 5 in/ft. (127 mm/305 mm) is required to maintain a fire class rating.

## 4. Electrical Connections

**CAUTION: System design should consider the potential increased power output (Pmax) and current (Isc) due to the modules bifacial abilities. For more details on the additional Power and Energy generation of Prism Solar modules, please see the Prism Solar Design guide available by contacting us (www.prismsolar.com/contact-us/). Additional power and currents beyond the STC rating are possible. See the Electrical Specifications section and the Prism Solar design guide for additional power and current specifications. All protections, wiring, equipment ratings, and inverters should be sized accordingly to the product ratings, maximum expected output and required protection factors.**

### *4.1. Grounding*

Prism frameless modules do not require equipment grounding. All additional grounding should be performed in accordance with the National Electric Code (NEC) in the US, or the Canadian Electric Code (CEC) in Canada and any additional applicable codes or authorities having jurisdiction (AHJ). Prism Solar modules shall not be installed under a positive grounding scheme, which is defined as those in which the PV module cells are at a lower electrical potential than their surroundings. To reduce the effects of Potential Induced Degradation (PID), maintain electrical isolation between the module and any racking/mounting systems.

Module racking shall comply with all grounding requirements set forth in the applicable national or local electrical codes, and any other additional applicable codes or guidelines set by authorities having jurisdiction (AHJ).

### *4.2. Wiring*

- All wiring should be in accordance with applicable electrical codes.
- All wiring should be in accordance with the National Electric Code (NEC) in the US or the Canadian Electric Code (CEC) in Canada
- Use copper wire only, #12 AWG minimum, insulated to 90$^{o}$C minimum, a minimum of #10 AWG PV wire is recommended in situations with a significant bifacial contribution. Please see the design guide for Energy/Power estimations based on installation conditions.
- Use a minimum wire bend radius of 2 inches/50mm, or as specified by code.

### *4.3. Connectors*

All modules are supplied with Tyco PV4 connectors. DO NOT disconnect modules when under load. Follow the PV connector manufacturer's interconnection and wire management recommendations.

### *4.4. Series Connections*

To obtain the desired system voltage, the modules can be wired in series. Do not exceed the maximum system voltage stated in the Electrical Specifications section.

### *4.5. Parallel Connections*

To obtain the desired system current, the modules may be wired in parallel. Fusing of each series of string may be required. See the Electrical Specifications section for the maximum series fuse allowed.

## 5. Module Mounting & Installation

### *5.1. Application Class*

These modules are intended for Application Class A

### *5.2. PV Concentrated Light*

The modules are not intended for use in PV concentration systems.

### *5.3. Maximizing Power Output*

- Avoid shading the back side of the module by the support rack.
- Mount modules over highly reflective surfaces, such as a white roof or white ground surface covering.
- Elevate and tilt the modules above the mounting surface a much as possible.
- See the Prism Solar Design Guide for details on how to maximize the systems output.

### *5.4. Operating Temperature*

Prism modules are designed to operate in the following temperature range: -40ºC to 85ºC (-40ºF to 185ºF)

### *5.5. Mechanical Loading*

5.5.1. Standard four point mounting (see section 5.7)

Maximum mechanical loading of:

- 4 Point with 80mm clamps: 2400Pa (snow)/2400Pa (wind).
- 4 Point with 120mm clamps: 5400Pa (snow)/2400Pa (wind).

* All Racking, clamps, rails, and support systems must meet mechanical loading specifications of the specific configuration and the application's load requirements as specified in PV codes such as UL1703/UL2703/UL3703/IEC61215/IEC61730, other local codes, and ordinances, guidelines, or regulations established by authorities having jurisdiction (AHJ). All mechanical loads and site conditions must be checked and approved by the racking supplier and the local authority having jurisdiction.

### *5.6. Excluded Operating Conditions*

Prism Modules are not designed to operate where the module are exposed to continuous high humidity, high salinity conditions, abrasive conditions, corrosive conditions, or contaminant build up conditions. Prism Solar modules shall not be used under concentrated light conditions.

