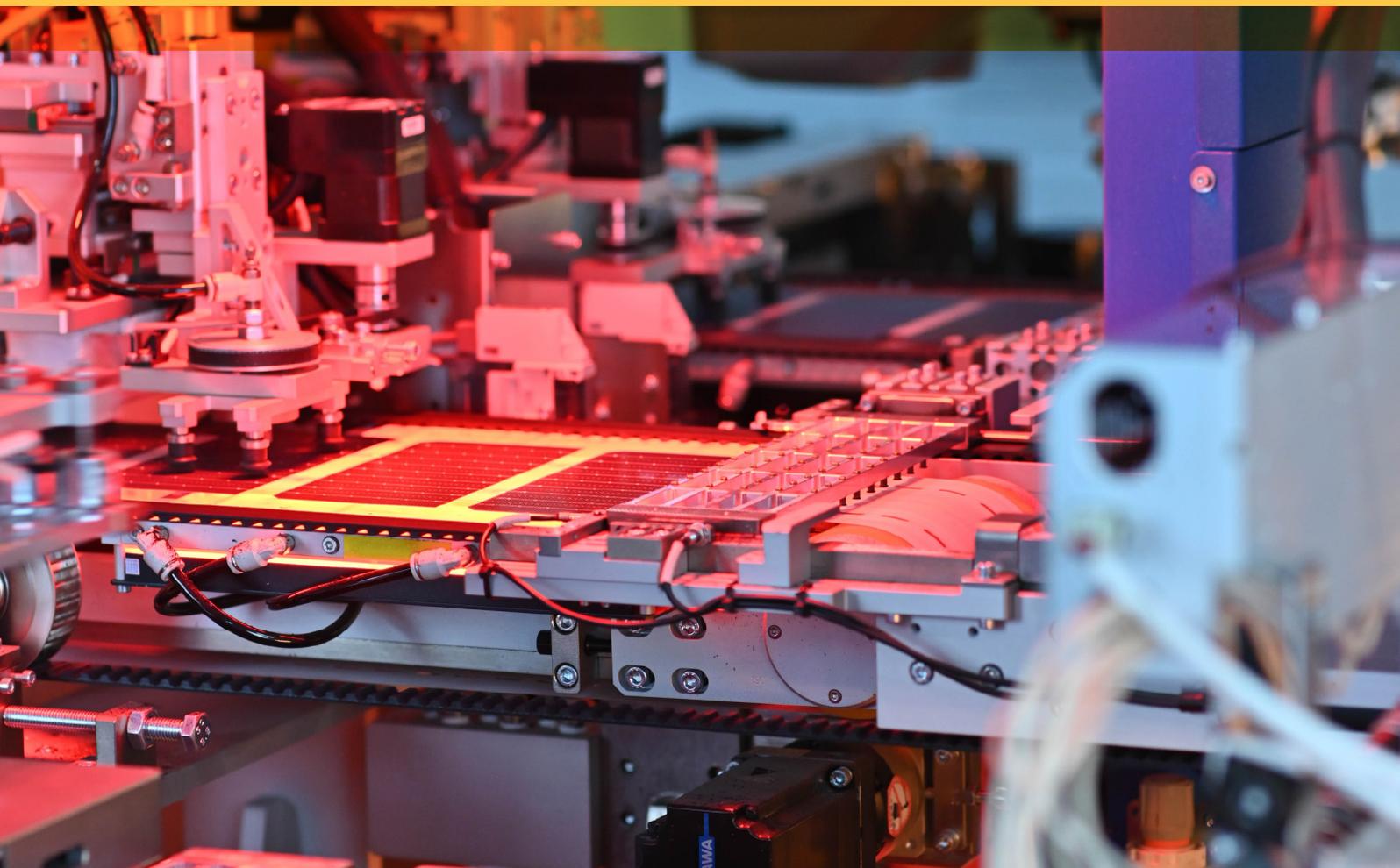




*Installation manual*



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- 1. GENERAL INFORMATION**
- 2. DISCLAIMER**
- 3. WARNINGS**
- 4. UNPACKING**
- 5. PREPARATION BEFORE INSTALLATION**
  - 5.1. INSTALLATION CONDITIONS
  - 5.2. SITE SELECTION
  - 5.3. TILT ANGLE SELECTION
- 6. MECHANICAL INSTALLATION**
  - 6.1.1. MODULES WITH 60 CELLS
  - 6.1.2. MODULES WITH 72 CELLS
  - 6.1.3. MODULES WITH 144 CELLS
  - 6.2. MOUNTING WITH CLAMPS
    - 6.2.1. MODULES WITH 60 CELLS
    - 6.2.2. MODULES WITH 72 CELLS
    - 6.2.3. MODULES WITH 144 CELLS
- 7. WIRING AND CONNECTION**
- 8. MAINTENANCE AND CARE**
  - 8.1. CLEANING OF MODULES
  - 8.2. VISUAL INSPECTION
  - 8.3. PREVENTIVE MAINTENANCE
- 9. CONTACTS**

# 1. GENERAL INFORMATION

You have chosen an EXIOM module, thank you for trusting us.

