CanadianSolar

INSTALLATION MANUAL OF BIFACIAL MODULE

For professional use only

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1.0
GENERAL INFORMATION

This general manual provides important safety information relating to the installation, maintenance and handling of bifacial double glass solar modules. Professional installer must read these guidelines carefully and strictly follow these instructions. Failure to follow these instructions may result in death, injury or property damage. The installation and handling of PV modules requires professional skills and should only be performed by qualified professionals. Installers must inform end -users (consumers) the aforesaid information accordingly.

The word “module” or “PV module” used in this manual refers to one or more double glass solar modules. This manual is only valid for the bifacial double glass module type CS3U-MB-FG, CS3K-MB-FG, CS3U-MB-AG, CS3K-MB-AG, CS3U-PB-FG, CS3K-PB-FG, CS3U-PB-AG and CS3K-PB-AG. Please retain this manual for future reference.

We recommend visiting www.canadiansolar.com regularly for the most updated version of bifacial module installation manual.

1.1
INSTALLATION MANUAL DISCLAIMER

The information contained in this manual is subject to change by Canadian Solar Inc. without prior notice. Canadian Solar Inc. gives no warranty of any kind whatsoever, either explicitly or implicitly, with respect to the information contained herein.

In the event of any inconsistency among different language versions of this document, the English version shall prevail. Please refer to our product lists and documents published on our website at: http://www.canadiansolar.com as these lists are updated on a regular basis.

1.2 LIMITATION OF LIABILITY

Canadian Solar Inc. shall not be held responsible for damages of any kind, including– without limitation – bodily harm, injury or damage to property, in connection with handling PV modules, system installation, or compliance or non-compliance with the instructions set forth in this manual.

2.0 SAFETY PRECAUTIONS

Warning: Before attempting to install, wire, operate and/or service the module and other electrical equipment, all instructions should be read and understood. PV module interconnectors pass direct current (DC) when exposed to sunlight or other light sources. Contact with electrically active parts of the module, such as terminals, can result in injury or death, irrespective of whether or not the module and the other electrical equipment have been connected.

Avertissement: Toutes les instructions devront être lues et comprises avant de procéder à l’installation, le câblage, l’exploitation et/ou l’entretien des panneaux. Les interconnexions des panneaux conduisent du courant continu (CC) lorsque le panneau est exposé à la lumière du soleil ou à d’autres sources lumineuses. Tout contact avec des éléments sous tension du panneau tels que ses bornes de sortie peut entraîner des blessures ou la mort, que le panneau soit connecté ou non.

GENERAL SAFETY

- All Modules must be installed by licensed electricians in accordance with the applicable electrical codes such as, the latest National Electrical Code (USA) or Canadian Electric Code (Canada) or other national or international electrical codes.

Protective clothing (non-slip gloves, clothes, etc.) must be worn during installation to prevent direct contact with 30 V DC or greater, and to protect hands from sharp edges.

Prior to installation, remove all metallic jewelry to prevent accidental exposure to live circuits.

When installing modules in light rain, morning dew, take appropriate measures to prevent water ingress into the connector.

Do not allow children or unauthorized persons near the installation site or module storage area.

- Use electrically insulated tools to reduce the risk of electric shock.

- If the disconnects and over current protective devices (OCPD) cannot be opened or the inverter cannot be powered down, cover the fronts and backs of modules in the PV array with an opaque material to stop the production of electricity when installing or working on

a module or wiring.

- **Do not** install modules in strong wind.
- **Do not** use or install broken modules.
- **Do not** contact module surface if the front or rear glass is broken. This may cause electric shock.
- **Do not** open the cover of the junction box at any time.
- **Do not** attempt to repair any part of the PV module. The module does not contain any serviceable parts.
- **Do not** disassemble a module or remove any module part.
- **Do not** artificially concentrate sunlight on a module.
- **Do not** connect or disconnect modules when current from the modules or an external source is present.

3.0 MECHANICAL / ELECTRICAL SPECIFICATIONS

Module electrical ratings are measured under Standard Test Conditions (STC) of 1000 W/m^2 irradiance, with an AM 1.5 spectrum, and a cell temperature of 25°C. Detailed electrical and mechanical characteristics of Canadian Solar Inc. crystalline silicon PV modules can be found in Annex A (Mechanical And Electrical Ratings). Main electrical characteristics under STC are also stated on each module label. Please refer to the datasheet or the product nameplate for the maximum system voltage.

Under certain conditions, a module may produce higher current or voltage than its STC rated power. As a result, a module open-circuit voltage and short-circuit current under STC should be multiplied by 1.25 when determining component voltage ratings, conductor ampacities, overcurrent device ratings, and the size of controls connected to the PV output. For Bifacial modules, the operating current is related to specific mounting conditions, and will vary under different module mounting height and albedo of ground surface. A higher multiplier than 1.25 may be considered by system design engineers according to relevant design codes and system simulation results.

An additional 1.25 multiplier for the short-circuit current (giving a total multiplier of 1.56), may be applicable when sizing conductors and fuses, as described in section 690-8 of U.S. NEC. Electrical calculations and design must be performed by competent engineer or consultant.

TABLE 1: LOW TEMPERATURE CORRECTION FACTORS FOR OPEN-CIRCUIT VOLTAGE

Lowest Expected Ambient Temperature (°C/°F)	Correction Factor
24 to 20 / 76 to 68	1.02
19 to 15 / 67 to 59	1.04
14 to 10 / 58 to 50	1.06
9 to 5 / 49 to 41	1.08
4 to 0 / 40 to 32	1.10
-1 to -5 / 31 to 23	1.12
-6 to -10 / 22 to 14	1.14
-11 to -15 / 13 to 5	1.16
-16 to -20 / 4 to -4	1.18
-21 to -25 / -5 to -13	1.20
-26 to -30 / -14 to -22	1.21
-31 to -35 / -23 to -31	1.23
-36 to -40 / -32 to -40	1.25

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Alternatively, a more accurate correction factor for the open-circuit voltage can be calculated using the following formula:

$$C_{VOC} = 1-\alpha_{Voc} \times (25 - T)$$

T is the lowest expected ambient temperature at the system installation site

α_{Voc} (%/°C) is the voltage temperature coefficient of the selected module (refer to corresponding datasheet)

Electrical calculations and design must be performed by competent engineer or consultant.

4.0 UNPACKING AND STORAGE

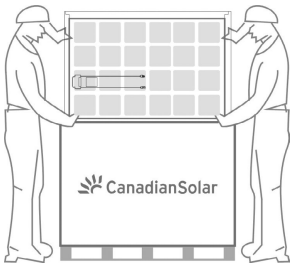
NOTICE

PRECAUTIONS

- Modules should be stored in a dry and ventilated environment to avoid direct sunlight and moisture. If modules are stored in an uncontrolled environment, the storage time should be less than 3 months and extra precautions should be taken to prevent sunlight exposure to modules ormoisture exposure to connectors. Specific T4 connector endcaps are available on request.

- Unpack module pallets carefully, following the steps shown on the pallet. Unpack, transport and store the modules with care.

- Modules must always be unpacked and installed by two people. Always use both hands when handling modules.



- **Do not** lift modules by their wires or junction box.

- **Do not** stack the modules.

- **Do not** place excessive loads on the module or twist the module.

- **Do not** stand, step, walk and/or jump on modules under any circumstances. Localized heavy loads may cause severe micro-cracks at cell level, which in turn may compromise module reliability and void Canadian Solar Inc's warranty.

- **Do not** carry modules on your head.

- **Do no**t drop or place objects (such as tools) on the modules.

- **Do not** use sharp instruments on the modules.

- **Do not** leave modules unsupported or unsecured.

- **Do not** change the wiring of bypass diodes.

- Keep all electrical contacts clean and dry at all times.

PRODUCT IDENTIFICATION

- Each module has two identical barcodes (one inside the laminate under the front glass, the second on the rear side of the module) that act as a unique identifier. Each module has a unique serial number containing 14 digits.

- A nameplate is also affixed to the rear glass of each module. This nameplate specifies the model type, as well as the main electrical and safety characteristics of the module.

5.0 MODULE INSTALLATION

PRECAUTIONARY MEASURES AND GENERAL SAFETY

- Prior to installing modules please obtain information about any requirements and necessary approvals for the site, installation and inspection from the relevant authorities.

- Check applicable building codes to ensure that the

construction or structure (roof, facade, support, etc.) can bear the module system load.

· Canadian Solar Inc. double glass solar modules have been qualified for Application Class A (equivalent to Safety Class II requirements). Modules rated under this class should be used in systems operating at voltage above 50V or power above 240W, where general contact access is anticipated.

· Canadian Solar Inc. double glass modules have been certified by CSA as Type 3 or Type 13 and by VDE as Class A for fire performance, please refer to the datasheet or the product nameplate for the detailed types.

