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Solar Module Installation Manual Annex

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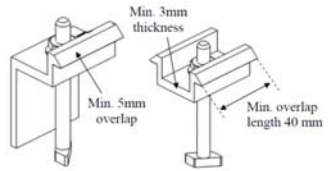
CONTENTS

ANNEX A: Alternative Mounting Methods

- All the basic requirements of the main installation manual should apply to the alternative mounting methods, unless otherwise specified.

Mounting Method A: Clamping

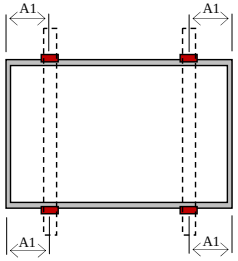
- The mounting method has been qualified by Canadian Solar Inc. and certified by VDE and CSA.
- Top or bottom clamping methods will vary and are dependent on the mounting structures. Follow mounting guidelines recommended by the mounting system supplier.
- Each module must be securely fastened at a minimum of 4 points on two opposite sides. The clamps should be positioned according to the authorized position ranges defined in table A-1. Install and tighten the module clamps to the mounting rails using the torque stated by the mounting hardware manufacturer. M8 size bolt and nut are used for clamping method. Tightening torques should be within 10~17 Nm for M8x1.5 coarse thread bolts, depending on bolt class.
- Different recommendations from specific clamping hardware suppliers should prevail. System designer and installer are responsible for load calculations and for proper design of support structure.
- Canadian Solar Inc. warranty may be void in cases where improper clamps or unsuitable installation methods are found. When installing inter-modules or end type clamps, take measures so as:
    1. Not to bend the module frame
    2. Not to touch or cast shadow on the front glass
    3. Not to damage the surface of the frame
    4. To ensure the clamps overlap the module frame by at least 5 mm.
    5. To ensure the clamps overlap length is at least 40 mm.

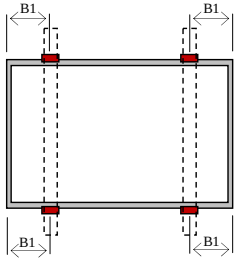


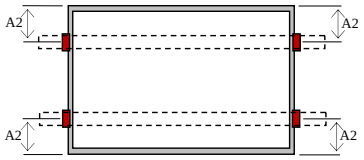
- Clamp material should be anodized aluminum alloy.
- Floating type clamps are not authorized.
- Clamp positions are of crucial importance for the reliability of the installation, the clamp centerlines must only be positioned within the ranges indicated in table A-1, depending on the configuration and load.
- For configurations where the mounting rails run parallel to the clamps installation side, precautions should be taken to ensure the module frame (C-shape) overlap the rail by 15mm or more.

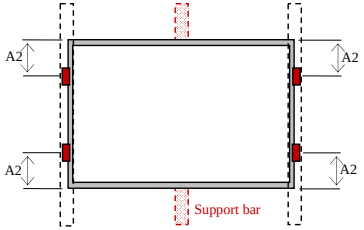
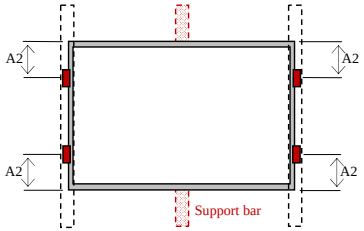
Table A-1: Authorized attachments for clamping method

	Uplift load ≤ 2400 Pa **Downforce load ≤ 2400 Pa**	**Uplift load ≤ 2400 Pa** **2400 Pa ≤ Downforce load ≤ 5400 Pa**
Clamping on long side frame	Use 4 clamps on the long side, the allowed range depends on the module type.	Use 4 clamps on the long side, the allowed range depends on the module type.

<table>
<tr><td></td><td> 

Mounting rails may run perpendicularly or parallel to the long side frame.</td><td> 

Mounting rails may run perpendicularly or parallel to the long side frame</td></tr>
<tr><td>Clamping on short side frame</td><td>Use 4 clamps on the short side, the allowed range depends on the module type. Mounting rails may run parallel or perpendicularly to the short side frame
 

For CS5P and CS6P series, an additional support bar should be placed below the module where download force above 1600Pa is expected. Mounting rails should run parallel to the short side frame.
 
</td><td>Use 4 clamps on the short side, the allowed range depends on the module type. An additional support bar should be placed below the module.
 