To ensure correct installation of the photovoltaic modules, it is recommended that you read the information shown in this manual before installing and using them.

Remember that you are going to work with products and elements that generate electricity, therefore, the appropriate safety measures must be taken, which will be dealt with in later sections.

Our modules have the Security Qualification of photovoltaic modules UNE-EN IEC 61730-1: 2019, Construction Requirements and UNE-EN IEC 61730-2: 2019, Test Requirements complying with the Requirements for Safety Class II .

## 2. DISCLAIMER

The manipulation, installation and subsequent use of the photovoltaic modules are beyond the control of the manufacturer, therefore, EXIOM does not assume any type of responsibility related to damages, losses, or costs derived from inappropriate use, manipulation and / or maintenance.

## 3. WARNINGS

- At the design stage, the variation in voltage depending on the temperature at the time of installation must be taken into account, for this check the specifications relating to the temperature coefficient of the modules (the VOC of the modules increases with decreasing temperature). Consequently, the Isc and Voc value marked on this module must be multiplied by 1.25 when determining component voltage ratings, conductor current ratings, fuse sizes, and the size of controls connected to the power supply photovoltaic output.
- The maximum load test on the module surface must not exceed 5.4kN/m<sup>2</sup>.
- Photovoltaic modules generate DC electrical energy when exposed to sunlight or other light sources. Special care must be taken with the live parts of the module, particularly the terminals.
- Artificially concentrated sunlight shall not be directed on the module or panel.
- Application class is class A.
- To reduce the risk of electric shock or burns, the

modules can be covered with an opaque material during installation.

- Use proper protective equipment and tools to reduce the risk of electric shock.
- All instructions must be understood before installing the photovoltaic module.
- Follow the battery manufacturer's recommendations if using batteries with modules.
- If the module is to be mounted to a roof of a building, the assembly is to be mounted over a fire resistant roof covering rated for the application for the non-integral module, Fire class C. The fire class rating of modules is Class C.
- Do not walk on the module.
- Do not scratch the front or rear surfaces of the module.
- Never use a module with a broken glass.
- Broken modules must not be repaired.
- Do not disassemble or remove any part of the modules.
- Do not touch the live terminals with your bare hands.
- Always use insulating tools for electrical connections.
- Do not use water for fire fighting while the power supply is connected.
- Protect the contacts against dirt.
- Never handle or install modules that are wet or in high wind conditions.
- Make sure there are no polarity reversals.
- All photovoltaic systems must be grounded, following the applicable National regulations and standards.
- Only photovoltaic modules of the same cell size should be connected in series
- During transportation, try to minimize shocks, drops or vibrations that could compromise the integrity of the module.
- The modules must be protected from prolonged exposure to aggressive environments (alkaline, high sulfur content, acids ...) that may present a risk of corrosion.
- Do not clean the glass of the module with chemicals.
- Before cleaning a module, make sure the surface is cool (using cold water on a hot surface could cause the glass to break).
- Do not disconnect any module under load.
- Before handling or working with installed modules, turn off the main switch in the connection box.
- Do not put the connectors in contact with oily substances, organic solvents or other corrosive substances.
- Do not dispose of the photovoltaic modules using the usual procedure, contact your installer or dispose of them in a clean point specialized in the recycling of this type of equipment.

## 4. UNPACKING

- Use adequate machinery and tools for unloading, unpacking and handling of the modules.
- If storage is necessary before installation, select a dry and ventilated place for it.
- Do not place the modules one on top of the other.
- Before installation, make sure the electrical contacts are clean and dry.

## 5. PREPARATION BEFORE INSTALLATION

### 5.1. INSTALLATION CONDITIONS

The recommended conditions for the installation of EXIOM solar modules will be the following:

- Ambient temperature: From  $-40^{\circ}\text{C}$  to  $50^{\circ}\text{C}$ .
- Working temperature: From  $-40^{\circ}\text{C}$  to  $85^{\circ}\text{C}$ .
- Storage Temperature: From  $-20^{\circ}\text{C}$  to  $50^{\circ}\text{C}$ .
- Humidity:  $\leq 85\%$  RH.
- Mechanical Load Pressure: 5400 Pa.