· Consult your local authority for guidelines and requirements for building or structural fire safety.

UL 1703 SYSTEM FIRE RATING REQUIREMENTS

· The fire rating for this module is only valid when the product is installed as specified in the mechanical mounting instructions.

· When installing the modules on a rooftop, ensure the assembly is mounted over a fire resistant roof covering rated for the application.

· A photovoltaic system composed of UL1703 certified modules mounted on a UL2703 certified mounting system should be evaluated in combination with roof coverings in accordance with UL1703 standard, with respect to meeting the same fire classification as the roof assembly.

· Mounting systems with a System Fire Class Rating (Class A, B or C), tested in conjunction with fire rated “Type 3” or “Type 13” rated modules, are considered acceptable for use with Canadian Solar Inc. modules, provides the mounting system does not violate any other requirements of this manual.

· Any mounting system limitations on inclination or accessories required to maintain a specific System Fire Class Rating should be clearly specified in the installation instructions and UL2703 certification of the mounting system supplier.

ENVIRONMENTAL CONDITIONS

· The module is intended for use in general open-air climates, as defined in IEC 60721-2-1: Classification of environmental conditions Part 2-1: Environmental conditions appearing in nature - temperature and humidity.

· Please consult the Canadian Solar Inc. technical support department for more information on the use of modules in special climates.

· Do not install modules near open flames or flammable materials.

· Do not immerse modules in water or constantly expose modules to water (neither fresh nor salt) (i.e. from fountains, sea spray).

· Exposing modules to salt (i.e. marine environments) or sulfur (i.e. sulfur sources, volcanoes) incurs the risk of module corrosion.

· Failure to comply with these instructions will void Canadian Solar Inc. warranty.

INSTALLATION REQUIREMENTS

· Ensure that the module meets the general technical system requirements.

· Ensure that other systems components do not damage modules mechanically or electrically.

· Modules can be wired in series to increase voltage or in parallel to increase current. To connect modules in series, connect the cables from the positive terminal of one module to the negative terminal of the next module. To connect in parallel, connect the cables from the positive terminal of one module to the positive terminal on the next module.

· Only connect the quantity of modules that corresponds to the voltage specifications of the inverters used in the system. Modules must NOT be connected together to create a voltage higher than the maximum permitted system voltage, even under the worst local temperature conditions.

· A maximum of two strings can be connected in parallel without using over-current protection device (fuses, etc.) incorporated in series within each string. Three of more strings can be connected in parallel if an appropriate and certified over-current protection device is installed in series with each string.

· Only modules with similar electrical outputs should be connected in the same series to avoid or minimize mismatch effects in arrays.

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- To minimize risk in the event of an indirect lightning strike, avoid forming loops when designing the system.

- The recommended maximum series fuse rating is stated in a table in the Annex.

- Modules should be safely fixed to bear all expected loads, including wind and snow loads.

- A minimum clearance of 10 mm (0.394 in) or more between modules is required to allow for thermal expansion of the modules. The clearance is from the plastic corner protector to adjacent plastic corner protector.

AVOID SHADING

- Even minor partial shading (e.g. from dirt deposits) reduces yields. A module can be considered to be unshaded if its entire surface is free from shading all year round. Sunlight shall be able to reach the module even on the shortest day of the year.

- Under the premise of assuring maximum power generating of the front side, obstacles shall be avoid as much as possible between modules and mounting ground.

- Permanent shading conditions can affect module service lifetime, due to accelerated ageing of the encapsulation material and thermal stress on the bypass diodes.

RELIABLE VENTILATION

- Bifacial double glass modules need to obtain direct, reflected, or diffuse sunlight on the backside to generate additional power. Therefore, bifacial modules are not suggested to be used in building attached photovoltaic systems (BAPV). If BAPV, or similar mounting is still required, sufficient clearance at least 10 cm (3.94 in) between the module and the mounting surface needs to be provided to allow cooling air to circulate around the back of the module. This also allows condensation or moisture to dissipate.

- According to UL 1703, any other specific clearance required for maintaining a system fire rating should prevail. Detailed clearance requirements pertaining to system fire ratings must be provided by your racking supplier.

5.1
MODULE WIRING

CORRECT WIRING SCHEME

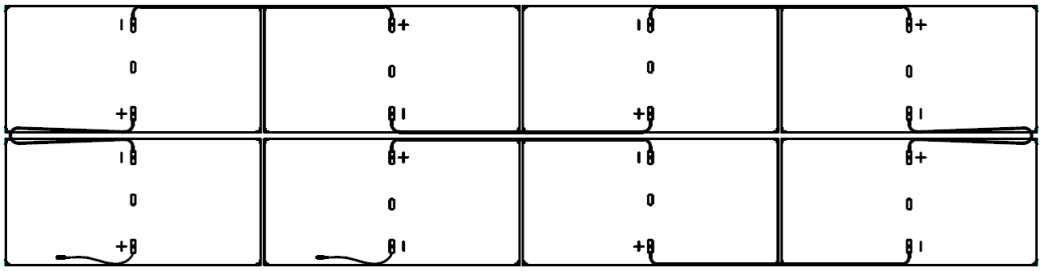
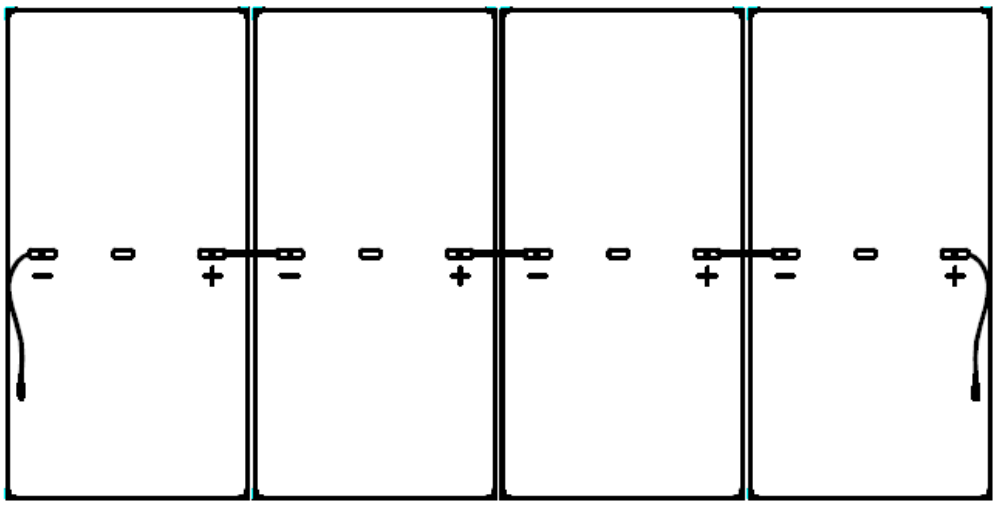
- Ensure that the wiring is correct before starting up the system. If the measured open circuit voltage (Voc) and short-circuit current (Isc) differ substantially from the specifications, this indicates that there is a wiring fault.

- When modules have been pre-installed but the system has not been connected to the grid yet, each module string should be kept under open-circuit conditions and proper actions should be taken to avoid dust and moisture penetration inside the connectors.

- For CS3U and CS3K series modules, Canadian Solar Inc. offers recommended and optional cable specifications to match various system configurations, which are shown in table 3:

- Cables should always be fastened on module frames or mounting rails, in order to avoid shading on module rear side.

TABLE 2:
SYSTEM CABLE CONFIGURATION FOR CS3U AND CS3K MODULES

Module types	Recommended cables
CS3U-MB-FG CS3K-MB-FG CS3U-MB-AG CS3K-MB-AG CS3U-PB-FG CS3K-PB-FG CS3U-PB-AG CS3K-PB-AG	 Landscape installation two rows: CS3U Cable length per lead= 1250 mm CS3K Cable length per lead=1160 mm **NOTICE** Adjacent modules need to be rotated 180 degrees for proper installation.
	 Portrait installation one row: CS3U & CS3K cable length per lead is 400 mm (+), 200 mm (-)

