

Installation Manual

Global version (A)

Frame Type PV Module

[For IEC]

NT-xxx AF / NT-xxx AX

[For UL]

NT-xxx UF / NT-xxx UX

Table of Contents




1. Introduction	2
1.1 Safety	2
1.1.1 General Safety	2
1.1.2 Handling Safety	3
1.1.3 Installation Safety	3
1.2 Storage	5
1.3 WEEE Information	5
1.4 Disclaimer of Liability	5
2. Installation	6
2.1 General Information	6
2.2 Mounting Method	6
2.2.1 Bolting System	7
2.2.2 Clamping System	7
2.3 Wiring	9
2.3.1 Series Wiring	10
2.3.2 Parallel Wiring	10
2.4 Cable Selection	11
2.5 Bypass Diodes	11
2.6 Grounding	11
2.7 Inverter Requirement	13
3. Maintenance	14
3.1 Cleaning Instructions	14
3.2 System Inspection	14
APPENDIX 1 - Appearance	15
APPENDIX 2 - Mounting Guideline	16

1. Introduction


Thank you for choosing NexPower PV Module (Photovoltaic Module). Please read this manual carefully before the installation. It provides important safety and instructions for installation and maintenance of this PV Module. Please refer to product specification for all electrical and mechanical characteristics of the NexPower PV Module.

Failure to follow the requirements and instructions in this manual will invalidate the warranty for PV Modules provided by NexPower.


1.1 Safety


 Risk of electric shock	 Caution	 Prohibit
---	--	---

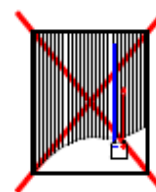
1.1.1 General Safety


 PV module converts sunlight to electricity, when sunlight or light other source illuminates the module surface. PV modules can produce high voltage and current which may cause serious injury or even death. Extra attention is required to avoid “Electric Shocks” during usage.


 Do NOT work under rain, snow, or windy conditions.

 Please note, the back surface of PV module is not protected by glass and is vulnerable to sharp objects.

 Do NOT install PV module upside down (junction box downward).







 Protect plug contacts against soiling and do NOT use soiled plug contacts to make any plug connections.






 Do NOT disassemble the PV module or remove any component or label from the module.

 Do NOT drill holes in the frame or on the glass of PV module.





 Do NOT artificially concentrate sunlight onto the PV module.

-  Do NOT use chemicals in cleaning the surface or back sheet of PV module. Do NOT let water remain on the glass surface of PV modules for an extended period of time.
-  Do NOT cover the water drain holes of the frame.
-  Do NOT hang or carry PV module by the cable.
-  Do NOT pull the cable, resulting in loose or damaged the junction box during handing and installing process.

1.1.2 Handling Safety

-  The manual handling process must be made by two people. If the PV module damaged (fault, crack or break) is caused by improper handling process, it will be deemed negligent construction work.
-  Do NOT store or move the modules with the cables connected.
-  Do NOT use PV modules near equipments or locations where flammable gases can be generated.
-  Do NOT stand or step on the PV module, cables, connectors, or end caps.
-  Do NOT drop the PV module or allow objects to fall on PV module.

1.1.3 Installation Safety

-  Always wear electrical insulating gloves, protective head gear, suitable eye protection, and safety shoes while working on systems. Use only insulated tools during installation.
-  Do NOT touch the junction box or the output cables connectors with bare hands during installation, regardless whether the PV module is connected to or disconnected from the system.
-  When connecting cables, push the plus and minus connectors against each other while twisting them until they are fully engaged.
-  Mount the PV module onto the structure member with specified mounting structure. Make sure to fasten bolts completely and lock in order not to loosen.

Frame Type PV Module

- ⚠ The support structure for the PV module must be engineered to withstand the anticipated wind and snow loads. Additionally, other forces may need to be considered according to local standards and regulations.
- ⚠ Appropriate measures should be taken to prevent possible damage to lower edge of the PV module in snow condition and also take proper steps to maintain reliability and safety, in case the PV modules are installed in area such as cold areas/ strong wind areas.
- ⚠ The position of junction box should not overlap the mounting structure.
- ⚠ Junction box, cables and connectors should not be stressed in any circumstances.
- ⚠ The PV module can either be installed in portrait or landscape orientation (Fig. 1), however portrait mounting is strongly recommended. Following conditions must be conformed during design phase.
 - i) For all conditions, partial shading parallel to the longitudinal direction is not permissible. Even in case of on-end assembly all shading parallel to the longitudinal direction must be avoided at all times especially during completion of installation when the modules are hooked on grid; such shading is also created by erecting scaffolds, masts, sticks etc.
 - ii) For on-ground installation, make sure to leave sufficient distance between PV module and the ground to avoid the module being covered by accumulated water, snow, grass or other objects.