It will be the responsibility of the installer to carry out the pertinent load calculations that guarantee the stability of the system for the chosen design.

Check the solar cell modules with irradiance of more than  $600\text{W}/\text{m}^2$  and get the voltage. In case the voltage is ZERO, it should NOT be installed and please contact the supplier.

### 5.2. SITE SELECTION

EXIOM photovoltaic modules must be installed in a place where they will receive maximum sunlight throughout the year. In the northern hemisphere, the module must generally face south, and in the southern hemisphere, the modules must face north.

When choosing a site, avoid trees, buildings, or obstructions, which could cast shadows on the solar PV modules, especially during the winter months when the sun's arc is lower on the horizon. Shading causes a loss of output, although factory installed PV module bypass diodes will minimize such loss.

Do not install the PV module near open flames or flammable materials.

When using solar modules to charge batteries, the battery must be installed in a way that protects the performance of the system and the safety of its users. Follow the battery manufacturer's guidelines

for installation, operation, and maintenance recommendations.

Most batteries generate hydrogen gas during charging, which can be explosive. Do not light matches or create sparks near the battery bank. When a battery is installed outdoors, it must be placed in a ventilated and insulated battery box specifically designed for that purpose. Do not install the PV module in a place where it will be submerged in water or continuously exposed to water.

### 5.3. TILT ANGLE SELECTION

The tilt angle of the photovoltaic module is measured between the surface of the photovoltaic module and a horizontal ground surface. The photovoltaic module generates the maximum power output when directly facing the sun.

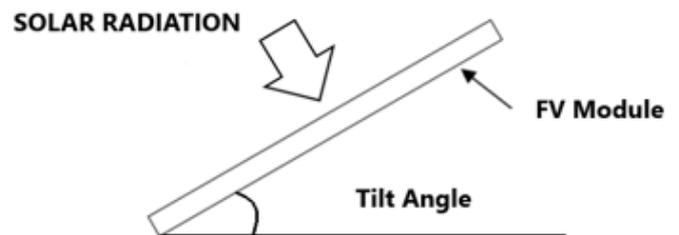


Figure 5.3.1. Tilt Angle.

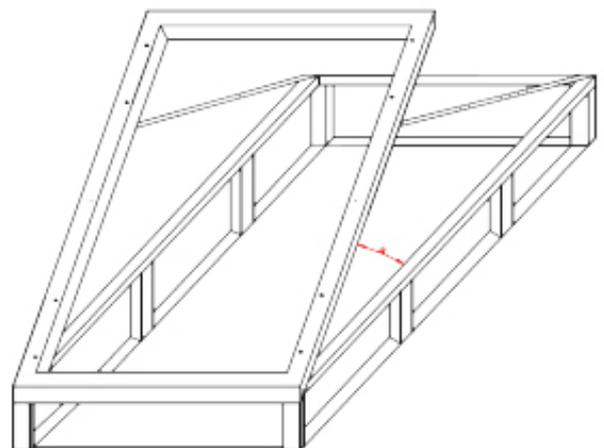


Figure 5.3.2. Tilt Angle Detail.

In stand-alone systems with batteries where the PV modules are connected to a permanent structure, the tilt angle of the PV modules should be selected to optimize performance based on seasonal load and sunlight. In general, if the PV output is adequate when the irradiance is low (for example, in winter), the chosen angle should be suitable for the rest of the year.

In installations connected to the grid where the photovoltaic modules are fixed to a permanent structure, the photovoltaic modules must be tilted so that the energy production of the photovoltaic modules is maximized annually.

## 6. MECHANICAL INSTALLATION

The mounting of EXIOM photovoltaic solar modules is usually done by two methods, screws or clamps.

- The installation methods listed below are for reference, EXIOM does not provide any related mounting components. The installer will be responsible for the photovoltaic system, the installation and pertinent calculations to guarantee the safety and stability of the system.
- Previous installation, you must take into account:
  - Checking and cleaning the module if necessary.
  - Checking the serial numbers of the modules, these must match with those provided in the packing list.
- Special care must be taken when mounting solar modules in environments with a significant snow load probability and / or strong winds. The design must provide sufficient strength and meet local code requirements.