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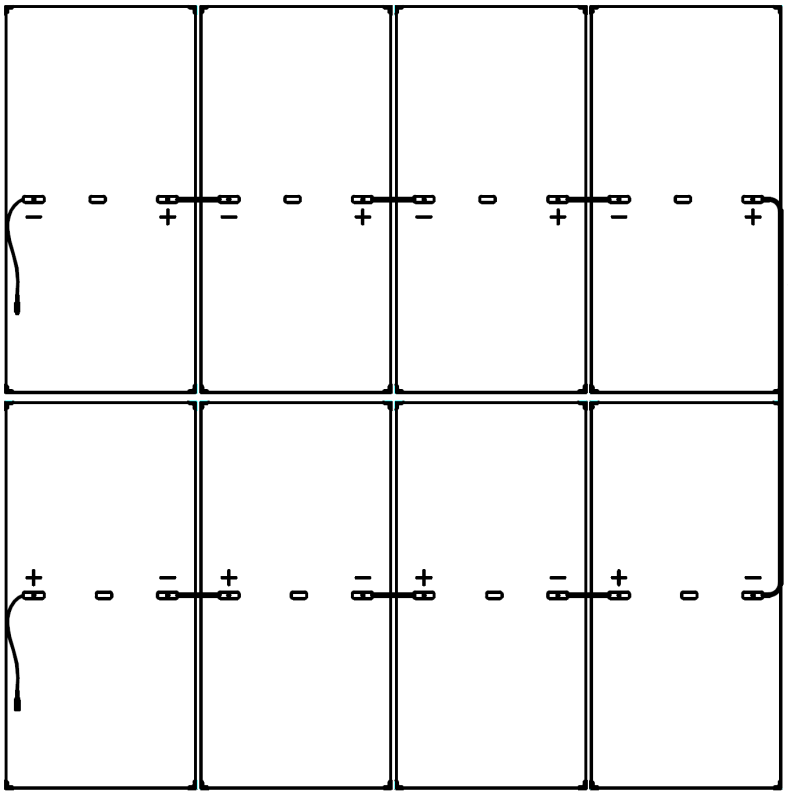
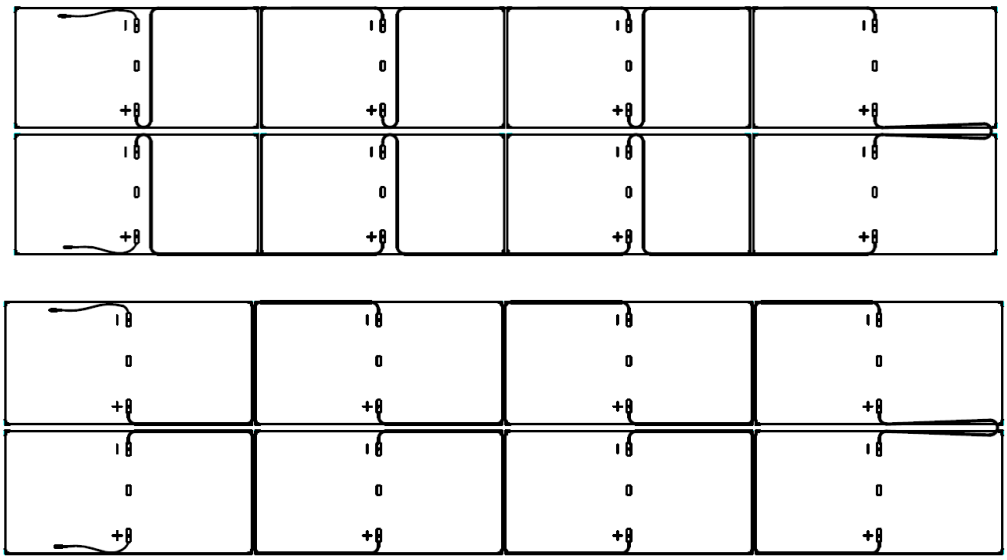
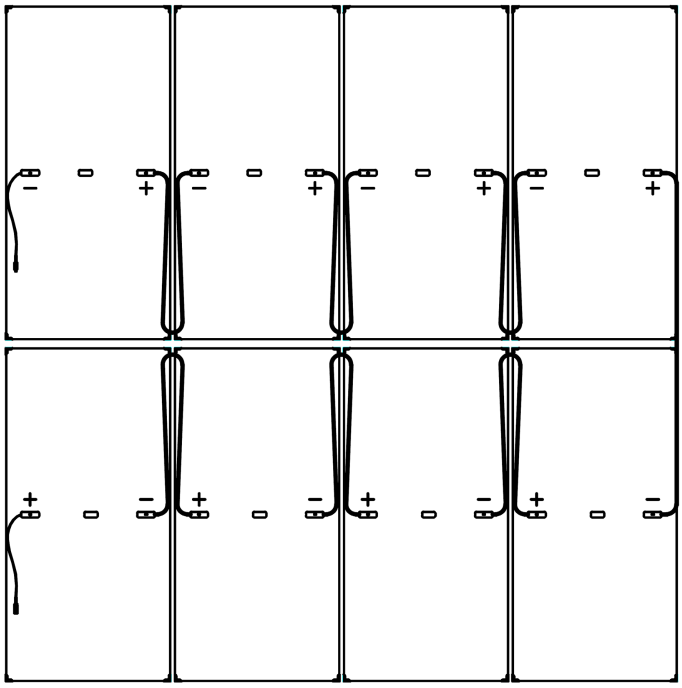
Module types	Recommended cables (continued)
CS3U-MB-FG CS3K-MB-FG CS3U-MB-AG CS3K-MB-AG CS3U-PB-FG CS3K-PB-FG CS3U-PB-AG CS3K-PB-AG	
	Portrait installation two rows: **CS3U** cable length = 400 mm (+) +200 mm (-) +1800 mm cable jumper **CS3K** cable length = 400 mm (+) +200 mm (-) +1400 mm cable jumper ***NOTICE*** Modules in adjacent rows should be rotated 180 degrees for proper installation.

Module types	Recommended cables (continued)
CS3U-MB-FG CS3K-MB-FG CS3U-MB-AG CS3K-MB-AG CS3U-PB-FG CS3K-PB-FG CS3U-PB-AG CS3K-PB-AG	
	Landscape installation two rows: CS3U cable length per lead = 1650 mm **CS3K** cable length per lead = 1450 mm
	
	Portrait installation two rows: CS3U cable length = 1250 mm **CS3K** cable length = 1160 mm

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The maximum distance between two adjacent modules should be within 50 mm (1.96 in) for side with mounting clamps, and within 25 mm (0.98 in) for side without mounting clamps, in order to meet system cable scheme.

CORRECT CONNECTION OF PLUG CONNECTORS

- Make sure that all connections are safe and properly mated. The PV connectors should not be subjected to stress from the exterior. Connectors should only be used to connect the circuit. They should never be used to turn the circuit on and off.

- Connectors are not waterproof when unmated. When installing modules, connector should be connected to each other as soon as possible or appropriate measures should be taken to avoid moisture and dust penetrating into the connector (T4 endcaps).

USE OF SUITABLE MATERIALS

- Only use dedicated solar cable and suitable plugs (wiring should be sheathed in a sunlight-resistant conduit or, if exposed, should itself be sunlight-resistant) that meet local fire, building and electrical regulations. Please ensure that all wiring is in perfect electrical and mechanical condition.

- Installers may only use single-conductor cable listed and labeled as USE-2 or PV wire which is 90°C wet rated in North America, and single conductor cable, 4-16 mm² (5-12 AWG), 90°C wet rated in other areas (i.e. TUV 2PfG1169 or EN50618 approved), with proper insulation which is able to withstand the maximum possible system open-circuit voltage. Only copper conductor material should be used. Select a suitable conductor gauge to minimize voltage drop and ensure that the conductor ampacity complies with local regulations (i.e. NEC 690.8(D)).

CABLE AND CONNECTOR PROTECTION

- Secure the cables to the mounting system using UV-resistant cable ties. Protect exposed cables from damage by taking appropriate precautions (e.g. placing them inside a metallic raceway like EMT conduit). Avoid exposure to direct sunlight.

- A minimum bending radius of 60mm (2.36 in) is required when securing the junction box cables to the racking system.

- Protect exposed connectors from weathering damage by taking appropriate precautions. Avoid exposure to direct sunlight.

- Do not place connectors in locations where water could easily accumulate.

5.2 GROUNDING

- EQUIPMENT GROUNDING: Frameless bifacial double glass modules (CS3U-MB-FG, CS3K-MB-FG) do not present any exposed conductive parts, and therefore do not require to be electrically grounded for compliance to the North American National Electrical Code (NEC).

- For grounding requirements in North America, a module with exposed conductive parts is considered to comply with UL 1703 only when it is electrically grounded in accordance with both the instructions presented below and the requirements of the National Electrical Code. Any grounding means used with Canadian Solar Inc. modules should be NRTL certified to UL 467 and UL 2703 standards. Please consult our technical service team for the formal approval process.

- For grounding requirements in other areas, although the modules are certified to Safety Class II, we recommend them to be grounded and that module installation should comply with all applicable local electrical codes and regulations. Grounding connections should be installed by a qualified electrician. Connect module frames together using adequate grounding cables: we recommend using 4-14 mm² (AWG 6-12) copper wire. Holes provided for this purpose are identified with a grounding symbol ⏚ (IEC61730-1). All conductive connection junctions must be firmly fixed.

- Do not drill any extra ground holes for convenience this will void the modules warranty.