Mounting rails should run parallel to the short side frame</td></tr>
<tr><td colspan="3">Authorized range for clamping as a function of model type:
<table>
<tr><th>Model type</th><th>A1 range (mm)</th><th>B1 range (mm)</th><th>A2 range (mm)</th></tr>
<tr><td>CS5A</td><td>220 – 380</td><td>330 – 400</td><td>170 – 200</td></tr>
<tr><td>CS5AH</td><td>120 – 170</td><td>120 – 170</td><td>170 – 200</td></tr>
<tr><td>CS5P</td><td>220 – 390</td><td>330 – 400</td><td>220 – 270</td></tr>
<tr><td>CS6A</td><td>220 – 340</td><td>270 – 330</td><td>200 – 250</td></tr>
<tr><td>CS6P, CS5T</td><td>240 – 410</td><td>340 – 410</td><td>200 – 250</td></tr>
<tr><td>CS6X</td><td>340 – 550</td><td>410 – 490</td><td>200 – 250</td></tr>
<tr><td>CS6V</td><td>240 – 410</td><td>340 – 410</td><td>170 – 210</td></tr>
<tr><td>CS6VH</td><td>130 – 210</td><td>160 – 210</td><td>170 – 210</td></tr>
</table></td></tr>
</table>

Mounting Method B: Insertion Systems

- The mounting method has been qualified by Canadian Solar Inc. and certified by VDE and CSA.
- Insertion methods will vary and are dependent on the mounting structures. Follow mounting guidelines recommended by the mounting system supplier.
- Each module must be securely maintained through all its length on two opposite sides. Install and tighten the insertion profiles to the support structure using the hardware and instructions provided by the mounting system manufacturer. System designer and installer are responsible for load calculations and for proper design of support structure.
- Canadian Solar Inc. warranty may be void in cases where improper insertion systems or unsuitable installation methods are found. When installing insertion profiles, take measures so as:
  1. Not to bend the module frame
  2. Not to touch or cast shadow on the front glass
  3. Not to damage the surface of the frame
  4. To ensure the insertion profiles overlap the module frame by at least 10 mm.
  5. To ensure the module frame (C-shape) overlap the insertion profiles by at least 15mm.
  6. To ensure insertion profile thickness and tolerances suits module thickness (40mm for most of Canadian Solar inc modules).

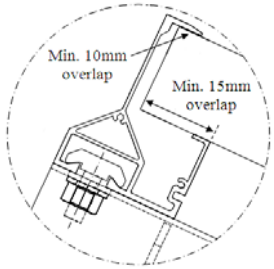
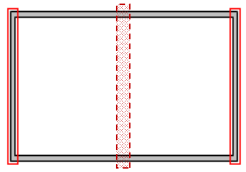
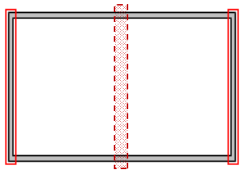


Table A-2: Authorized attachments for insertion method

<table>
<tr><th></th><th>Uplift load ≤ 2400 Pa
Downforce load ≤ 2400 Pa</th><th>Uplift load ≤ 2400 Pa
2400 Pa ≤ Downforce load ≤ 4000 Pa</th></tr>
<tr><td>Insertion profile on long side frame</td><td colspan="2">Use 2 insertion profiles running parallel to the long side frame.
 
For CS6X series, installations where the downforce load can reach up to a 5400Pa are authorized.</td></tr>
<tr><td>Insertion profile on short side frame</td><td>Use 2 insertion profiles running parallel to the short side frame.
  </td><td>Use 2 insertion profiles running parallel to the short side frame.
  </td></tr>
</table>

	For CS5P and CS6P series, an additional support bar should be placed below the module where download force above 1600Pa is expected. 	An additional support bar should be placed below the module. For CS6X series, installations where the downforce load can reach up to a 5400Pa are authorized

Mounting Method C: Grizzly Bear® FR *Gen II* SYSTEM

- Grizzly Bear® FR Gen II System has been qualified by Intertek (ETL) to UL2703 for use with Canadian Solar Inc. modules.

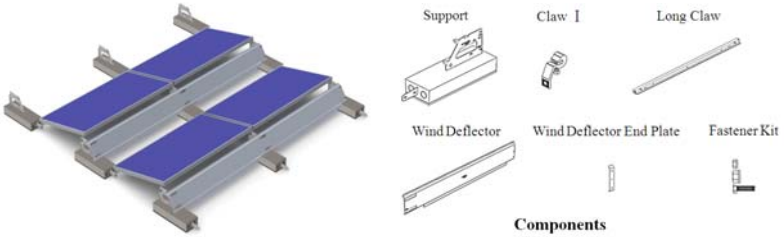
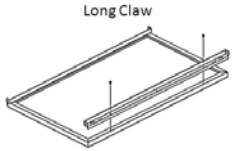


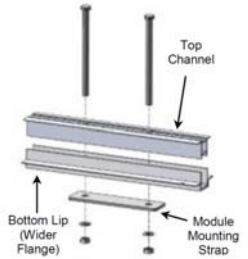
Table A-3: Authorized attachments for Grizzly Bear® FR Gen II SYSTEM

Claw	Compatible Modules	Install Methods
Claw I 	CS5A series, , CS5T-M, CS6P series, CS6A series, CS6X series Only 1600Pa is authorized for CS6P/CS6X without support bar.	Place a PV module face down on protected work surface and place a Claw over the module frame flange on the short side of the module; slide to the corner and tighten the 3⁄8-16 x 1.25” 18-8 hex head cap screw between 24.4 and 27.1 Nm (18-20 ft-lb). Ensure that the Claw is seated up against the flanges of both the long and short sides of the module. Each module must be fitted with four (4) Claws.
Long Claw 	CS6X-M, CS6X-P	This Claw is used for PV modules that are not compatible with flange clamp style Claws. The Long Claw attaches at the module mounting holes using standard bolting method. Refer to paragraph 6.1 for suitable torque and fastening requirements.