### *5.7. Standard Mounting with frameless/laminate module clamps:*

IMPORTANT: Prism modules are frameless, and require a frameless mounting system that attaches the module with an isolating material designed to interface with glass surfaces such as EPDM, UV stabilized rubber, etc. The mounting system should not impede water shedding and must provide adequate ventilation and airflow to prevent excessive operating temperatures.

CAUTION: Do not allow the modules/glass to come into direct contact with cement, tile, metal or other hard, abrasive or conductive surfaces, as they might damage the frameless module.

Module clamp systems which comply include, but are not limited to: Schletter Profi Middle Clamp and Profi End Clamp, S:FLEX 80/120/200mm laminate clamps; Mounting Systems/Haticon 80mm and 120mm laminate clamps, other laminate/frameless clamps can work if approved by their manufacturers for use with 7.2mm thick modules and rated for the appropriate weight load rating of the application. The module clamping system must overlap from the edge of the module by at least 10mm but should avoid shading the cells in the module. The applied torque used to attach the clamps to the module/racking should refer to the mechanical design standard for the specific bolt in use. Prism Solar recommends a minimum of a M8 (or equivalent) bolt.

For 4 point mounting, the center of the 4 mounting clamps should be located at the quarter points (1/4 points ±5%) of the longest sides of the modules. For example, the quarter points are 16.7in/424mm ± 3.3in/85mm from the short edge of the module, along the long edge for the Bi60/Bi48 module. See Figure 1 for an example of 4 sided mounting with a Bi60/Bi48 sized module. All racking, loads and site conditions must be checked and approved by the racking supplier and the local authority having jurisdiction.

Do not grip modules on the shorter dimension without properly supporting the module in the longer dimension. Depending on local snow and wind conditions, more than 4 clamps may be needed to ensure that the modules can withstand the expected load. For loads larger than 2400Pa, ensure that each clamp has a minimum length of 120mm. Do not use clamps with a length smaller than 80mm unless approved by Prism Solar and the authority having jurisdiction for your particular application/case.

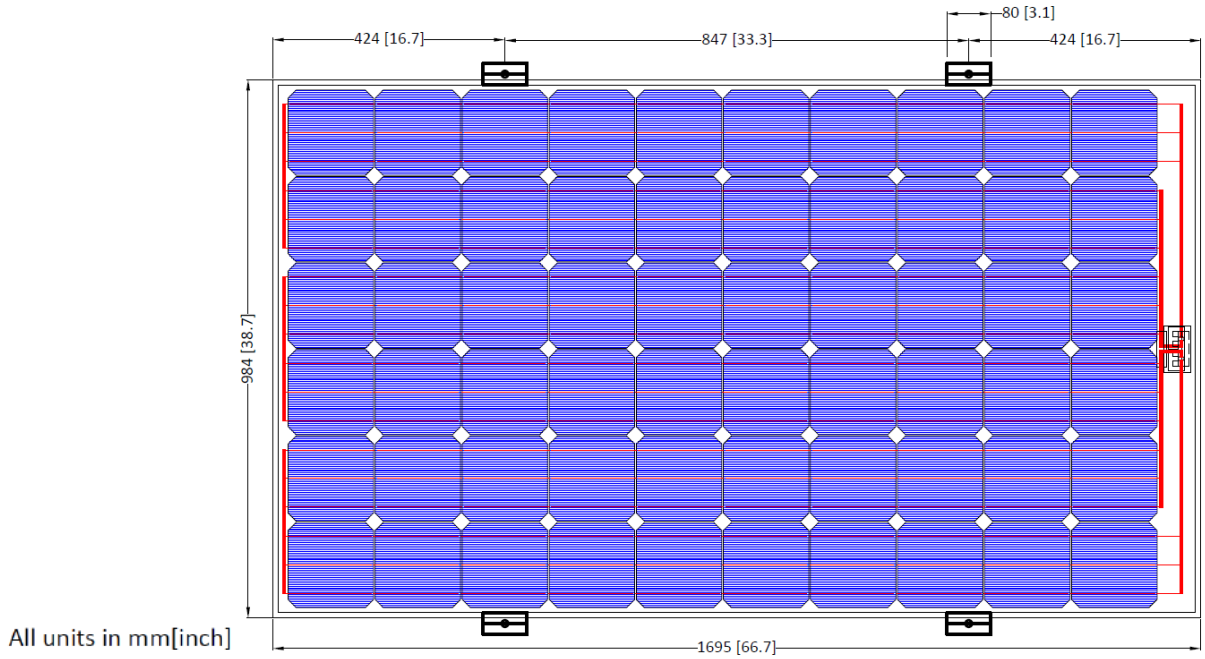


Figure 1. Example of 4 point mounting with a Bi60/Bi48 sized module. The ¼ points are located 16.7in/424mm ± 3.3in/85mm from the short edge of the module. The center of the clamp should fall within the allowable ¼ point tolerance.