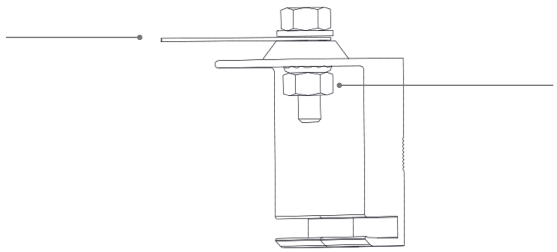
- All bolts, nuts, flat washers, lock washers and other relevant hardware should be made of stainless steel, unless otherwise specified.

- Canadian Solar Inc. does not provide grounding hardware.

- One grounding method is recommended for Canadian Solar Inc. standard modules, as described below. For alternative grounding methods, please refer to Annex B (Alternative Grounding Methods) of Installation Manual Annex of Alumium Frame Dymond Module on the website (www.canadiansolar.com). It is not possible to use standard grounding methods for certain module ranges.

GROUNDING METHOD:
BOLT + TOOTHED NUT + CUP WASHER.

1. To fix the wire between the flat washer and cup washer, place the cup washer (concave side up) between the frame and the wire.



2. Then tighten the bolt using the toothed nut.

- A grounding kit containing an M5 (3/16”) SS cap bolt, an M5 (3/16”) SS flat washer, an M5 (3/16”) SS cup washer, and an M5 (3/16”) SS nut (with teeth) is used to attach copper grounding wire to a pre-drilled grounding hole on the frame (see image above).

- Place the wire between the flat washer and the cup washer. Ensure that the cup washer is positioned between the frame and the wire with the concave side up to prevent galvanic corrosion. Tighten the bolt securely using the SS toothed nut. A wrench may be used to do this. The tightening torque is 3-7 Nm (2.2-5.2 ft-lbs).

6.0 MOUNTING INSTRUCTIONS

The applicable regulations pertaining to work safety, accident prevention and securing the construction site must be observed. Workers and third party personnel shall wear or install fall arrest equipment. Any third party need to be protected against injuries and damages.

- The mounting design must be certified by a registered professional engineer. The mounting design and procedures must comply with local codes and requirements from all relevant authorities.

- Canadian Solar Inc. does not provide mounting hardware.

- The loads described in this manual correspond to test loads. For installations complying with IEC 61215-2:2016 and UL 1703, a safety factor of 1.5 should be applied for calculating the equivalent maximum authorized design loads. Project design loads depend on construction, applicable standards, location and local climate. Determination of the design loads is the responsibility of the racking suppliers and/or professional engineers. For detailed information, please follow local structural code or contact your professional structural engineer.

- Use appropriate corrosion-proof fastening materials. All mounting hardware (bolts, spring washers, flat washers, nuts) should be hot dip galvanized or stainless steel.

- Use a torque wrench for installation.

- Do not drill additional holes or modify the module frame. Doing so will void the warranty.

- Install and tighten the module clamps to the mounting rails using the torque stated by the mounting hardware manufacturer. System designer and installer are responsible for load calculations and for proper design of support structure. It is recommended to use a torque wrench for installation. Tightening torques should respectively be within 17-23 Nm (12.5-17.0 ft-lb) for M8x1.25-Grade8.8 (5/16”-18 Grade B7) galvanized or A2-70 stainless steel coarse thread bolts, depending on bolt class. The yield strength of bolt and nut should not be less than 450 MPa.

- Clamp material should be anodized aluminum alloy or steel of appropriate grade. For frameless module used clamps, one buffer rubber material (Recommended material is EPDM) must be added between the clamp and the glass.

- Clamp positions are of crucial importance for the reliability of the installation, the clamp centerline must only be positioned within the authorized position ranges indicated below, depending on the configuration and load.

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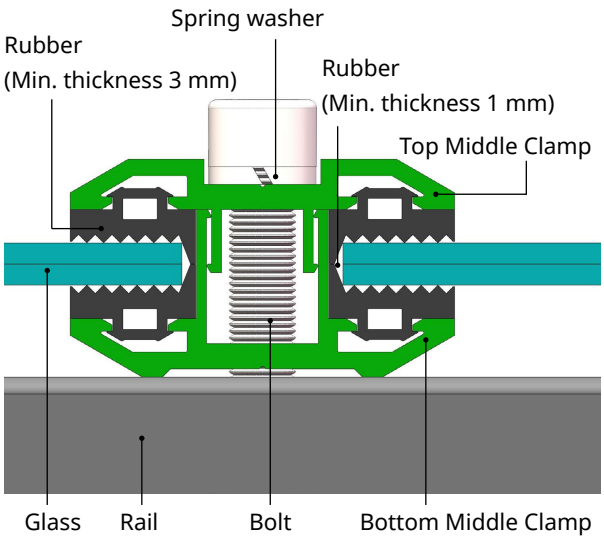
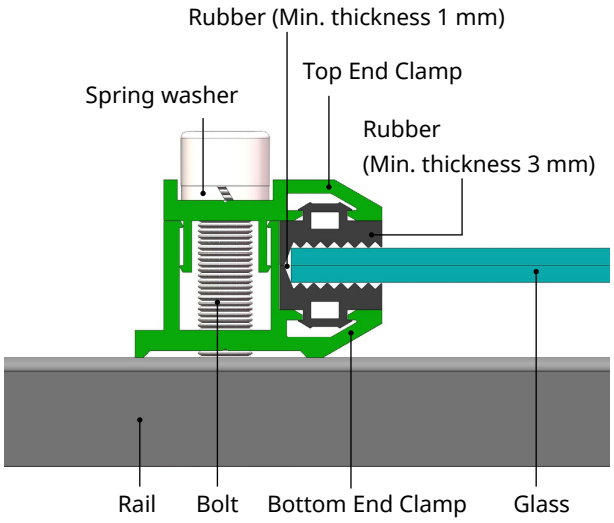
6.1
MOUNTING METHODS FOR FRAMELESS BIFACIAL DOUBLE GLASS MODULE (CLAMPING)

MIDDLE CLAMP:



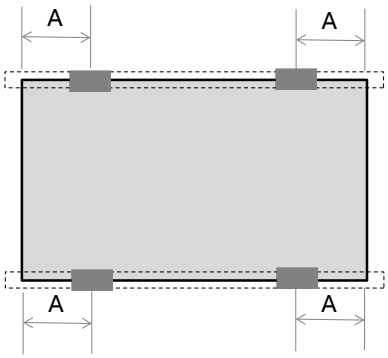
END CLAMP:



· The mounting methods have been qualified by Canadian Solar Inc., as well as certified by VDE and CSA.

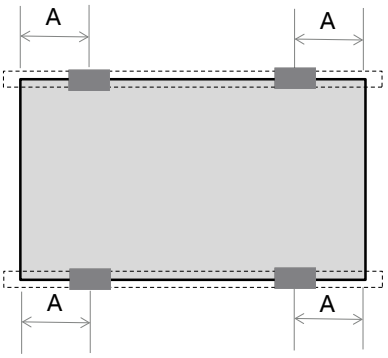
· Canadian Solar Inc. warranty may be void in cases where improper clamps or unsuitable installation methods are found. When installing clamps, take measures so as:

1. Not to bend the glass excessively.
2. Not to cast shadow on the cells.
3. Not to damage or scratch the surface of the glass.
4. To ensure the clamps overlap the module by 13 mm to 15 mm.
5. To ensure the minimum clamping clearance of the clamps ≤ 4 mm.
6. To ensure thickness of top and bottom rubber ≥ 3 mm, and side rubber thickness ≥ 1 mm.
7. The mounting rails shall be designed to limit as much as possible shade on module rearside cells.



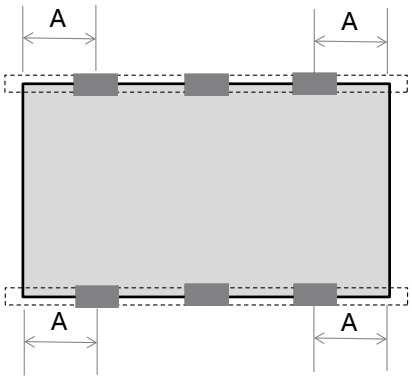
Use 4 clamps on the long side.
Mounting rails run parallel to the long side frame.

Clamp length ≥ 130 mm
A = 460 ± 20 mm
Maximum Load:
Uplift load ≤ 2400 Pa
Downforce load ≤ 2400 Pa



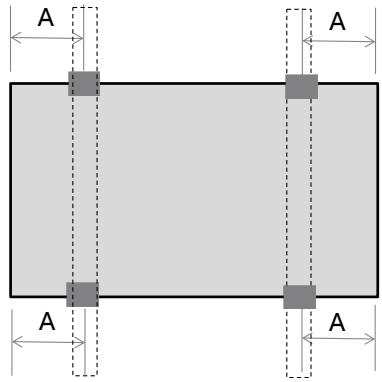
Use 4 clamps on the long side.
Mounting rails run parallel to the long side frame.