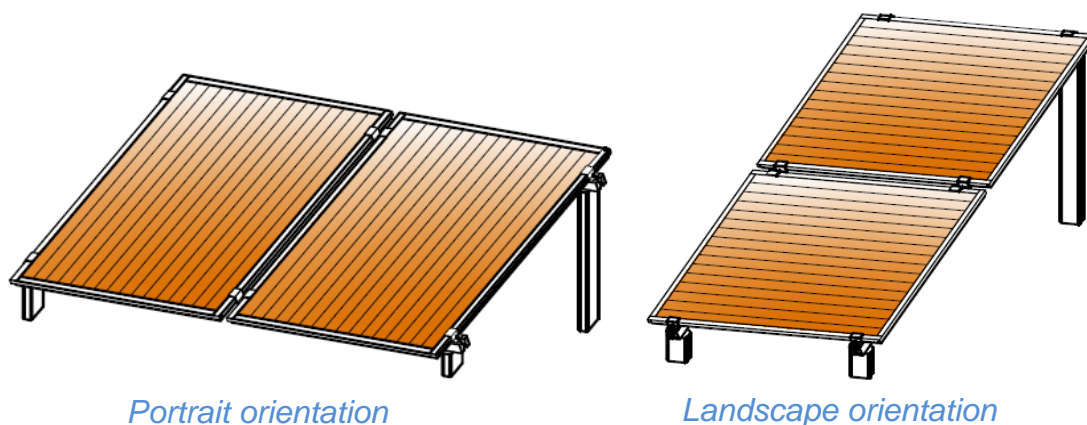


Fig. 1: PV Module mounting configuration

- ⊘ Do NOT connect the NexPower PV module mixed with other brand or NexPower's different product models.
- ⊘ Do NOT cut the cable attached on PV module then connect to another type of cable or connector.



Do NOT damage the back sheet of PV modules while fastening the PV modules to mounting structure.

1.2 Storage

Please refer to the warranty document for storing condition.

1.3 WEEE Information

For EU (European Union) member users:

According to the WEEE directive, do not dispose of the photovoltaic panels to be mixed with general waste. Waste electrical and electronic equipment should be appropriately collected and recycled as required by practices established for your country. For further details of your nearest designated collection point, please contact your local authority.

WEEE website of European Commission (<http://ec.europa.eu/environment/waste/weee>)

1.4 Disclaimer of Liability

NEXPOWER EXPRESSLY DISCLAIMS THE LIABILITY FOR ANY LOSS, DAMAGES, OR EXPENSE ARISING OUT OF OR IN ANY WAY CONNECTED WITH THE INSTALLATION, OPERATION, USE, OR MAINTENANCE OF THE PV MODULE(S). NEXPOWER WILL NOT BE LIABLE FOR ANY CLAIM THAT THE PV MODULE(S) INFRINGE(S) ANY THIRD PARTY'S PATENT, COPYRIGHT, AND/OR OTHER INTELLECTUAL PROPERTY RIGHT(S). NEXPOWER may, at its sole discretion, modify the specifications of the product and the terms of this installation manual from time to time if necessary without sending the prior written notice to the client or any other parties.

2. Installation

2.1 General Information

- The PV module generates power when it is illuminated by sunlight. In order to gain maximum power, the PV module should face directly towards the sun. The PV module should be installed to typically face south in the northern hemisphere and north in the southern hemisphere.
- In most applications, the PV module should be installed in a location without shading throughout the year. It is necessary to choose a site where no trees, buildings, or obstructions could cast shadows on the PV module.
- If it is not possible to place the PV module in a shadow-free location, place it in the least shaded location and conduct an analysis on shadow coverage throughout the year.
- In systems that are configured with multiple rows of angled PV modules, the rows should be spaced far enough apart to minimize the impact of rows shading other rows during the course of the day. This distance is dependent on the latitude at which the system is installed.
- It is not permitted to modify the module under any circumstances.
- Make sure the installation location and its surroundings are free from corrosive matters. (Ex. sea water, chemical factory, domestic animals hut, hot spring or volcano area emitting hydrogen sulfide or ammonia gas).
- In some installations, the PV module is mounted at a tilt angle which is measured between the PV module and the horizontal ground. For grid-connected installations where PV modules are attached to a permanent structure, it is recommended to tilt PV module at the angle equal to the site's latitude in most simple way or get optimal tile angle by simulation software. Adjust the PV module orientation to face the sun directly so it will generate the maximum power.
- It is recommended to set the tilt angle above **10 degrees** so that rain can flush away the accumulated dust on PV module surface. If lower, a periodic cleaning maintenance may be necessary.

2.2 Mounting Method

- PV modules can be mounted on ground, roof, and/or pole by using bolts, clamps, fixing plates.
- In most installations a clearance of **0.2 inch (5 mm)** at least between modules is necessary to accommodate thermal expansion.
- For proper operation and to avoid damage from condensation, the PV module requires an adequate flow of air across the rear surface. While installing PV modules, ensure sufficient distance between the rear of PV module and the mounting surface to allow the air flow.
- In case of on-ground installation, be sure to leave sufficient distance between PV module and the ground to avoid the module being exposed to standing water or snow.

Frame Type PV Module

- The array racks must support the modules and must be continuous pieces (no breaks in the rack).
- The frames of module should not be stressed by bending or twisting force during installation and operation.
- When selecting the material for the assembly system, pay attention to the electrochemical effect (avoidance of contact corrosion between different materials).
- PV module can be mounted as desired in accordance with the instruction approved in **APPENDIX 2 – Mounting Guideline**.