### 6.1. MOUNTING WITH BOLTS

It is extremely important that the systems are installed only by qualified personnel and at least two people.

- The system involves electricity and can be dangerous if personnel are not familiar with proper safety procedures.
- Do not step on the module.
- Although the modules are quite strong, the glass can break (and the module will no longer function properly) if it is dropped or hit with tools or other objects.
- The photovoltaic solar module has 8 holes, symmetrical between them for fixing to the structure.

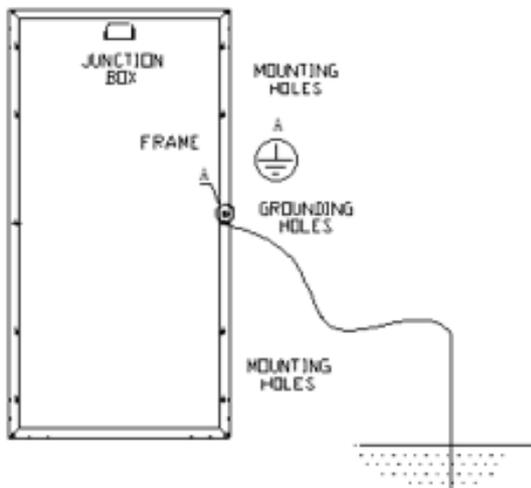


Figure 6.1.1. Rear of the FV Module

- Place the solar modules on the structure where they are to be installed, go through the panel frame and the structure itself with the screw, using the holes prepared for it, place a flat washer, a pressure washer and finally tighten the appropriate nut, exerting adequate pressure to fix the assembly. (You can see the union of the elements in figure 6.1.2.).

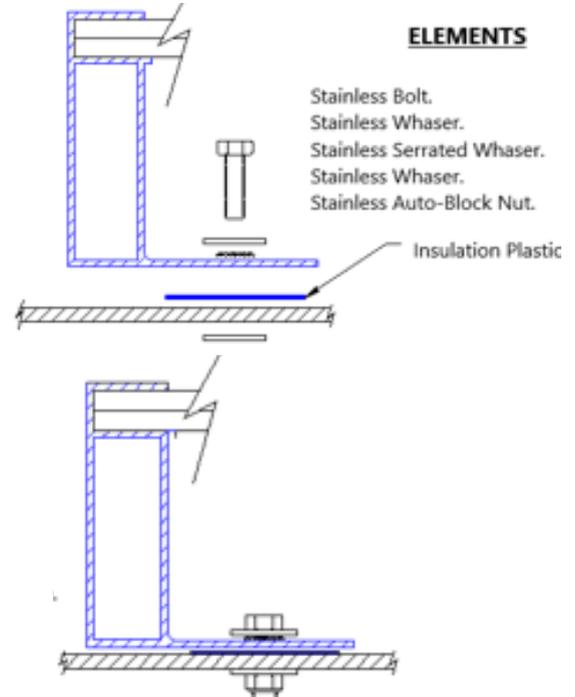


Figure 6.1.2. Screw Fixing Elements.

- The frame of the module is made of anodized aluminum and, therefore, corrosion may occur if the module is subjected to an aggressive environment (salinity, high degree of humidity ...) the frame in contact with the metal of the structure could generate electrolytic corrosion, to help avoid this process, PVC pieces can be placed between the frame of the solar module and the support structure.
- The frame of the solar module must be fixed to a supporting structure using M8 stainless steel elements.
- The screws must be fastened with a torque of between 15-20 Newton-meter (Nm).
- The module has been evaluated by TUV for mounting using the 8 mounting holes provided in the frame.
- The separation between modules should be  $15 \pm 2$ mm.
- All module frames must be grounded for safety reasons. The ground connections between the modules must be approved by a qualified electrician, the ground connection itself must be made by a qualified electrician. The ground wire must be at least the same size as the electrical conductors, ground wires of no less than 4 mm<sup>2</sup> are recommended.