- Refer to *Grizzly Bear® FR Gen II Installation Manual (9910010 Rev A)* from *PanelClaw* Inc. for more information and always follow latest safety procedures when installing. Failure to follow corresponding regulatory instructions will void Canadian Solar Inc. module warranty.

Mounting Method D: ATI Clamping

- The mounting method has been qualified by Canadian Solar Inc. and certified by CSA.
- Array Technology Inc. (ATI) uses a clamp mounting method for attaching modules to the tracker assembly. The clamp mounting method involves installing a module mounting clamp assembly on the torque tube, attaching a module, and then another clamp assembly until the row of modules is installed. Clamps may also be installed earlier, when bearing housings are installed on torque tubes.

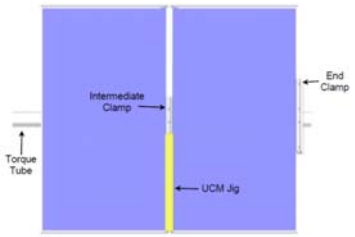


- Canadian Solar Inc. qualified 2 kinds of ATI clamps, 12-inch length standard clamp and 12-inch length high-clearance clamp. Both clamps are mounted on long side frame, in the middle position (with Universal Clamp Module Jig), such that the module is usually evenly divided in half by the torque tube.
- End clamps are attached to the module at the end of each array and in the middle next to the gear drive. Four end clamps are used for each row of modules. End clamps are at least 22” long and have four attachment holes. End clamps also include a spacer plate (fabricated for each specific module) that must be inserted in the clamp on the outside of the clamp (opposite the end module) to maintain a balanced force with the end module.
- The top module edge must engage the clamp a minimum of 3⁄8 of an inch on the top clamp edge and the bottom module edge must engage a minimum of 11⁄16 of an inch on the bottom clamp edge. If these distances cannot be measured, a total of 0.062 inches of gap is allowed between the module and both clamps. This gap can be offset to one side or split between the clamps.
- All the clamp assemblies, spacer plate, and hardware should be tightened to the torque tube with a torque setting of 13 ± 2 ft-lbs (18 ± 3 Nm), using the long bolts provided (bolt length is dependent on model used).

Table A-4: Authorized attachments for ATI clamping

	CS6P Series	CS6X Series
12-inch length standard clamp	Uplift load ≤ 1200 Pa Downforce load ≤ 1200 Pa	Uplift load ≤ 2400 Pa Downforce load ≤ 5400 Pa
12-inch length high-clearance clamp	Uplift load ≤ 1200 Pa Downforce load ≤ 3600 Pa	Uplift load ≤ 2400 Pa Downforce load ≤ 5400 Pa

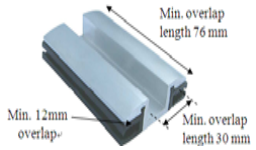
- Refer to *DuraTrack™HZ Solar Tracker Installation Guide(November,2012, Rev. B-01)* from *Array Technologies* Inc. for more information and always follow latest safety procedures when installing. Failure to follow corresponding regulatory instructions will void Canadian Solar Inc. module warranty.



Mounting Method E: For Specific Module Ranges

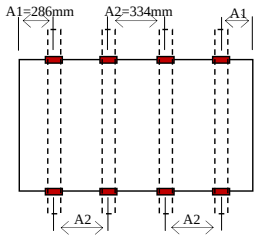
Floating clamped configuration (only for CS5A-M-L laminate model)

- The mounting method has been certified by CSA.
- Clamping methods will vary and are dependent on the mounting structures. Follow mounting guidelines recommended by the mounting system supplier.
- Each laminate must be securely fastened at a minimum of 8 points on the two opposite long sides. 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 A-5. Install and tighten the module clamps to the mounting rails using the torque stated by the mounting hardware manufacturer (in the absence of instructions, Canadian Solar Inc. recommends a torque about 15Nm to 20Nm). System designer and installer are responsible for load calculations and for proper design of support structure.
- Clamp material should be aluminum. EPDM type rubber or similar material should be used between the laminate/clamp and laminate/mounting rail interfaces in order to prevent any damages to the laminate.
- Canadian Solar Inc. warranty may be void in cases where improper clamps or unsuitable installation methods are found. When installing inter-modules or end type clamps, take measures so as:
    1. Not to bend the laminate excessively
    2. Not to cast shadow on the cells
    3. Not to damage or scratch the surface of the glass and backsheet
    4. To ensure the clamps overlap the module glass by at least 12 mm.
    5. To ensure the clamps overlap length is at least 76 mm.
    6. To ensure a minimum contact area of 40mm x 30mm between the clamp and the mounting rails (rail thickness should be at leat 40mm).
    7. To use clamps of appropriate thickness, allowing the CS5A-M-L 4mm glass laminate to be fixed floatingly.



- Vertical (landscape) mounting of the laminate is not authorized unless appropriate safety hooks are used to secure the laminate against sliding-off.