2.2.1 Bolting System

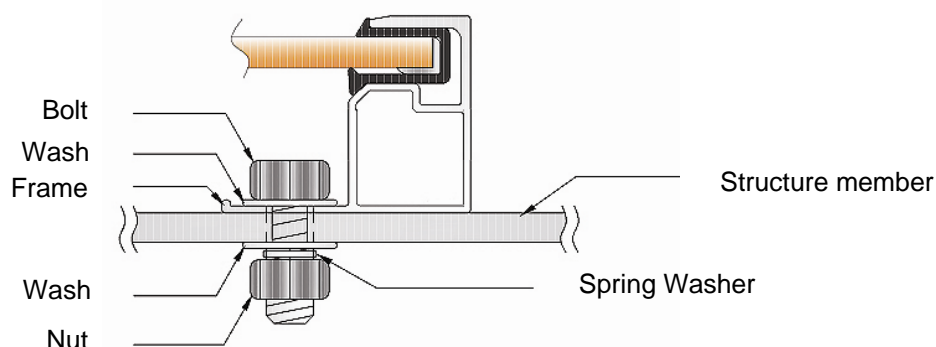


Fig. 3: Bolting system

- The PV module has four holes on the long edge of its frame for mounting purpose. Please refer to **APPENDIX 1 – Appearance**.
- PV modules may be fastened to a support by using bolt holes that are at the bottom of the frame with stainless bolts, washers, spring washers, and nuts.
- Do NOT damage the rear surface of PV modules while fastening PV modules by bolts.

2.2.2 Clamping System

- The mounting clamp and fixing plate must meet the dimensions requirements (Fig. 4).

For NT-xxx AF / NT-xxx UF

Clamp and fixing plate dimensions requirements	
Length A	$0.55 \text{ inch}(14 \text{ mm}) \geq A \geq 0.28 \text{ inch}(7 \text{ mm})$
Length B	$B \geq 1.57 \text{ inch}(40 \text{ mm})$

Clamp and fixing plate torque requirements	
Toque	$3.69 \sim 8.85 \text{ lbf-ft} (5 \sim 12 \text{ N-m})$

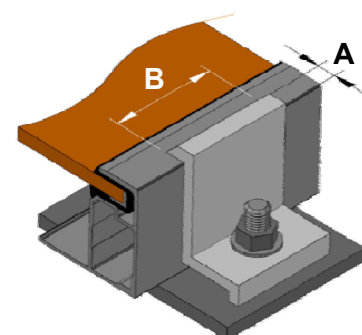


Fig. 4: Clamp dimension definition

For NT-xxx AX / NT-xxx UX

Clamp and fixing plate dimensions requirements	
Length A	0.66 inch(17 mm) \geq A \geq 0.28 inch(7 mm)
Length B	B \geq 1.57 inch(40 mm)

Clamp and fixing plate torque requirements	
Toque	5.9~7.4 lbf-ft (8~10 N-m)