### 6.1.1. MODULES WITH 60 CELLS

Below is a table with models and measurements of the 60 cells photovoltaic solar modules:

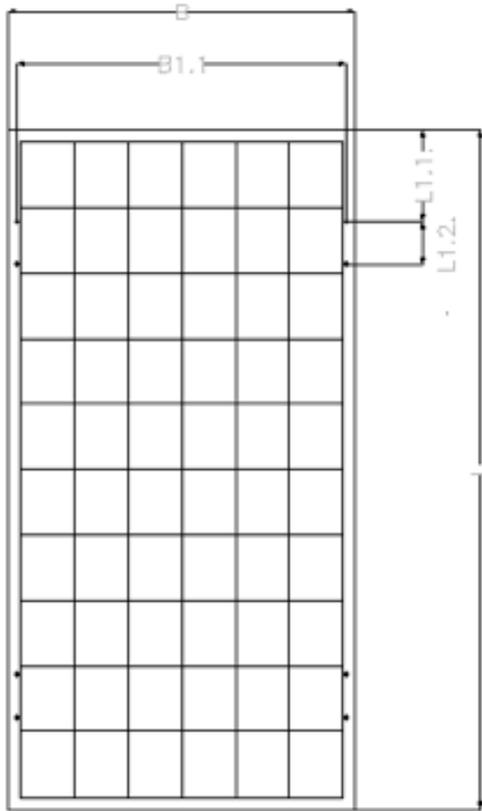


Figure 6.1.1.1. Module with 60 cells.

### 6.1.2. MODULES WITH 72 CELLS

Below is a table with models and measurements of the 72 cells photovoltaic solar modules:

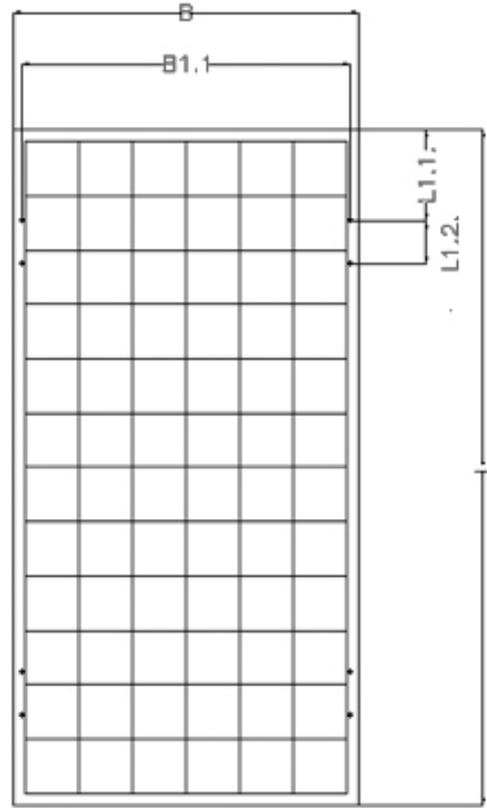


Figure 6.1.2.1. Module with 72 cells.

EXIOM FV MODULE		
	MODEL	DIMENSIONS mm (LXB)
60 CELLS	EX315-335-M(B)	1665 X 1002
	EX320-340-M(B)-120(HC)-9BB-(158)*	1684 X 1002
	EX295-315-M6(B)-60	1640 X 992
	EX270-285-P(B)-60	1640 X 992
	EX260-280-M(B)-96*	1580 X 1069
	EX190-210-M6(B)-72*	1580 X 808
	EX140P(B)-36*	1482 X 676

Table 6.1.1.1. Models and Dimensions of EXIOM 60 Cells FV Moduls.

EXIOM FV MODULE		
	MODEL	DIMENSIONS mm (LXB)
72 CELLS	EX390-415(B)-108(HC)-10BB(182)*	1722 x 1134
	EX380-400-M(B)	1979 x 1002
	EX360-385-M6(B)	1956 x 992
	EX365-385SPM(HC)(FLEX)-126*	1840 x 1040 x 1,7/2,5
	EX365-380SPM(B)-126(HC)*	1771 x 1015
	EX355-375-M(B)-120(HC)-9BB-(166)*	1765 x 1048//1755 x 1038
	EX325-345(B)-72	1956 x 992

Table 6.1.2.1. Models and Dimensions of EXIOM 72 Cells FV Moduls.

\* These models are within the table and method of installation of 72 cells.

### 6.1.3. MODULES WITH 144 CELLS

Below is a table with models and measurements of the 144 cells photovoltaic solar modules:

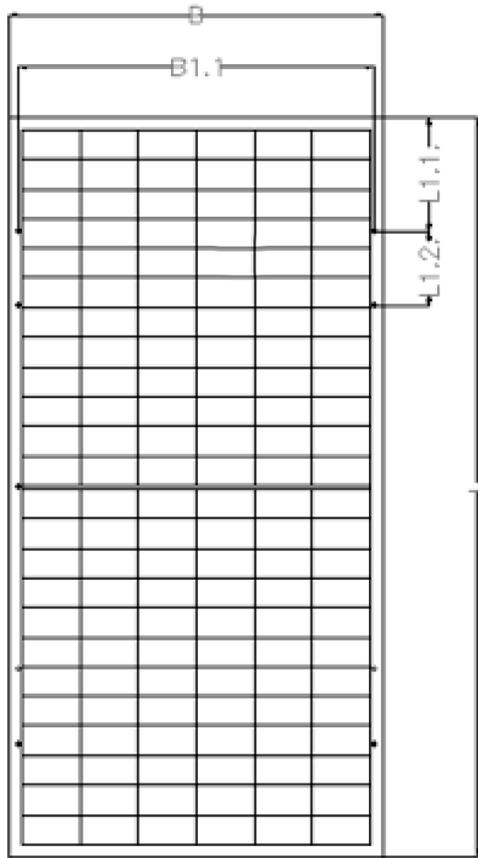


Figure. 6.1.3.1. Module with 144 cells.

EXIOM FV MODULE		
	MODEL	DIMENSIONS mm (LXB)
144 CELLS	EX650-665M-132(HC)(210)*	2384 X 1303
	EX590-605M-120(HC)(210)*	2172 X 1303
	EX530-550M(B)-144(HC)-9BB-(182)	2279 X 1134
	EX530-550(B)-144(HC)BF(182)	2279 X 1134
	EX485-505M(B)-132(HC)(182)*	2094 X 1134
	EX450-470-SPM-156(HC)*	2005 X 1105
	EX440-455(B)-144(HC)-9BB-(166)	2108 X 1048//2094 X 1038
	EX395-420SPM-144(HC)	2020 X 1016
	EX390-415-M(B)-144(HC)-9BB-(158)	2024 X 1004//2008 X 1002

Table 6.1.3.1. Models and Dimensions of EXIOM 144 Cells FV Moduls.

\* These models are within the table and method of installation of 144 cells.

### 6.2. MOUNTING WITH CLAMPS

It is extremely important that the systems are installed only by qualified personnel and at least two people.

- The system involves electricity and can be dangerous if personnel are not familiar with proper safety procedures.

- Do not step on the module.
- Although the modules are quite strong, the glass can break (and the module will no longer function properly) if it is dropped or hit with tools or other objects.
- Staples must not come into contact with the front glass and must not deform the frame.
- Be sure to avoid shadow effects from the module clamps.

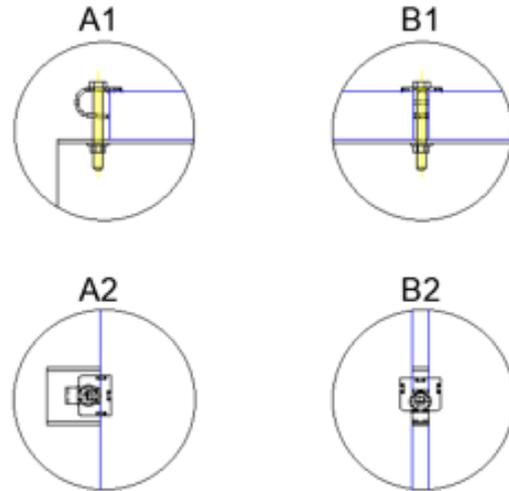


Figure 6.2.1. Clamp detail

- The module framework must not be modified under any circumstances.
- When choosing this type of clamp mounting method, be sure to use at least four clamps on each module, placing two staples on each long side of the module.

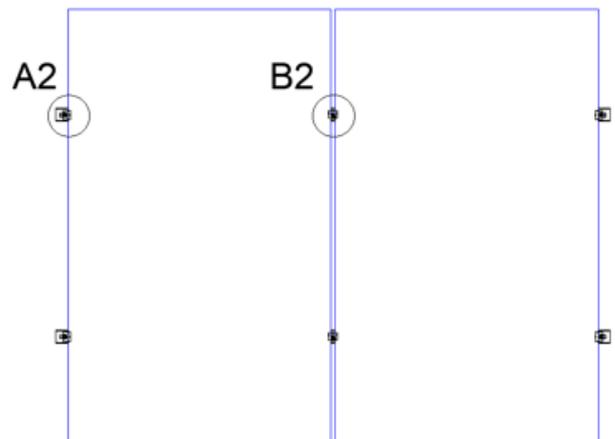


Figure 6.2.2. Clamp positioning.

- Depending on local wind and snow loads, if excessive pressure loading is expected, additional clamps or brackets will be required to ensure the module can support that load.
- The applied torque value must be large enough to fix the modules consistently (check with your clamp or

bracket supplier for the specific torque value).