When installing modules in an array, please allow for a minimum lateral air gap of at least 10mm or 3/8" between the exposed edges of the adjacent modules to account for thermal expansion and contraction of PV system elements in the field.

For a non-integral module installations such as roofs, the PV module/support assembly is to be mounted over a fire resistant roof covering rated for the application and all mechanical connections shall comply with section 5.5.1 and the local authority having jurisdiction.

The mounting system shall comply with all grounding and wiring requirements set forth in the applicable electrical codes, or any other codes or regulations required by the authorities having jurisdiction.

### *5.8. Continuous Mounting (Carports, Canopies, BIPV, etc.)*

For a continuous mounting system (one that uses the entire perimeter of the module, such as a skylight, water tight carport or awning) the mounting surfaces should:

- Prism modules are frameless, and require a frameless mounting system that attaches the module with an isolating material designed to interface with glass surfaces such as EPDM, UV stabilized rubber, etc., and firmly clamp and hold the entire perimeter of the module, on both the front and back of the module.
- The module shall be fully supported by at least 10mm from the edge on all sides of the module.
- Any shading or covering of the cells in the module must be avoided.
- The mounting system should prevent water or debris accumulation at the edges of the module through water management/design.
- The mounting system should provide adequate ventilation and airflow to prevent excessive operating temperatures.
- Any shading or covering of the cells in the module must be avoided.
- The mounting system shall comply with all grounding and wiring requirements set forth in the applicable electrical codes, or any other codes or regulations required by the authorities having jurisdiction.

## 6. Maintenance

- Inspect all modules annually for any damage or loose electrical connections.
- When modules become dirty or soiled, clean with a soft cloth and water. A mild detergent may also be used. Do not use an abrasive pad, abrasive cleaners or scrapers for cleaning.
- The timeframe between module cleaning will depend on local and installation conditions such as weather and installation angle.
- If any module becomes broken or compromised in the field, de-electrify the system, and replace the module immediately.

## 7. Guidelines for Handling Tempered Glass

- Wear safety glasses and safety gloves.
- Do not rest or install the modules/glass directly onto cement, tile, metal or any other hard surface.
- Prevent all edges and corners from coming into contact with any hard surfaces, materials or debris.
- Make sure that the installer removes or covers hard objects from in his person; such objects might otherwise come into contact with the module/glass surfaces and edges and cause

breakage. These objects can include but are not limited to: rings and jewelry, metallic belt buckles, keys and other metal or hard objects.

- Use suction cups or other specialized glass handling equipment to aid in lifting and moving the modules/glass, as temperatures permit.
- Inspect and clean any surface that will contact the module/glass. Small point-loads, like those caused by small rocks, debris or other small matter are more likely to cause shattering.
- Do not handle modules/glass under wind or wet conditions.
- Do not stack modules/glass or allow the edges of modules to come into contact with each other.

*Please follow all instruction in this document and module specifications, failure to comply with these guidelines may results in the loss of your product warranty or may cause risk/injury to property or persons.*

**Public revision History:**

- Version 1 – April 2012.
- Revision 1.2 – July 2012.
- Revision 1.3 – November 2012.
- Revision 1.5 – January 2013.
- Revision 2.0 – September 2013.
- Revision 2.1 – November 2013.
- Revision 2.2 – November 2014.
- Revision 2.4 – December 2014.
- Revision 2.5X – February/March 2015.
- Revision 2.6X – April 2015.
- Revision 3.0 and 3.01 – June/July 2015.
- Revision 3.02 – July 2016.
- Revision 3.03 – Feb 2017.
- Revision 3.04 – April 2017.