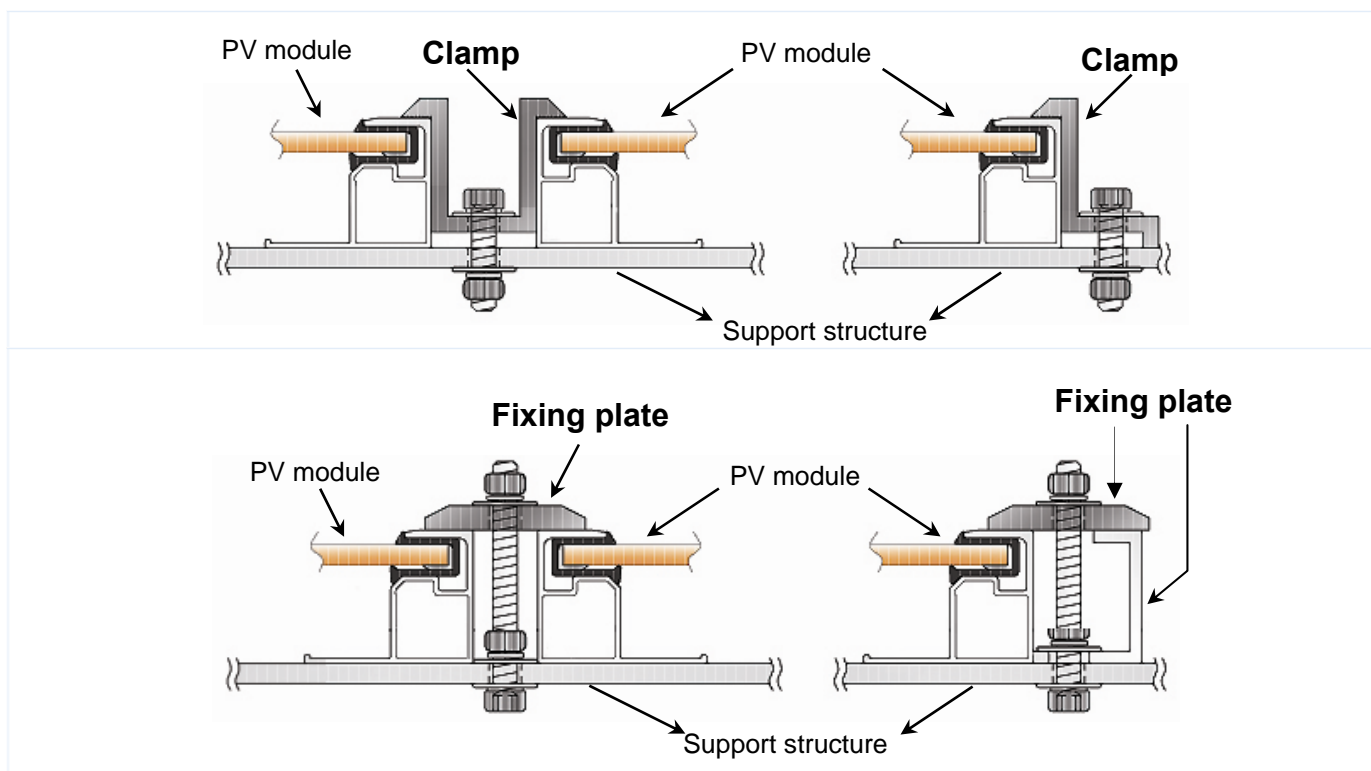


Fig. 5: Clamping system

- The PV module can be mounted by using clamps and fixing plates.
- The common clamp used for crystalline PV modules is compatible.
- For more detailed or specific recommendations, please contact your PV system dealer or module provider.
- The PV modules may be mounted by using clamps or fixing plates on long edge of PV module, which would be perpendicular (Fig. 6) or parallel to array racks (Fig. 7).
- It is essential to install the PV module according to the following guidelines.
 - i) The clamp position (C) is from the end of the module to the centerline of the clamp or fixing plate.
 - ii) The clamp position (C) should be symmetrical at each side of PV module.
 - iii) PV module can be mounted as desired in accordance with the instruction approved in **APPENDIX 2 – Mounting Guideline.**

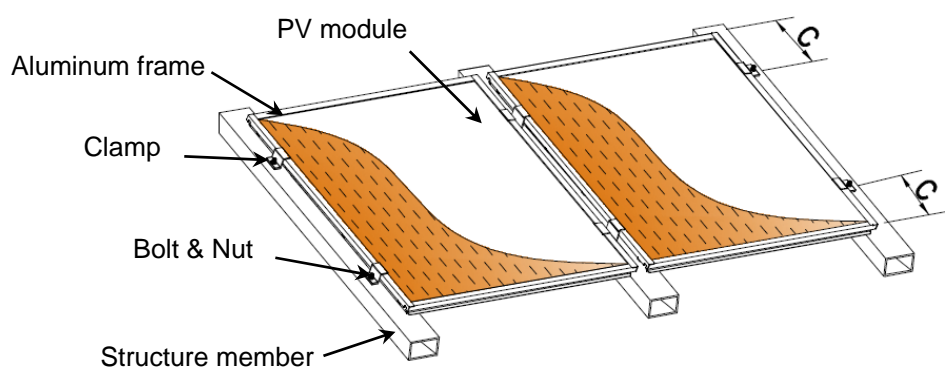


Fig. 6: Mounting structure - A

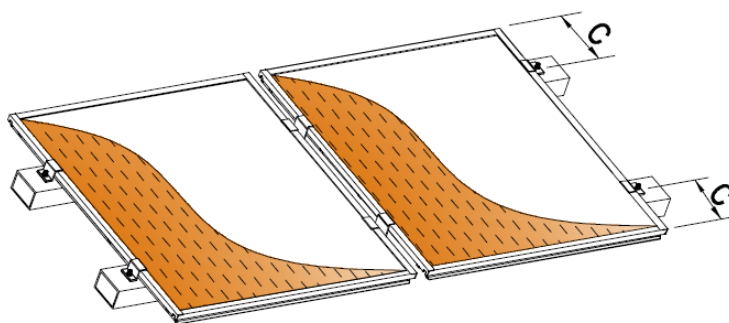


Fig. 7: Mounting structure - B

2.3 Wiring

- The PV module has two sunlight resistant output cables, and each is terminated with a Multi-Contact compatible connector. The positive terminal has a female connector, and the negative terminal has a male connector.
- Connecting PV modules in series would increase voltage, while connecting in parallel would increase current. In order to design an adequate PV system, PV modules should be connected in series and/or in parallel depending on specifications of inverters or other pertinent equipments.
- While connecting several strings in parallel, it is necessary to keep equivalent quantity of PV modules to each parallel string. If connected incorrectly, PV modules will become damaged.
- All system wiring must conform to local electrical codes.
- **[UL only]** All system wiring must conform to Section 690-8 of the National Electrical Code (NEC) in USA, Canadian Electrical Code (CEC) in Canada, or local electrical codes, for an additional multiplying factor of 125% (80% derating) which may be applicable.
- **[UL only]** Additional devices such as ground fault, fuses, and disconnects for over-current protection may be required, in accordance with Article 690-5 of the National Electrical Code (NEC).
- **[UL only]** Installation shall be in accordance with CSA C22.1, safety Standard for Electrical Installations, Canadian Electrical Code Part 1.

Frame Type PV Module

2.3.1 Series Wiring

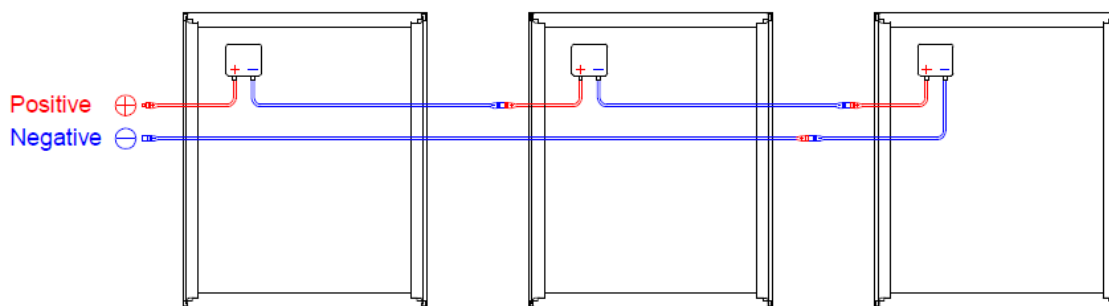


Fig. 9: Series wiring

- PV modules can be wired in series to increase voltage. Connect cables from the positive(+) / negative(-) terminal of one module to the negative(-) / positive(+) terminal of the next module.
- When several PV modules are connected in series, the voltage and current are as below:

$$V_{total} = V_1 + V_2 + \dots + V_n$$

$$I_{total} = I_1 = I_2 = \dots = I_n$$

n : number of PV modules

- When determining system voltage ratings:

Requirements / Standards	IEC	UL
Voc multiplied factor	1.25	1.25
Maximum system voltage	1000V	600V

2.3.2 Parallel Wiring

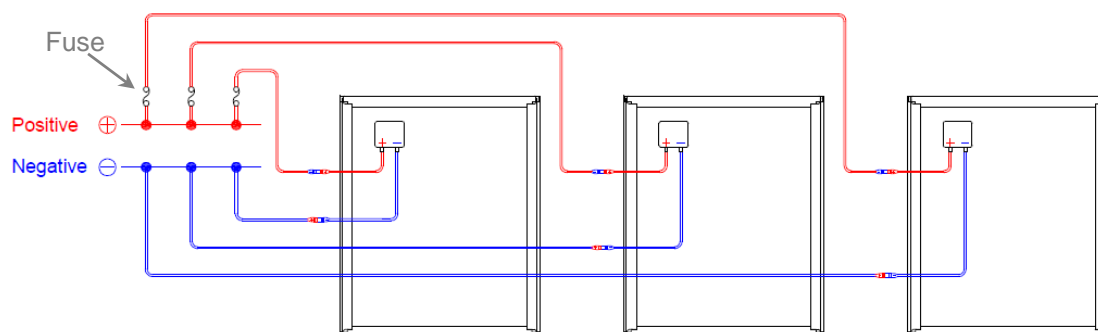


Fig. 10: Parallel wiring

- PV modules can be wired in parallel to increase current. Connect cables from the positive(+) / negative(-) terminal of one module to the positive(+) / negative(-) terminal of the next module.
- When several PV modules are connected in parallel, the voltage and current are as below:

$$V_{total} = V_1 = V_2 = \dots = V_n$$

$$I_{total} = I_1 + I_2 + \dots + I_n$$

n : number of PV modules

- Please be noted that the short-circuit current of system is calculated by multiplying the I_{sc} listed on the module label by the number of source circuits operating in parallel. Use this

Frame Type PV Module

value and multiply by **1.56** to determine the conductor capacities and fuse sizes connected to the module output.

- Ensure the system design prevents a reverse current of no more than specification will flowing through the PV module.
- Parallel configuration is not limited in case of taking proper measure (e.g. fuse for protection of module and cable from over current, and/or blocking diode for prevention of unbalanced strings voltage) to block the reverse current flow.

2.4 Cable Selection

- **[IEC only]** The cables should use **2.5mm²** or upper grade copper wires.
- **[UL only]** The cables should use **14 AWG** or upper grade copper wires.
- It is very important to use the proper cable with a minimum wire gauge approved for usage at the maximum short circuit current. Smaller gauge cables and connectors can become overheated under high currents.
- The cables selected should have a temperature rating higher than 90°C.
- Series and parallel wiring should use compatible connectors as of the PV modules.
- **[UL only]** The final array output wiring can be made to a permanent wiring system in accordance with Article 690-13 of National Electrical Code (NEC).

2.5 Bypass Diodes

- Buildings, trees, or obstructions around PV modules can cast shadows on PV modules. Current forced through shaded part of PV modules causes additional heating and severe loss of power.
- In order to avoid this condition which may impair PV module, NexPower PV Module is equipped with factory-installed bypass diodes.

Specification	Rated value
Repetitive Peak Reverse Voltage	1000 V
Maximum Average Forward Current	5 A

2.6 Grounding

- Grounding method must comply with laws or electrical regulations. Please confirm electrical codes in the region where the PV system is installed. If the grounding should be completed in local codes, please conform to the following steps.
- Each PV module must be grounded using the grounding holes found on the frame. The PV module has four **Φ0.14 inch (Φ3.5mm)** holes in the frame for grounding purpose. Select at least one grounding hole according to PV module mounting mode.
- Must apply equipment grounding at the same electrical potential level to all PV modules.
- **[IEC only]** Grounding cables must be bolted or screwed with star washers (Fig.11).

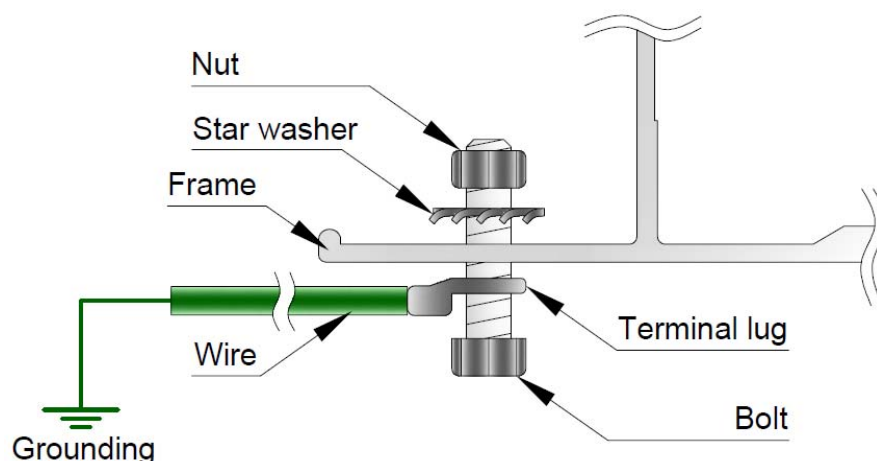


Fig. 11: Grounding connection of the PV module [IEC only]