Clamp length ≥ 250 mm
A= 460 ± 20 mm
Maximum Load:
Uplift load ≤ 2400 Pa
Downforce load ≤ 3600 Pa



Use 6 clamps on the long side.
Mounting rails run parallel to the long side frame.

Clamp length ≥ 130 mm
A= 300 - 400 mm
Maximum Load:
Uplift load ≤ 2400 Pa
Downforce load ≤ 3600 Pa



Use 4 clamps on the long side.
Mounting rails run perpendicular to the long side frame.
(Keep suitable clearance between mounting rails and module back side)

Clamp length ≥ 250 mm
A= 460 ± 20 mm
Maximum Load:
Uplift load ≤ 2400 Pa
Downforce load ≤ 5400 Pa

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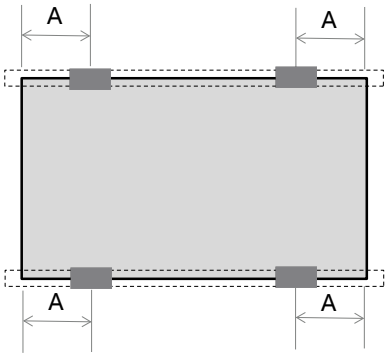
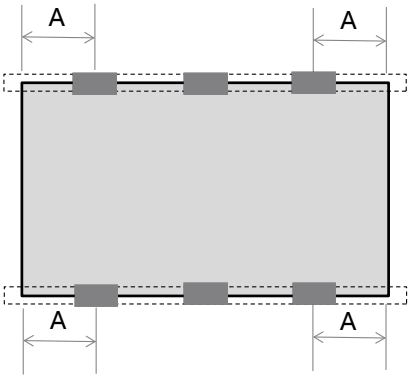


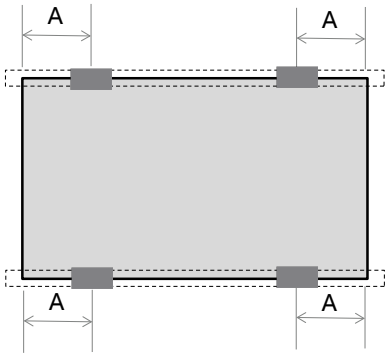
Use 4 clamps on the long side.
Mounting rails run parallel to the long side frame.

Clamp length ≥100 mm
A = 390 ± 20 mm
Maximum Load:
Uplift load ≤ 2400 Pa
Downforce load ≤ 2400 Pa



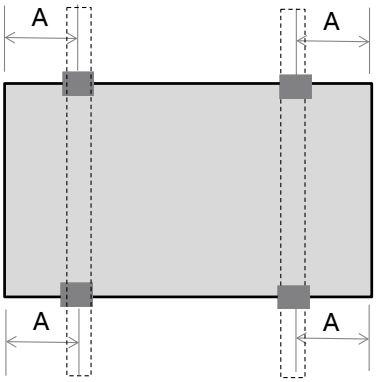
Use 6 clamps on the long side.
Mounting rails run parallel to the long side frame.

Clamp length ≥100 mm
A = 250 - 300 mm
Maximum Load:
Uplift load ≤ 2400 Pa
Downforce load ≤ 3600 Pa



Use 4 clamps on the long side.
Mounting rails run parallel to the long side frame.

Clamp length ≥ 200 mm
A = 390 ± 20 mm
Maximum Load:
Uplift load ≤ 2400 Pa
Downforce load ≤ 3600 Pa

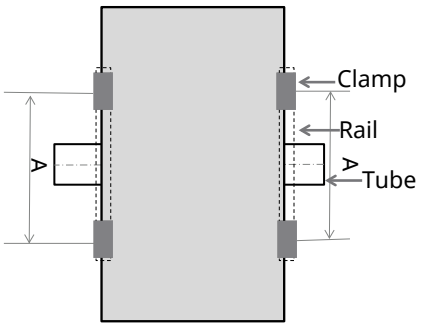


Use 4 clamps on the long side.
Mounting rails run perpendicular to the long side frame.
(Keep suitable clearance between mounting rails and module back side)

Clamp length ≥ 200 mm
A = 390 ± 20 mm
Maximum Load:
Uplift load ≤ 2400 Pa
Downforce load ≤ 5400 Pa

6.2 MOUNTING METHODS FOR FRAMELESS BIFACIAL DOUBLE GLASS MODULE (SINGLE-AXIS TRACKERS)

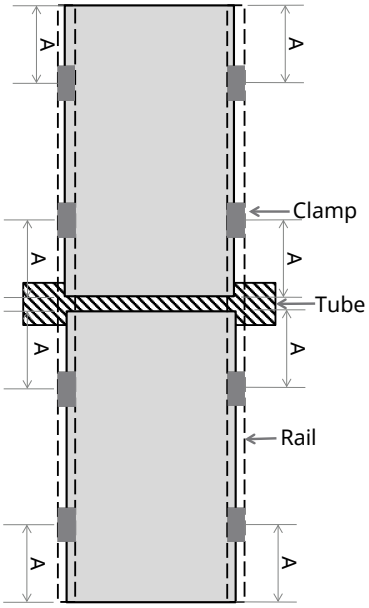
· The clamps used in this section should follow the requirements in 6.1.

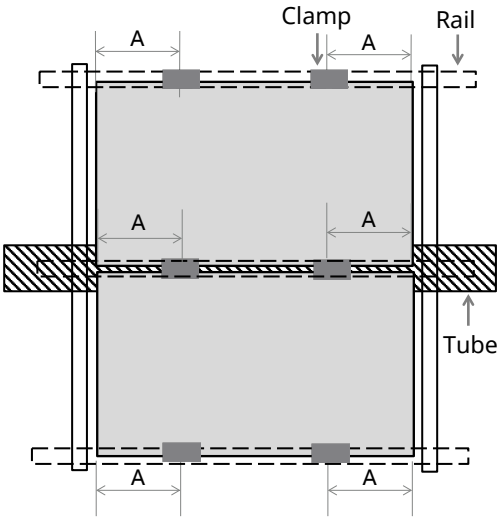


Use 4 clamps on the long side.
Mounting rails run parallel to the long side frame.
Mounting rails fixed on torque tube.

Clamp length ≥ 80 mm
A = 1000 mm
Maximum Load:
Uplift load ≤ 1650 Pa
Downforce load ≤ 1650 Pa

Clamp length ≥ 130 mm
A = 1000 mm
Maximum Load:
Uplift load ≤ 2400 Pa
Downforce load ≤ 2400 Pa





Two modules share one tube, portrait or landscape installation. Use 4 clamps on the long side of each module.
Mounting rails run parallel to the long side frame. Mounting rails fixed on torque tube (tracker).

Clamp length ≥ 130 mm
A = 460 ± 20 mm
Maximum Load:
Uplift load ≤ 2400 Pa
Downforce load ≤ 2400 Pa

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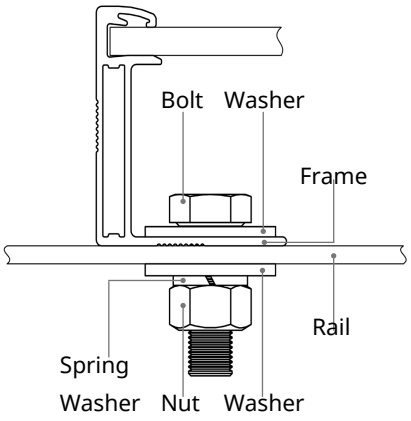
6.3 MOUNTING METHODS FOR FRAMED BIFACIAL DOUBLE GLASS MODULE (BOLTING)

- The mounting method has been qualified by Canadian Solar Inc., as well as certified by VDE and CSA.
- Modules should be bolted to support structures through the mounting holes in the rear frame flanges only.
- Each module must be securely fastened at a minimum of 4 points on two opposite sides.

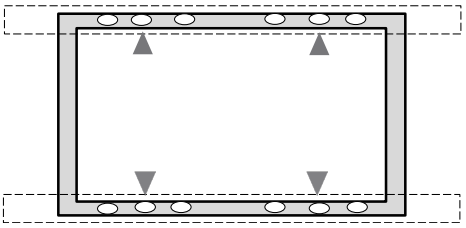
  M8 X 1.25 (5/16") bolt and nut should be used.

  The yield strength of bolt and nut should not be less than 450 MPa.
- Tightening torques should be within 17-23 Nm (12.5-17.0 ft-lbs) for M8 (5/16") coarse thread bolts, depending on bolt class.
- In areas with heavy wind loads, additional mounting points should be used. The system designer and the installer are responsible for calculating the load and ensuring that the support structure meets the requirements.