Table A-5: Authorized attachments for CS5A-M-L laminate

	Uplift load ≤ 2400 Pa Downforce load ≤ 2400 Pa	Uplift load ≤ 2400 Pa 2400 Pa ≤ Downforce load ≤5400 Pa
Clamping on long side frame	Use 4 clamps on the long side, at the positions defined below (tolerance ±20 mm).  Mounting rails may run perpendicularly or parallel to the long side frame	Not allowed.

Clamping on short side frame	Not allowed

Zep Compatible frame (only for NewEdge CS5A-xxxMX and NewEdge CS6P-xxxPX/MX modules)

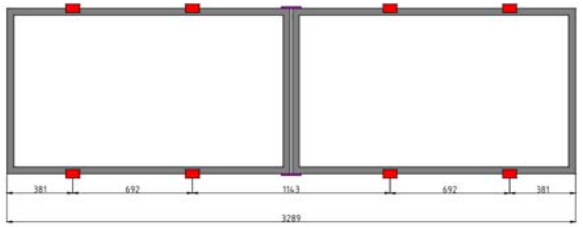
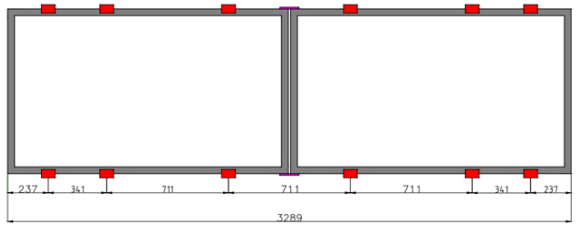
The mounting method (ZEP system II) has been certified by CSA and INTERTEK.

WARNING: WARRANTY VOID IF NON-ZEP-CERTIFIED HARDWARE IS ATTACHED TO GROOVE IN MODULE FRAME.

Modules (NewEdge CS5A-xxxMX, NewEdge CS6P-xxxPX/MX) with Zep Compatible frame profiles are fastened to the roof structural support members using the following components:

1. Interlocks – Use to mechanically fasten two modules together and provide a ground bond connection between them. Each Interlock consists of a Plate (6061-T6 Al) and two Interlock Zeps (stainless steel).
2. Leveling Feet – Use to mount the modules to a flashing device, a separate roof attachment, or directly to the roof in some applications. Material: 6061-T6 aluminum.
3. Ground Zep – Use to provide a reliable ground bond connection from the array to the equipment grounding conductor(s). Material: 316 stainless steel.

Table A-6: Authorized attachments for Zep Compatible frame

Clamping on long side frame	**Uplift load ≤ 2400 Pa**	**Downforce load ≤ 2400 Pa**
	Use 4 clamps on the long side, at the positions defined below 	
Clamping on long side frame	**Uplift load ≤ 2400 Pa**	**2400 Pa ≤ Downforce load ≤5400 Pa**
		
Clamping on short side frame	Not allowed	

The array of modules must be mounted to the roof with Zep Leveling Feet and suitable roof attachment devices (flashings not provided by Canadian Solar Inc.), to maintain the waterproof integrity of the roof.

Refer to *ZEP system II PV Installation Manual (801-00015, Rev 2)* from *Zep Solar* Inc. for more information and always

follow latest safety procedures when installing. Failure to follow corresponding regulatory instructions will void Canadian Solar Inc. module warranty.

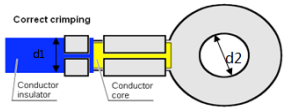
ANNEX B: Alternative Grounding Methods

- All the basic requirements of the main installation manual should apply to the alternative grounding methods, unless otherwise specified.

Grounding Method A: Bolt + K-nut + Ring Terminal (copper)

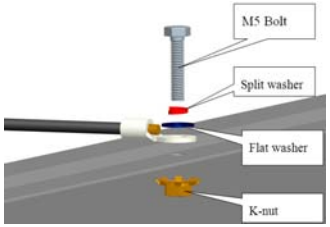
When diameter of the grounding holes is 5mm (INTERTEK and CSA certified)

- A copper terminal ring is recommended (please see below picture for reference). The d2 diameter should be 5.3mm and the size of d1 is determined by the size of the grounding cable. Proper crimping tool and method should be used to crimp the terminal onto the grounding cable. Once crimped, each terminal should be visually checked according to the following points:



  1. The insulator jacket is correctly crimped in the first collar
  2. The conductor core is correctly crimped in the second collar
  3. The conductor core does not run over the functional part of the ring terminal
  4. The ring terminal should not be bent or deformed during the crimping operation.

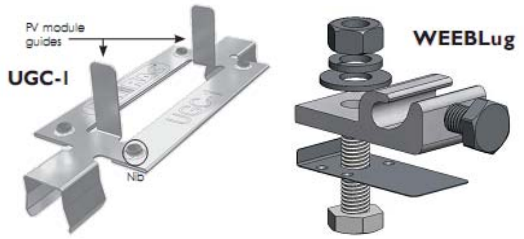
- Connect the grounding hardware (M5 Bolt, split washer, flat washer, ring terminal, K-nut) to the grounding hole on the frame as shown in the picture.
- A K-nut is used to penetrate the frame's anodizing (protective coating) to create conductive connection.
- A torque moment of about 3Nm should be used to fasten the grounding parts to module frame.