- [UL only] Grounding cables must be bolted with washers (Fig.12).
- [UL only] Attach the equipment grounding conductor to the module frame by a **No.6 (M3)** bolt, stainless steel cup washer, stainless steel washer, star washer (Fig.12).
- [UL only] The stainless steel washer is to be placed between the grounding lead and the aluminum frame.
- [UL only] The grounding conductor size should be **14 AWG** or above and must be sized according to Table 255-122 of the National Electrical Code and with a temperature rating higher than **90°C**.
- [UL only] The torque to the bolt should be **1.0 lbf-ft (1.4 N-m)**.

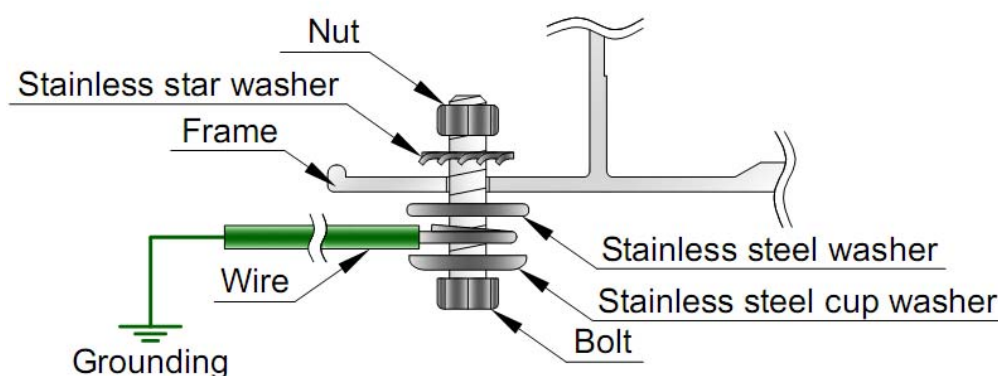


Fig. 12: Grounding connection of the PV module [UL only]

- When connecting in series, PV modules either connect to the structure members by attaching wires to the ground holes on the frames or directly bind with the structure member at adequate positions to deploy the grounding method at the designated equipment grounding spot.
- Support structure member must apply grounding.

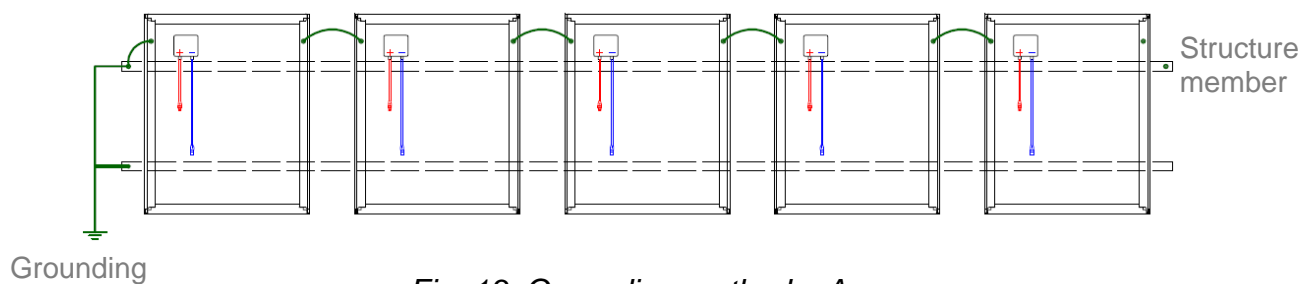


Fig. 13: Grounding method – A

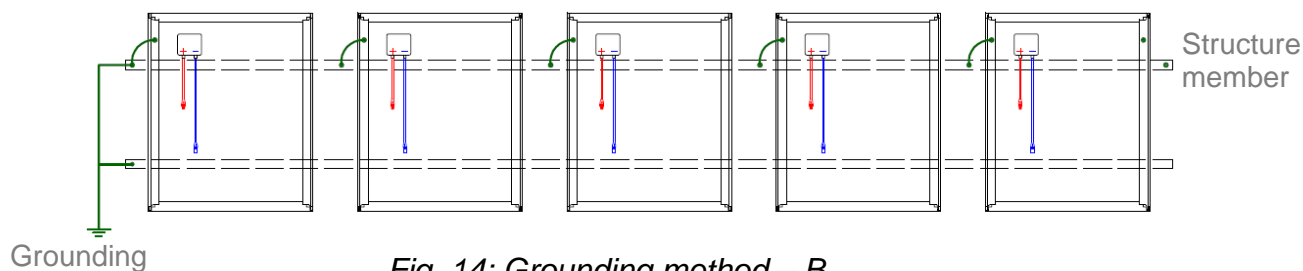


Fig. 14: Grounding method – B

2.7 Inverter Requirement

- For NexPower module requirement, **it is essential to select transformer type inverters with DC negative pole grounding function.**
- For more details or specific recommendations, please contact your PV system dealer or module provider.