- Modules should be bolted at the following hole locations depending on the configuration and load:

CS3U-MB-AG, CS3K-MB-AG, CS3U-PB-AG, CS3K-PB-AG



Bolting on long frame side using four innermost mounting holes
Mounting rails run parallel to the long frame side

Maximum Load:
Uplift load ≤ 2400 Pa
Downforce load ≤ 5400 Pa

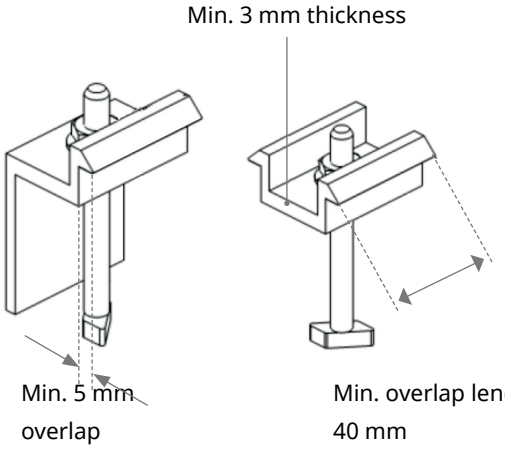
6.4 MOUNTING METHODS FOR FRAMED BIFACIAL DOUBLE GLASS MODULE (CLAMPING)

- The mounting method has been qualified by Canadian Solar Inc. as well as certified by VDE and CSA.
- Each module must be securely fastened at a minimum of four points on two opposite sides. The clamps should be positioned symmetrically. The clamps should be positioned according to the authorized position ranges defined in table below. Install and tighten the module clamps to the mounting rails using the torque stated by the mounting hardware manufacturer. M8 X 1.25 (5/16") bolt and nut are used for this clamping method. The yield strength of bolt and nut should not be less than 450MPa.
- Tightening torques should be within 17-23 Nm (12.5-17.0 ft-lbs) for M8 (5/16"-18 Grade B7) coarse thread bolts, depending on the bolt class. For the bolt grade, the technical guideline from the fastener suppliers should be followed. Different recommendations from specific clamping hardware suppliers should prevail.
- The system designer and installer are responsible for load calculations and for proper design of support structure.
- The mounting rails shall be designed to limit as much as possible shade on module rear side cells
- Canadian Solar Inc.'s warranty may be void in cases where improper clamps or unsuitable installation methods are found. When installing inter-modules or end-type clamps, the clamps must:

  1. Not bend the module frame
  2. Not touch or cast shadows on the front glass
  3. Not damage the surface of the frame (to the exception of the clamps with bonding pins)
  4. Ensure to overlap the module frame by at least 5 mm

(0.2 in)

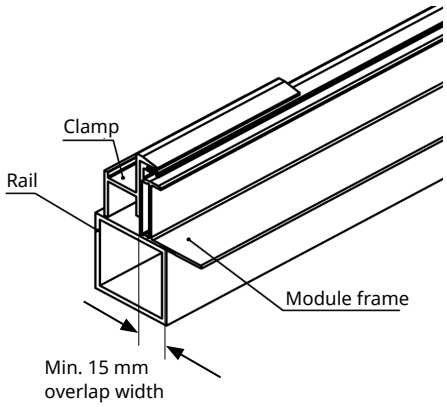
5. Ensure to overlap in length by at least 80 mm (3.15 in) when uplift load ≤ 4000 Pa, 40 mm (1.57 in) when uplift load ≤ 2400 Pa.
6. Ensure clamps to have a thickness of at least 3 mm (0.12 in)



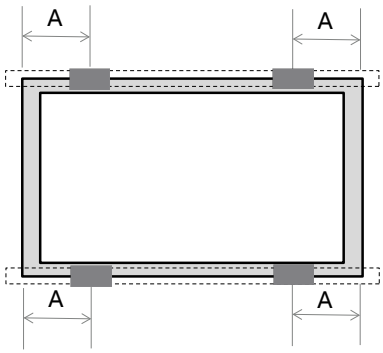
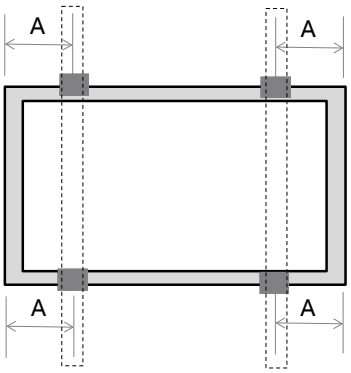
· Clamp material should be anodized aluminum alloy or stainless steel.

· Clamp positions are of crucial importance for the reliability of the installation. The clamp centerlines must only be positioned within the ranges indicated in table below, depending on the configuration and load.

· For configurations where the mounting rails run parallel to the frame, precautions should be taken to ensure the bottom flange of the module frame overlaps the rail by 15 mm (0.59 in) or more.



CS3U-MB-AG AND CS3U-PB-AG

 Use 4 clamps on the long side. Mounting rails run parallel to the long side frame.	 Use 4 clamps on the long side. Mounting rails run perpendicular to the long side frame.
Clamp length ≥ 40 mm A = (410 - 490) mm Maximum Load: Uplift load ≤ 2400 Pa Downforce load ≤ 5400 Pa	Clamp length ≥ 80mm A = (410 - 490) mm Maximum Load: Uplift load ≤ 4000 Pa Downforce load ≤ 8100 Pa

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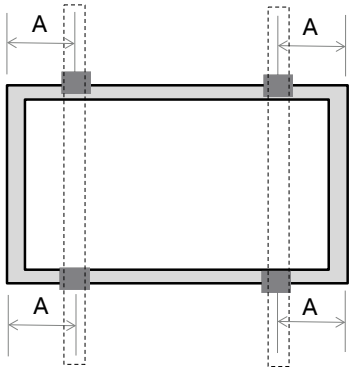
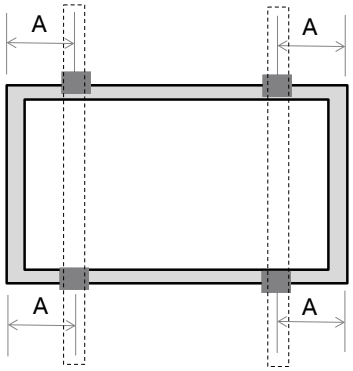
CS3K-MB-AG AND CS3K-PB-AG



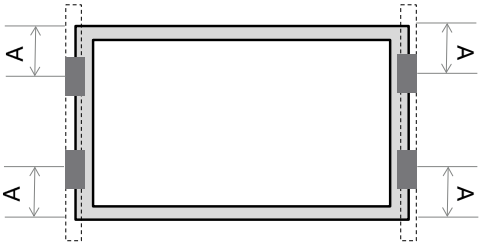
Use 4 clamps on the long side.
Mounting rails run perpendicular to the long side frame.

Clamp length ≥ 40 mm
A = (240 – 550) mm
Maximum Load:
Uplift load ≤ 3600 Pa
Downforce load ≤ 3600 Pa



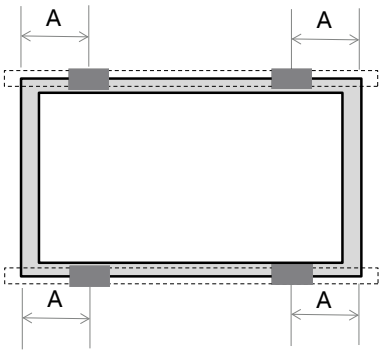
Use 4 clamps on the long side.
Mounting rails run perpendicular to the long side frame.

Clamp length ≥ 80mm
A = (270 – 380) mm
Maximum Load:
Uplift load ≤ 4000 Pa
Downforce load ≤ 8100 Pa



Use 4 clamps on the short side.
Mounting rails run parallel to the short side frame.

Clamp length ≥ 40mm
A = (230 – 270) mm
Maximum Load:
Uplift load ≤ 2400 Pa
Downforce load ≤ 2400 Pa



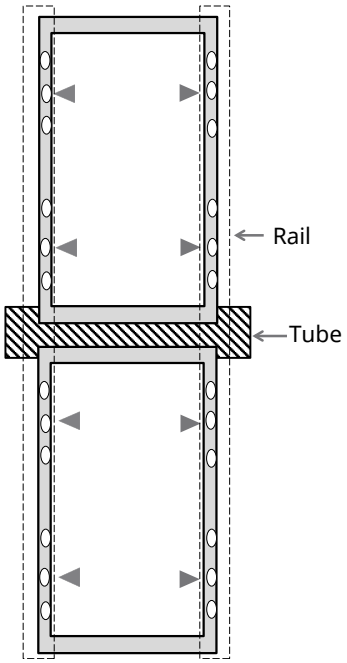
Use 4 clamps on the long side.
Mounting rails run parallel to the long side frame.