Grounding Method B: UGC-1 clips + WEEBlug 6.7

Used in conjonction with SolarMount® rails from UNIRAC, no hole is requested (INTERTEK certified).

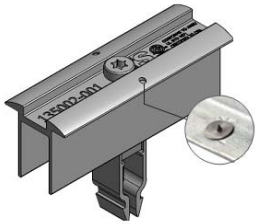
- UGC-1 grounding clips are used to create grounding path between the module frame and the UNIRAC rail. WEEBlug 6.7 assemblies are designed for use with size 6-12 AWG solid copper conductor wire, and allow connecting the system to equipment ground connector.



- Refer to *Unirac Code-Compliant Installation Manual* (*Pub 140130 -1cc*) from *UNIRAC* for more information. Always follow safety procedures when installing. Failure to follow SolarMount Rail System regulatory instructions will void Canadian Solar Inc. module warranty.

Grounding Method C: Rapid2+ Grounding Middle Clamps

Used in conjonction with any Schletter© module mounting rail (INTERTEK certified)



- Schletter Rapid^{2+} Grounding Clamps are used to create a grounding path between the module frame and the mounting rail. An integrated grounding pin ensures bonding to the module frame by penetrating the frame coating. The Rapid^{2+} Clamp includes integrated grounding as a standard feature.
- The clamps have overall dimensions of 100mm x 35.5mm ($3^{15}/_{16}$ in x $1^{3}/_{8}$ in, respectively length by width) and are rated to 10 AWG solid copper conductor wire.
- To install, simply position the clamp over the mounting rail and insert the pointed clamp end into the rail groove. Next, tighten the Rapid Grounding Clamp using a standard drill, using a torque of no more than 14.3 Nm (10.5 ft-lbs) to fasten the clamp hardware (M8x55 Torx and M8 nut). Use of a hammer drill is not recommended. The quantity of Rapid^{2+} Grounding Clamps is determined solely by the module layout.
- Refer to *Schletter Rapid^{2+} Clamp* installation instructions for more information and always follow safety procedures when installing. Failure to follow Rapid^{2+} Clamp regulatory instructions will void Canadian Solar Inc. module warranty.

Grounding Method D: Grounding for Grizzly Bear® FR *Gen II* SYSTEM

Only for PanelClaw Grizzly Bear® FR Gen II mounting system (INTERTEK certified)

- All PanelClaw mounting attachments or "Claws" have been tested to and are certified under UL Subject 2703 to act as a module and racking equipment grounding conductor (EGC) device. This certification allows for the Claw to module and Claw to Support connection to serve the purpose of a copper EGC that would typically run to each module and Support. When grounding devices are installed according with the approved methodology and capacity, the connections described above meet all the requirements outlined in NEC 690.43.
- Each Claw to Claw, and Claw to module connection has been certified 120A. Determine the quantity of strings that a bonding jumper connection can accommodate based on the module series fuse rating and bonding jumper size as below. Verify that all devices used in connecting this bonding jumper can accommodate the conductor being used.

Module Series Fuse Rating / DC String Fuse Rating (A)	Size of Bare Cu Bonding Jumper (AWG)			
	#12	#10	#8	#6
	Allowable Ampacity of Conductor (A)			
	15	50	90	120
	Number of Strings per Bonding Jumper			
10	1	5	9	12
15	1	3	6	8

* refers to this combination of module series fuse rating and bonding jumper size not being allowed due to ampacity limitations. Please use a larger conductor in order to achieve an allowable combination.

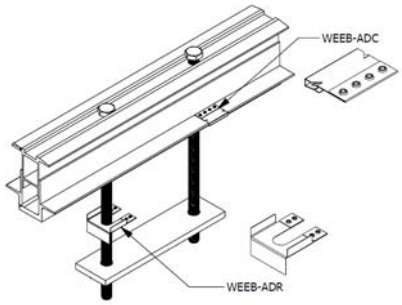
- Refer to *Grizzly Bear® FR Gen II Installation Manual(9910010 Rev A)* from *PanelClaw* for more information and always follow safety procedures when installing. Failure to follow PanelClaw regulatory instructions will void Canadian Solar Inc. module warranty.

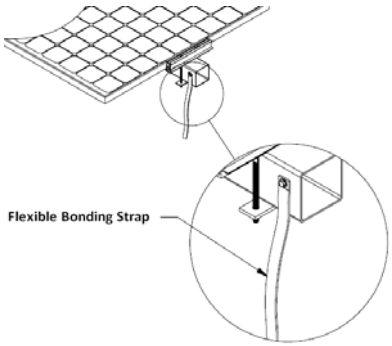
Grounding Method E: WEEB for ATI Clamping

Only for ATI duratrack HZ Solar Tracker (CSA certified)

- The WEEB (Washer, Electrical Equipment Bond) clips have been tested to and are certified as recognized component under UL Subject 2703.
- The WEEB clips are used to create a grounding path between the module and ATI clamps (WEEB-ADC), as well as between ATI clamps and torque tube (WEEB-ADR).