3. Maintenance

3.1 Cleaning Instructions

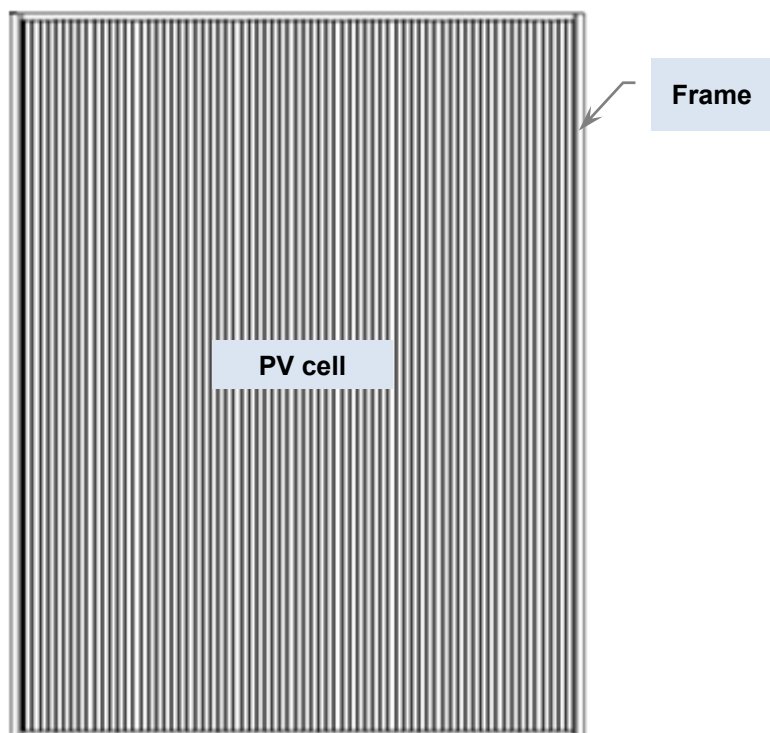
- When dirt accumulates on the surface of PV module and becomes excessively built-up, power output may decline. When this situation occurs, it is a good manner to use only lots of water to flush the dirt away.
- Moreover, cleaning the module surface is proper but only with a soft cloth and water.
- Before washing, please wear electrical insulation gloves to avoid electrical accidents.
- Protect yourself against any possibility from accidents during maintenance.
- If cleaning the back of the module is required, take utmost care to avoid penetrating the back side materials.
- During the cleaning process, do NOT cause any partial shading parallel to the longitudinal direction of the module.
- It is recommended to shut down the system before the cleaning process or to clean the modules under low irradiance condition (e.g. at dawn or nightfall).

3.2 System Inspection

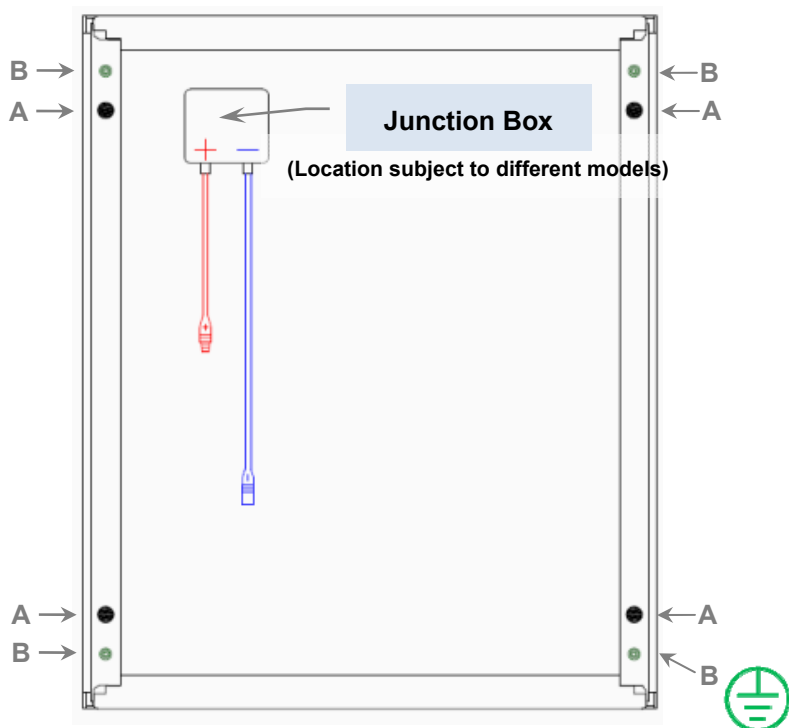
- The PV modules are designed to last for extended period of time thus require very little maintenance.
- Check annually and carefully to ensure for fixed mounting hardware and tightened wiring. Any loose connections or parts may cause damages in modules or arrays.
- If any problem is found, please contact your local PV system dealer for professional service.