Clamp length ≥ 40 mm
A = (270 – 380) mm
Maximum Load:
Uplift load ≤ 2400 Pa
Downforce load ≤ 5400 Pa

6.5 MOUNTING METHODS FOR FRAMED BIFACIAL DOUBLE GLASS (SINGLE-AXIS TRACKER)

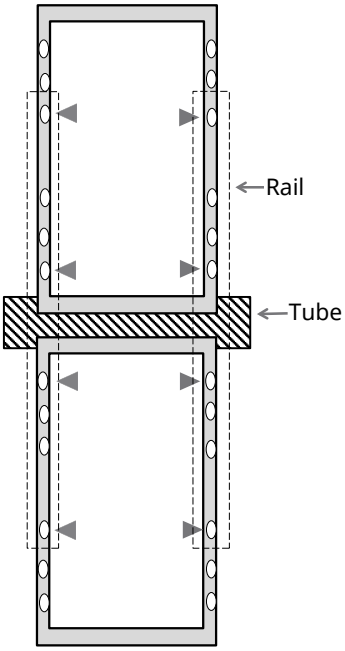
· The bolts and clamps used in this section should follow the requirements in 6.3 and 6.4.

· Under no load conditions the junction box can be in contact with the subjacent racking structure.



Two modules share one tube, portrait installation.
Bolting on long frame side using four innermost mounting holes
Mounting rails run parallel to the long side frame.
Mounting rails fixed on torque tube (tracker).

Maximum Load:
Uplift load ≤ 2400 Pa
Downforce load ≤ 2400 Pa



Two modules share one tube, portrait installation.
Bolting on long frame side using four innermost mounting holes
Mounting rails run parallel to the long side frame.
Mounting rails fixed on torque tube (tracker).

Maximum Load:
Uplift load ≤ 1800 Pa
Downforce load ≤ 1800 Pa

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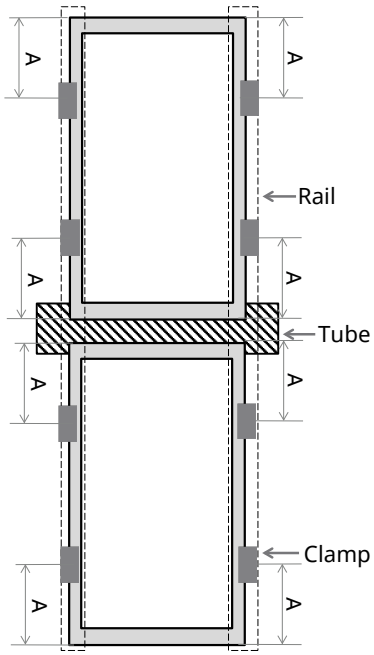
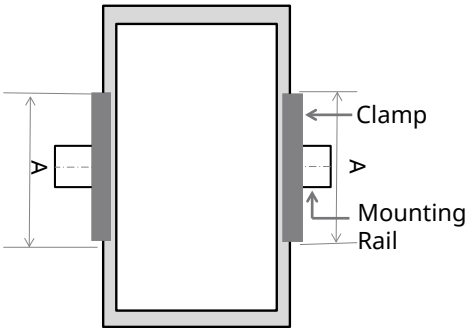


Two modules share one tube, portrait installation.
Use 4 clamps on the long side of each module.
Mounting rails run parallel to the long side frame.
Mounting rails fixed on torque tube (tracker).

Clamp length ≥ 40mm
A = (340 - 550) mm
Maximum Load:
Uplift load ≤ 2400 Pa
Downforce load ≤ 2400 Pa



Use 2 long center clamps on the long side of each module or bolting on the center holes of the long side frame.

Overlap length of clamp and frame ≥ 400 mm
Maximum Load:
Uplift load ≤ 2400 Pa
Downforce load ≤ 2400 Pa

The following tracker manufacturers and types are approved with Canadian Solar framed bifacial double glass modules.

Module Type	Compatible Tracker	Mounting Hardware	Maximum Load (Pa)	Reference Manual (Version No.)
CS3U-MB-AG CS3U-PB-AG	ATI DuraTrack™HZ Tracking System(V3)	Clamp Ear (V3)	Uplift load ≤ 2400 Pa Downforce load ≤ 2400 Pa	DuraTrack HZ Solar Tracker Installation Guide , (June 2017, Rev. B-03)
CS3U-MB-AG CS3U-PB-AG	NEXTracker NX Horizon	Short Rail V2.3 (400 mounting holes position) Rail part No: 20871, 21018, 20882, 20952, 20940	Uplift load ≤2400 Pa Downforce load ≤ 2400 Pa	NEXTracker NX Horizon 2.3.1 Short Rail Installation Manual (PDM-000149)
CS3U-MB-AG CS3U-PB-AG	Arctech single-axis tracker Portrait two rows	3438 mm rail (bolting method / M8 bolt + M8 plain washer (O.D. = 24 mm) / 1155 mm holes position) Rail drawing No: CS2018002	Uplift load ≤ 2400 Pa Downforce load ≤ 2400 Pa	SSMFIM-rev01（SkySmart-Module Fixing Installation Manual）
CS3U-MB-AG CS3U-PB-AG	Soltec SF7 Single-Axis Tracker	2604 / 2592 mm rail (Bolting method / M6 bolt + M6 plain washer (O.D. = 18 mm) / 1300 mm + 400 mm holes position) Rail drawing No: SF7-MR-04-009_Dr < UL1500 V > SF7-MR-04-016 < 1500 V (IEC) or 1000 V (IEC / UL) >	Uplift load ≤ 1800 Pa Downforce load ≤ 1800 Pa	SF7QG-1500V-en, revision 1.0
CS3U-MB-AG CS3U-PB-AG	Soltec SF7 Single-Axis Tracker	3359 / 3347 mm long rail (bolting method / M8 bolt + M8 plain washer (O.D. = 24 mm) / 1155 mm holes position) Rail Rail drawing No: SF7-MR-06-014_Dr < UL1500 V > SF7-MR-06-015_Dr < 1500 V (IEC) or 1000 V (IEC / UL) >	Uplift load ≤ 2400 Pa Downforce load ≤ 2400 Pa	SF7QG-1500V-en, revision 1.0

The allowable maximum twist angle of the module is 0.5 degree.

Please contact the tracker manufacturer and Canadian Solar Inc. technical support department for details in regard to specific projects.

7.0 MAINTENANCE

- Do not make modifications to any component of the PV module (diode, junction box, plug connectors or others).
- Regular maintenance is required to keep modules clear of snow, bird droppings, seeds, pollen, leaves, branches, dirt spots, and dust.
- Modules with sufficient tilt (at least 15°), generally do not require cleaning (rain will have a self-cleaning effect). If the module has become soiled, it shall be washed with water and a non-abrasive cleaning brush or sponge during the cool part of the day. Do not scrape or rub dry dirt away, as this may cause micro scratches.
- Snow should be removed using a soft brush.
- Periodically inspect the system to check the integrity of all wiring and supports.
- To protect against electric shock or injury, electrical or mechanical inspections and maintenance should be performed by qualified personnel only.
- Please refer to Standard Module Installation Manual Annex of standard solar modules (Section Annex D: Module Cleaning Guideline) for more information on this topic.

AMENDED EDITIONS AND DATES

- Rev 1.0 is released in June, 2018.

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ANNEX A: MECHANICAL AND ELECTRICAL RATINGS

Standard Test Conditions are: irradiance of 1 kW/m^2, air mass (AM) spectrum of 1.5, and cell temperature of 25°C. The electrical characteristics are respectively within ±10 percent or [0; +5 W] of the indicated values for Isc, Voc and Pmax. Specifications are subject to change without notice.