- A flexible bonding strap can be used for bonding the Torque Tube to the Support Columns.





- WEEBs are for SINGLE USE ONLY! Do not torque fasteners down if position of solar modules is not finalized. Only slightly tighten fasteners to keep modules in place.
- Fasten the ATI clamps with a torque setting of 18 ± 3 Nm,and the flexible bonding strap with a torque setting of 5 Nm.
- Refer to *WEEB installation instructions for ATI DuraTrack HZ mounting system only(50018785 Rev C)* from *Burndy LLC* for more information and always follow safety procedures when installing. Failure to follow the instructions will void Canadian Solar Inc. module warranty.

Grounding Method F: Zep Compatible frame Using Ground Zep

Only for modules with Zep Compatible frame (NewEdge CS5A-xxxMX & NewEdge CS6P-xxxPX/MX, CSA and INTERTEK certified).

WARNING: WARRANTY VOID IF NON-ZEP-CERTIFIED HARDWARE IS ATTACHED TO GROOVE IN MODULE FRAME.

- Correct installation ensures that the Zep components will provide a reliable electric bond from module to module (Interlocks) and from the module array to the equipment grounding conductor (Ground Zep).
  For an array up to 6 columns × 12 rows, a single Ground Zep is required to ground the entire array. When installing larger arrays, thermal breaks are required and one Ground Zeps should be added for each additional 6×12 sub-array. In this case, use solid copper conductors to create a ground bond jumper between Ground Zeps.
- Refer to *ZEP system II PV Installation Manual(801-00015, Rev 2)* from *Zep Solar* for more information and always follow safety procedures when installing. Failure to follow Zep Solar regulatory instructions will void Canadian Solar Inc. module warranty.

ANNEX C : Module Specifications

Standard Test Conditions are: irradiance of 1 kW/m^2, AM1.5 spectrum, and cell temperature of 25°C. The electrical characteristics are respectively within ±10% or [0; +5W] of the indicated values for Isc, Voc and Pmax. Specifications are subject to change without notice.

Table 1: Specifications for CS-series photovoltaic modules 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>
CS5A-195M	195.0	37	5.27	45	5.62	10.00	1595X801X40	15.3
CS5A-200M	200.0	37.4	5.35	45.3	5.71	10.00		
CS5A-205M	205.0	37.7	5.43	45.4	5.81	10.00		
CS5A-210M	210.0	38.1	5.51	45.6	5.90	10.00		
CS6C-140P	140.0	17.9	7.84	22.1	8.40	15.00	1485×666×40	12.00
CS6C-145P	145.0	17.9	8.09	22.2	8.65	15.00		
CS6C-150P	150.0	18.1	8.30	22.3	8.87	15.00		
CS6C-155P	155.0	18.1	8.54	22.4	9.09	15.00		
CS6P-200MX	200.0	29.2	6.86	36.5	7.56	15.00	1638X982X40	18.5(CS6P-xxxM/MM) or 20.0(CS6P-xxxMX)
CS6P-205MX	205.0	29.2	7.02	36.5	7.66	15.00		
CS6P-210MX	210.0	29.3	7.17	36.7	7.77	15.00		
CS6P-215MX	215.0	29.3	7.33	36.8	7.89	15.00		
CS6P-220MX	220.0	29.5	7.45	36.9	7.97	15.00		
CS6P-225MX	225.0	29.7	7.58	37.0	8.07	15.00		
CS6P-230MX	230.0	29.9	7.70	37.1	8.22	15.00		
CS6P-235MX	235.0	30.1	7.82	37.2	8.34	15.00		
CS6P-240MX	240.0	30.2	7.95	37.3	8.46	15.00		
CS6P-245M/MX	245.0	30.3	8.09	37.4	8.61	15.00		
CS6P-250M/MX	250.0	30.4	8.22	37.5	8.74	15.00		
CS6P-255M/MX	255.0	30.5	8.35	37.7	8.87	15.00		
CS6P-260M/MM/MX	260.0	30.7	8.48	37.8	8.99	15.00		
CS6P-265 M/MM/MX	265.0	30.9	8.61	37.9	9.11	15.00		
CS6P-270M/MM/MX	270.0	31.1	8.67	38.2	9.19	15.00		
CS6P-275M/MM/MX	275.0	31.3	8.80	38.3	9.31	15.00		
CS6P-200PX	200.0	28.9	6.93	36.2	7.67	15.00	1638X982X40	18.5(CS6P-xxxP) or 20.0(CS6P-xxxPX)
CS6P-205PX	205.0	28.9	7.09	36.2	7.78	15.00		
CS6P-210PX	210.0	29.0	7.25	36.4	7.89	15.00		
CS6P-215PX	215.0	29.0	7.40	36.5	8.01	15.00		
CS6P-220PX	220.0	29.2	7.53	36.6	8.09	15.00		
CS6P-225PX	225.0	29.4	7.65	36.7	8.19	15.00		
CS6P-230PX	230.0	29.6	7.78	36.8	8.34	15.00		
CS6P-235PX	235.0	29.8	7.90	36.9	8.46	15.00		
CS6P-240P/PX	240.0	29.9	8.03	37.0	8.59	15.00		