APPENDIX 1 - Appearance

Front View



Rear View

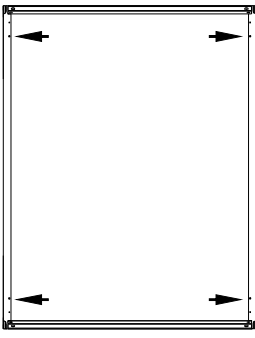
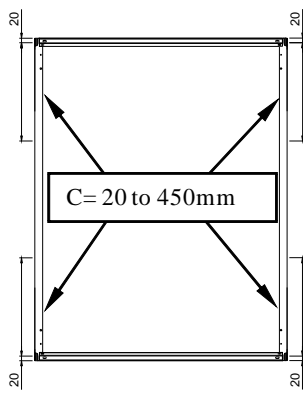
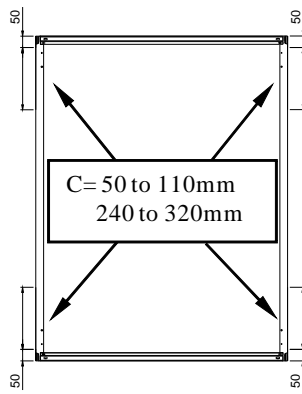
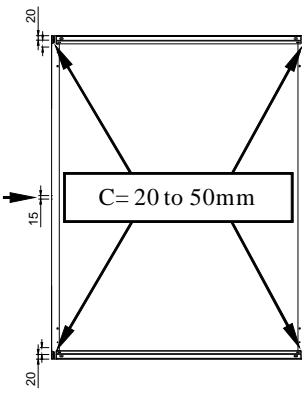
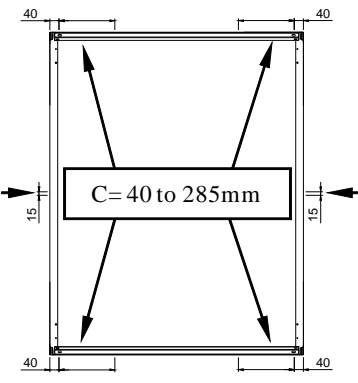
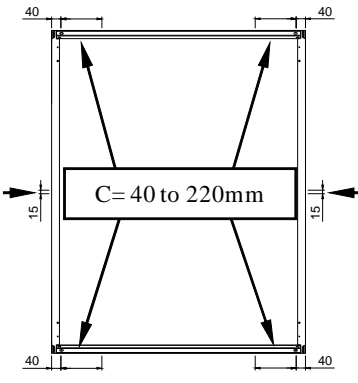


A		
Type	Mounting hole	Bolt size
NT-xxx AF/UF	$\Phi 0.26$ inch ($\Phi 6.5$ mm)	M6 (Stainless)
NT-xxx AX/UX	$\Phi 0.39$ inch ($\Phi 10$ mm)	M8 (Stainless)

B		
Type	Grounding hole	Bolt size
NT-xxx AF/UF NT-xxx AX/UX	$\Phi 0.14$ inch ($\Phi 3.5$ mm)	M3

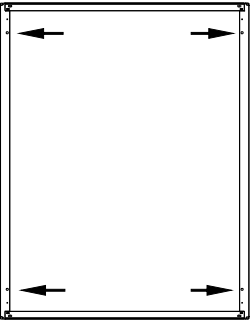
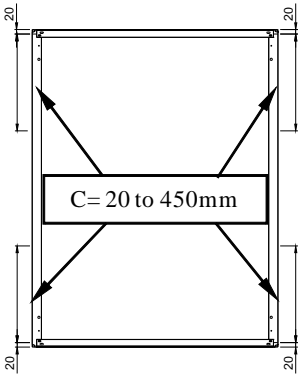
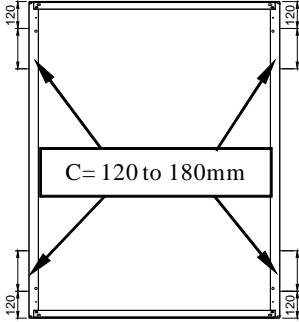
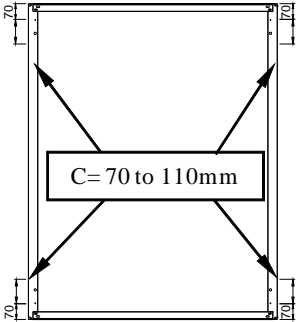
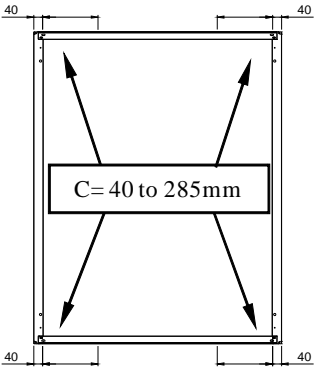
APPENDIX 2 - Mounting Guideline

2.1 For NT-xxx AF/ NT-xxx UF

	Snow/Wind load 1200 Pa	Snow/Wind load 2400 Pa	Snow/Wind load 3000 Pa
Bolting system Attach to the mounting holes	 <p>Use four mounting holes</p>		
Clamping system Attach to the long frame	 <p>Use four clamps</p>	 <p>Use four clamps*</p>	 <p>Use six clamps</p>
Clamping system Attach to the short frame		 <p>Use six clamps</p>	 <p>Use six clamps</p>

* The mounting configuration is certified by the third party organization.

2.2 For NT-xxx AX/ NT-xxx UX

	Snow/Wind load 2400 Pa	Wind load 3800 Pa	Snow load 5400 Pa
Bolting system Attach to the mounting holes	 <p>Use four mounting holes</p>		
Clamping system Attach to the long frame	 <p>Use four clamps*</p>	 <p>Use four clamps</p>	 <p>Use four clamps</p>
Clamping system Attach to the short frame	 <p>Use four clamps</p>		

* The mounting configuration is certified by the third party organization.

AI402-MI-C