TABLE 1: MECHANICAL AND ELECTRICAL RATINGS UNDER STC

Model Type	Maximum power Pmax<W>	Operating voltage Vmp <V>	Operating current Imp <A>	Open Circuit Voltage Voc <V>	Short Circuit Current Isc <A>	Max. Series Fuse Rating <A>	Overall Dimension <mm>	Weight <Kg>
CS3U-350MB-FG	350	38.8	9.03	46.6	9.53	20	2012 × 992 × 5.8 mm (79.2 × 39.1 × 0.23 in) without J-Box and corner protector	29.3 kg (64.6 lbs)
CS3U-355MB-FG	355	39.0	9.11	46.8	9.61	20		
CS3U-360MB-FG	360	39.2	9.19	47.0	9.69	20		
CS3U-365MB-FG	365	39.4	9.27	47.2	9.77	20		
CS3U-370MB-FG	370	39.6	9.35	47.4	9.85	20		
CS3U-375MB-FG	375	39.8	9.43	47.6	9.93	20		
CS3U-380MB-FG	380	40.0	9.50	47.8	10.01	20		
CS3U-385MB-FG	385	40.2	9.58	48.0	10.09	20		
CS3U-390MB-FG	390	40.4	9.66	48.2	10.17	20		
CS3U-395MB-FG	395	40.6	9.73	48.4	10.25	20		
CS3U-400MB-FG	400	40.8	9.81	48.6	10.33	20		
CS3U-405MB-FG	405	41.0	9.88	48.8	10.41	20		
CS3U-410MB-FG	410	41.2	9.96	49.0	10.49	20		
CS3K-280MB-FG	280	31.7	8.84	38.5	9.49	20	1690 × 992 × 5.8 mm (66.5 × 39.1 × 0.23 in) without J-Box and corner protector	24.3 kg (53.6 lbs)
CS3K-285MB-FG	285	31.9	8.94	38.7	9.57	20		
CS3K-290MB-FG	290	32.1	9.04	38.9	9.65	20		
CS3K-295MB-FG	295	32.3	9.14	39.1	9.73	20		
CS3K-300MB-FG	300	32.5	9.24	39.3	9.82	20		
CS3K-305MB-FG	305	32.7	9.33	39.5	9.90	20		
CS3K-310MB-FG	310	32.9	9.43	39.7	9.98	20		
CS3K-315MB-FG	315	33.1	9.52	39.9	10.06	20		
CS3K-320MB-FG	320	33.3	9.61	40.1	10.14	20		
CS3K-325MB-FG	325	33.5	9.71	40.3	10.22	20		
CS3K-330MB-FG	330	33.7	9.80	40.5	10.30	20		
CS3U-350MB-AG	350	38.8	9.03	46.6	9.53	20	2018 × 992 × 35 mm (79.5 × 39.1 × 1.38 in) / 2022 × 992 × 35 mm (79.6 × 39.1 × 1.38 in) (UL)	26.3 kg (58.0 lbs) / 26.4 kg (58.2 lbs) (UL)
CS3U-355MB-AG	355	39.0	9.11	46.8	9.61	20		
CS3U-360MB-AG	360	39.2	9.19	47.0	9.69	20		
CS3U-365MB-AG	365	39.4	9.27	47.2	9.77	20		
CS3U-370MB-AG	370	39.6	9.35	47.4	9.85	20		
CS3U-375MB-AG	375	39.8	9.43	47.6	9.93	20		
CS3U-380MB-AG	380	40.0	9.50	47.8	10.01	20		
CS3U-385MB-AG	385	40.2	9.58	48.0	10.09	20		
CS3U-390MB-AG	390	40.4	9.66	48.2	10.17	20		
CS3U-395MB-AG	395	40.6	9.73	48.4	10.25	20		
CS3U-400MB-AG	400	40.8	9.81	48.6	10.33	20		
CS3U-405MB-AG	405	41.0	9.88	48.8	10.41	20		
CS3U-410MB-AG	410	41.2	9.96	49.0	10.49	20		
CS3K-280MB-AG	280	31.7	8.84	38.5	9.49	20	1696 × 992 × 35 mm (66.8 × 39.1 × 1.38 in)/ 1700 × 992 × 35 mm (66.9 × 39.1 × 1.38 in)(UL)	22.7kg (50.0 lbs) / 22.8kg (50.3 lbs) (UL)
CS3K-285MB-AG	285	31.9	8.94	38.7	9.57	20		
CS3K-290MB-AG	290	32.1	9.04	38.9	9.65	20		
CS3K-295MB-AG	295	32.3	9.14	39.1	9.73	20		
CS3K-300MB-AG	300	32.5	9.24	39.3	9.82	20		
CS3K-305MB-AG	305	32.7	9.33	39.5	9.90	20		
CS3K-310MB-AG	310	32.9	9.43	39.7	9.98	20		
CS3K-315MB-AG	315	33.1	9.52	39.9	10.06	20		
CS3K-320MB-AG	320	33.3	9.61	40.1	10.14	20		
CS3K-325MB-AG	325	33.5	9.71	40.3	10.22	20		
CS3K-330MB-AG	330	33.7	9.80	40.5	10.30	20		

Model Type	Maximum power Pmax<W>	Operating voltage Vmp <V>	Operating current Imp <A>	Open Circuit Voltage Voc <V>	Short Circuit Current Isc <A>	Max. Series Fuse Rating <A>	Overall Dimension <mm>	Weight <Kg>
CS3U-320PB-FG	320	37.6	8.52	45.1	9.04	20	2012 × 992 × 5.8 mm (79.2 × 39.1 × 0.23 in) without J-Box and corner protector	29.3 kg (64.6 lbs)
CS3U-325PB-FG	325	38.2	8.51	45.6	9.11	20		
CS3U-330PB-FG	330	38.4	8.60	45.8	9.19	20		
CS3U-335PB-FG	335	38.6	8.68	46.0	9.27	20		
CS3U-340PB-FG	340	38.8	8.78	46.2	9.35	20		
CS3U-345PB-FG	345	39.0	8.86	46.4	9.43	20		
CS3U-350PB-FG	350	38.6	9.06	46.8	9.66	20		
CS3U-355PB-FG	355	38.8	9.14	47.0	9.74	20		
CS3U-360PB-FG	360	39.0	9.22	47.2	9.82	20		
CS3U-365PB-FG	365	39.8	9.18	47.2	9.75	20		
CS3U-370PB-FG	370	40.0	9.26	47.4	9.83	20		
CS3U-375PB-FG	375	40.2	9.33	47.6	9.91	20		
CS3K-265PB- FG	265	30.6	8.66	37.3	9.22	20	1690 × 992 × 5.8 mm (66.5 × 39.1 × 0.23 in) without J-Box and corner protector	24.3 kg (53.6 lbs)
CS3K-270PB- FG	270	31.5	8.58	38.1	9.21	20		
CS3K-275PB- FG	275	31.7	8.68	38.3	9.28	20		
CS3K-280PB- FG	280	31.9	8.78	38.5	9.35	20		
CS3K-285PB- FG	285	32.1	8.92	38.7	9.42	20		
CS3K-290PB- FG	290	32.3	8.98	38.9	9.49	20		
CS3K-295PB- FG	295	32.5	9.08	39.1	9.57	20		
CS3K-300PB- FG	300	32.7	9.18	39.3	9.65	20		
CS3K-305PB- FG	305	32.9	9.28	39.5	9.73	20		
CS3K-310PB- FG	310	33.1	9.37	39.7	9.81	20		
CS3K-315PB- FG	315	33.3	9.46	39.9	9.89	20		
CS3K-320PB- FG	320	33.5	9.56	40.1	9.97	20		
CS3K-325PB- FG	325	33.7	9.65	40.3	10.05	20		
CS3U-350PB-AG	350	38.6	9.06	46.8	9.66	20	2018 × 992 × 35 mm (79.5 × 39.1 × 1.38 in) / 2022 × 992 × 35 mm (79.6 × 39.1 × 1.38 in) (UL)	26.3 kg (58.0 lbs) / 26.4 kg (58.2 lbs) (UL)
CS3U-355PB-AG	355	38.8	9.14	47.0	9.74	20		
CS3U-360PB-AG	360	39.0	9.22	47.2	9.82	20		
CS3U-365PB-AG	365	39.2	9.30	47.4	9.90	20		
CS3U-370PB-AG	370	39.6	9.35	47.4	9.85	20		
CS3U-375PB-AG	375	40.2	9.33	47.6	9.91	20		
CS3K-265PB- AG	265	30.6	8.66	37.3	9.22	20	1696 × 992 × 35 mm (66.8 × 39.1 × 1.38 in) / 1700 × 992 × 35 mm (66.9 × 39.1 × 1.38 in) (UL)	22.7 kg (50.0 lbs) / 22.8 kg (50.3 lbs) (UL)
CS3K-270PB- AG	270	31.5	8.58	38.1	9.21	20		
CS3K-275PB- AG	275	31.7	8.68	38.3	9.28	20		
CS3K-280PB- AG	280	31.9	8.78	38.5	9.35	20		
CS3K-285PB- AG	285	32.1	8.92	38.7	9.42	20		
CS3K-290PB- AG	290	32.3	8.98	38.9	9.49	20		
CS3K-295PB- AG	295	32.5	9.08	39.1	9.57	20		
CS3K-300PB- AG	300	32.7	9.18	39.3	9.65	20		
CS3K-305PB- AG	305	32.9	9.28	39.5	9.73	20		
CS3K-310PB- AG	310	33.1	9.37	39.7	9.81	20		
CS3K-315PB- AG	315	33.3	9.46	39.9	9.89	20		
CS3K-320PB- AG	320	33.5	9.56	40.1	9.97	20		
CS3K-325PB- AG	325	33.7	9.65	40.3	10.05	20		

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