ANNEX C:
Module Specifications

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>
CS6P-245P/PX	245.0	30.0	8.17	37.1	8.74	15.00		
CS6P-250P/PX	250.0	30.1	8.30	37.2	8.87	15.00		
CS6P-255P/PX	255.0	30.2	8.43	37.4	9.00	15.00		
CS6P-260P/PX	260.0	30.4	8.56	37.5	9.12	15.00		
CS6P-265P/PX	265.0	30.6	8.66	37.7	9.23	15.00		
CS6P-270P/PX	270.0	30.8	8.75	37.9	9.32	15.00		
CS6P-275P/PX	275.0	31.0	8.88	38.0	9.45	15.00		
CS6A-160M	160.0	23.3	6.86	29.2	7.56	15.00	1324X984X40	15.5
CS6A-165M	165.0	23.4	7.06	29.2	7.71	15.00		
CS6A-170M	170.0	23.5	7.24	29.4	7.80	15.00		
CS6A-175M/MM	175.0	23.6	7.41	29.5	7.92	15.00		
CS6A-180M/MM	180.0	23.8	7.58	29.6	8.07	15.00		
CS6A-185M/MM	185.0	23.9	7.74	29.7	8.26	15.00		
CS6A-190M/MM	190.0	24.1	7.87	29.8	8.38	15.00		
CS6A-195M/MM	195.0	24.2	8.04	29.9	8.56	15.00		
CS6A-200M/MM	200.0	24.3	8.22	30.0	8.74	15.00		
CS6A-205M/MM	205.0	24.5	8.38	30.2	8.90	15.00		
CS6A-210M/MM	210.0	24.6	8.54	30.3	9.06	15.00		
CS6A-215M/MM	215.0	24.7	8.70	30.4	9.22	15.00		
CS6A-220M/MM	220.0	24.8	8.87	30.6	9.31	15.00		
CS6A-195P	195.0	24.0	8.13	29.6	8.69	15.00	1324X984X40	15.5
CS6A-200P	200.0	24.1	8.30	29.8	8.87	15.00		
CS6A-205P	205.0	24.2	8.47	29.9	9.03	15.00		
CS6A-210P	210.0	24.3	8.63	30.0	9.19	15.00		
CS6A-215P	215.0	24.5	8.78	30.2	9.35	15.00		
CS6A-220P	220.0	24.6	8.95	30.4	9.45	15.00		
CS6X-290P	290.0	35.9	8.08	44.4	8.64	15.00	1954×982×40	22.00 (3.2mm Glass)
CS6X-295P	295.0	36.0	8.19	44.5	8.76	15.00		
CS6X-300P	300.0	36.1	8.30	44.6	8.87	15.00		
CS6X-305P	305.0	36.3	8.41	44.8	8.97	15.00		
CS6X-310P	310.0	36.4	8.52	44.9	9.08	15.00		
CS6X-315P	315.0	36.6	8.61	45.1	9.18	15.00		
CS6X-320P	320.0	36.8	8.69	45.3	9.26	15.00		
CS6X-325P	325.0	37.0	8.78	45.5	9.34	15.00		
CS6X-330P	330.0	37.2	8.88	45.6	9.45	15.00		
CS6V-200M	200.0	25.2	7.95	31.1	8.46	15.00	1638×826×40	16.0
CS6V-205M	205.0	25.3	8.11	31.2	8.63	15.00		
CS6V-210M/MM	210.0	25.4	8.27	31.3	8.79	15.00		
CS6V-215M/MM	215.0	25.5	8.43	31.5	8.94	15.00		
CS6V-220M/MM	220.0	25.7	8.56	31.6	9.08	15.00		

ANNEX C:
Module Specifications

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>
CS6V-225M/MM	225.0	26.0	8.67	31.8	9.19	15.00		
CS6V-230M/MM	230.0	26.1	8.81	31.9	9.33	15.00		
CS6V-235MM	235.0	26.4	8.91	32.1	9.45	15.00		
CS6VH-100M/MM	100.0	12.6	7.95	15.5	8.46	15.00		
CS6VH-105M/MM	105.0	12.7	8.27	15.7	8.78	15.00		
CS6VH-110M/MM	110.0	12.9	8.55	15.8	9.07	15.00	844×826×40	9.0
CS6VH-115M/MM	115.0	13.1	8.80	16.0	9.32	15.00		
CS6VH-120MM	120.0	13.4	8.99	16.1	9.56	15.00		
CS6V-190P	190.0	24.6	7.73	30.6	8.28	15.00		
CS6V-195P	195.0	24.8	7.87	30.7	8.44	15.00		
CS6V-200P	200.0	24.9	8.03	30.8	8.59	15.00		
CS6V-205P	205.0	25.0	8.19	30.9	8.76	15.00		
CS6V-210P	210.0	25.1	8.35	31.1	8.92	15.00	1638×826×40	16.0
CS6V-215P	215.0	25.3	8.51	31.2	9.07	15.00		
CS6V-220P	220.0	25.5	8.64	31.4	9.21	15.00		
CS6V-225P	225.0	25.7	8.75	31.6	9.32	15.00		
CS6V-230P	230.0	25.9	8.90	31.7	9.47	15.00		
CS6VH-95P	95.0	12.3	7.7	15.3	8.28	15.00		
CS6VH-100P	100.0	12.5	8.03	15.4	8.59	15.00		
CS6VH-105P	105.0	12.6	8.35	15.5	8.91	15.00	844×826×40	9.0
CS6VH-110P	110.0	12.7	8.63	15.7	9.2	15.00		
CS6VH-115P	115.0	12.9	8.88	15.8	9.46	15.00		
CS6K-210P	210.0	29.0	7.25	36.4	7.89	15.00		
CS6K-215P	215.0	29.0	7.40	36.5	8.01	15.00		
CS6K-220P	220.0	29.2	7.53	36.6	8.09	15.00		
CS6K-225P	225.0	29.4	7.65	36.7	8.19	15.00		
CS6K-230P	230.0	29.6	7.78	36.8	8.34	15.00		
CS6K-235P	235.0	29.8	7.90	36.9	8.46	15.00		
CS6K-240P	240.0	29.9	8.03	37.0	8.59	15.00		
CS6K-245P	245.0	30.0	8.17	37.1	8.74	15.00	1650*992*40	19.0
CS6K-250P	250.0	30.1	8.30	37.2	8.87	15.00		
CS6K-255P	255.0	30.2	8.43	37.4	9.00	15.00		
CS6K-260P	260.0	30.4	8.56	37.5	9.12	15.00		
CS6K-265P	265.0	30.6	8.66	37.7	9.23	15.00		
CS6K-270P	270.0	30.8	8.75	37.9	9.32	15.00		
CS6K-275P	275.0	31.0	8.88	38.0	9.45	15.00		

ANNEX D:
Module Cleaning Guidelines

ANNEX D: Module Cleaning Guidelines

This manual lays down requirements for the cleaning procedure of Canadian Solar photovoltaic modules. The purpose of these cleaning guidelines is to provide general information for cleaning Canadian Solar modules. System user and professional installer should read these guidelines carefully and strictly follow these instructions. Failure to follow these instructions may result in death, injury or property damage to photovoltaic module. Damaged induced by inappropriate cleaning procedures will void Canadian Solar warranty.

Safety Warning

- Cleaning activities create risk of damaging the modules and array components, as well as increasing the potential electric shock hazard.
- Cracked or broken modules represent an electric shock hazard due to leakage currents, and the risk of shock is increased when modules are wet. Before cleaning, thoroughly inspect modules for cracks, damage, and loose connections.
- The voltage and current present in an array during daylight hours are sufficient to cause a lethal electrical shock.
- Ensure that the circuit is disconnected before starting the cleaning procedure as contact with leakage of electrically active parts can result in injury.
- Ensure that the array has been disconnected to other active components (such as inverter or combiner boxes) before starting with the cleaning.
- Wear suitable protection (Clothes, insulated gloves, etc.).
- Do not immerse the module, partially or totally, in water or any other cleaning solution.

Handling Notice

- Use a proper cleaning solution and suitable cleaning equipment.
- Do not use abrasive or electric cleaners on the module.
- Particular attention should be taken to avoid the module backsheet or frame to come in contact with sharp objects, as scratches may directly affect product safety.
- Do not use de-greasers on the module.
- Do not use cleaning corrosive solutions containing acid, alkali, acetone, or industrial alcohol.
- Canadian Solar recommends to avoid rotating brush cleaning method, as it could create micro-cracks in the PV modules.
- Dirt must never be scraped or rubbed away when dry, as this will cause micro-scratches on the glass surface.

Operation Preparation

- Noticeable dirt must be rubbed away by gentle cleaning implement (soft cloth, sponge or brush with soft bristles).
- Ensure brushes or agitating tools are not abrasive to glass, EPDM, silicone, aluminum, or steel.
- Conduct the cleaning activities avoiding the hottest hours of the day, in order to avoid thermal stress on the module.

Recommended water to be used:

- ✓ Water with low mineral content
- ✓ Near neutral PH water

- ✓ The maximum water pressure recommended is 4MPa (40 bar)

Cleaning Methods

Method A: Compressed Air

Canadian Solar recommends cleaning the soft dirt (like dust) on modules just with air pressure. This technique can be applied as long as the method is efficient enough considering the existing conditions.

Method B: Wet cleaning

If excessive soiling is present on module surface, a non-conductive brush, sponge, or other mild agitating method may be used with caution.

- Ensure that any brushes or agitating tools are constructed with non-conductive materials to minimize risk of electric shock and that they are not abrasive to the glass or the aluminum frame.
- If grease is present, an environmental friendly cleaning agent may be used with caution.