- Later you will find tables with the different models of modules and the recommended mounting distances for each one.

### 6.1.1. MODULES WITH 60 CELLS

Below is a table with models and measurements of the 60 cells photovoltaic solar modules:

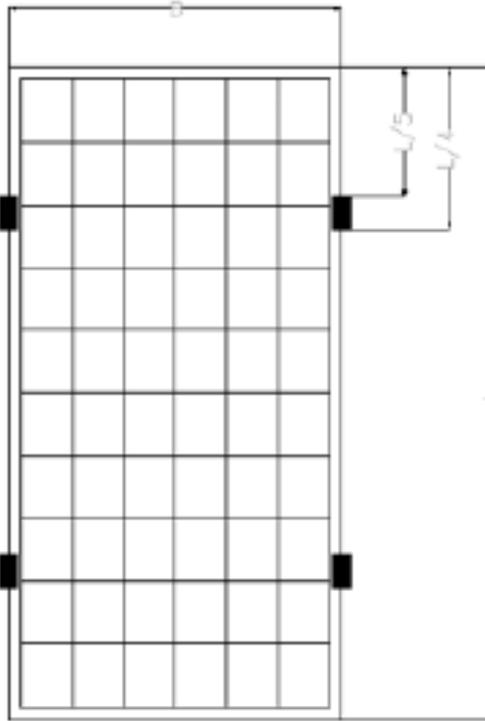


Figure 6.2.1.1. Module with 60 cells.

### 6.1.2. MODULES WITH 72 CELLS

Below is a table with models and measurements of the 72 cells photovoltaic solar modules:

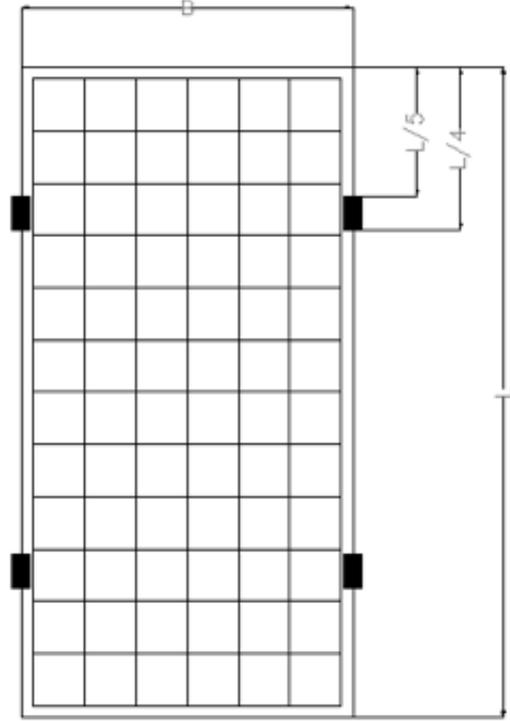


Figure 6.2.2.1. Module with 72 cells.

EXIOM FV MODULE		
	MODEL	DIMENSIONS mm (LXB)
60 CELLS	EX315-335-M(B)	1665 X 1002
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	EX140P(B)-36*	1482 X 676

Table 6.2.1.1. Models and Dimensions of EXIOM 60 Cells FV Moduls.

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	EX380-400-M(B)	1979 x 1002
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	EX365-385SPM(HC)(FLEX)-126*	1840 x 1040 x 1,7/2,5
	EX365-380SPM(B)-126(HC)*	1771 x 1015
	EX355-375-M(B)-120(HC)-9BB-(166)*	1765 x 1048//1755 x 1038
	EX325-345(B)-72	1956 x 992

Table 6.2.2.1. Models and Dimensions of EXIOM 72 Cells FV Moduls.

\* These models are within the table and method of installation of 72 cells.

### 6.1.3. MODULES WITH 144 CELLS

Below is a table with models and measurements of the 144 cells photovoltaic solar modules:

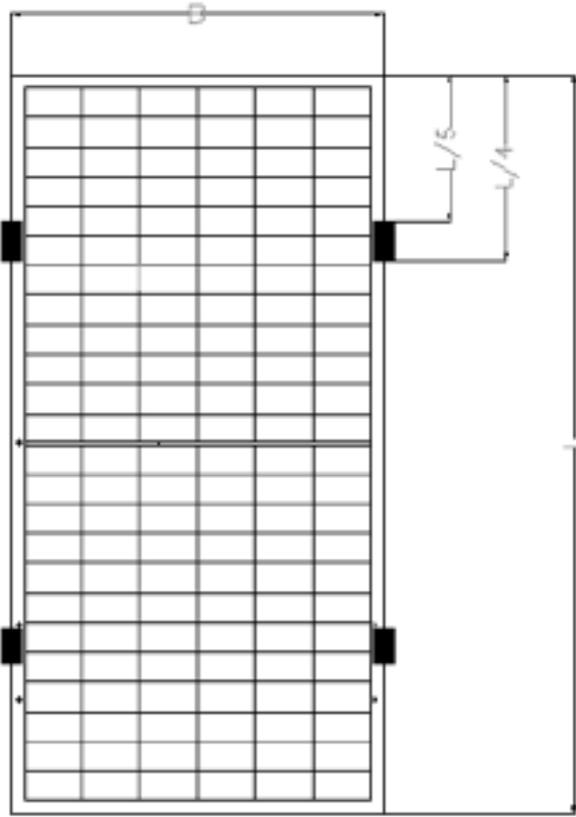


Figure 6.2.3.1. Module with 144 cells.

EXIOM FV MODULE		
	MODEL	DIMENSIONS mm (LXB)
144 CELLS	EX650-665M-132(HC)(210)*	2384 X 1303
	EX590-605M-120(HC)(210)*	2172 X 1303
	EX530-550M(B)-144(HC)-9BB-(182)	2279 X 1134
	EX530-550(B)-144(HC)BF(182)	2279 X 1134
	EX485-505M(B)-132(HC)(182)*	2094 X 1134
	EX450-470-SPM-156(HC)*	2005 X 1105
	EX440-455(B)-144(HC)-9BB-(166)	2108 X 1048//2094 X 1038
	EX395-420SPM-144(HC)	2020 X 1016
	EX390-415-M(B)-144(HC)-9BB-(158)	2024 X 1004//2008 X 1002

Table 6.2.3.1. Models and Dimensions of EXIOM 144 Cells FV Moduls.

\* These models are within the table and method of installation of 144 cells.

## 7. WIRING AND CONNECTION

- Before this procedure, please read the operation instructions of the PV control system carefully.
- Partial shading of an individual module can cause a reverse voltage across the shaded module. Current is then forced through the shaded area by the other

modules.

- When a bypass diode is wired in parallel with the series string, the forced current will flow through the diode and bypass the shaded module, thereby minimize module heating and array current losses. Diodes are used as bypass diodes.
- Make wiring by Multi-connecting cables between the PV modules in series or parallel connection, which is determined by user's configuration requirement for system power, current and voltage.
- Open the connection box of the control system and connect the cabled from the PV arrays to the connection box in accordance with the installation indication of the PV control systems.
- All module frames and structures must be properly grounded in accordance with local and national electrical codes.
- Follow the requirements of applicable local and national electrical codes.

## 8. MAINTENANCE AND CARE

Regular inspections and maintenance of the modules will be required, especially during the warranty period. To ensure optimum performance, EXIOM recommends carrying out the following measures:

### 8.1. CLEANING OF MODULES

The accumulation of dust or dirt on the front face of the modules will cause a decrease in energy production.

- Clean the panels preferably twice a year if possible (depending on site conditions) with a soft, dry or damp cloth as needed.
- It is recommended to use neutral water to clean the glass of the modules, avoiding damage to the coating layer of the glass.
- Never use abrasive material under any circumstances.
- Cleaning is recommended during the first hours of the morning or the last hours of the day, when the solar radiation is low and the modules are at a lower temperature.
- Never use chemicals when cleaning modules, as this can affect the module's warranty and power production.

### 8.2. VISUAL INSPECTION

It is recommended to carry out periodic visual inspections in search of possible defects, in case of

findings, the following elements should be evaluated:

- If modules with slight cell color differences are observed at different angles, this is a normal phenomenon of modules with anti-reflective coating technology.
- If the glass is broken.
- There are no sharp objects in contact with the surfaces of the photovoltaic module.
- Photovoltaic modules are not in the shadow of unwanted obstacles.
- Corrosion along the cell busbar. Corrosion is caused by moisture intrusion into the rear of the module.
- Check the rear for damage.
- Check if the rear is burned.
- Check if the screws and fasteners are tight, adjust as required.

### **8.3. PREVENTIVE MAINTENANCE**

It is recommended to implement the following preventive maintenance every 6 months:

- Check the junction box sealing for damage.
- Examine the PV modules for signs of deterioration.
- Check all wiring for possible damage from rodents, weather, and that all connections are tight and free of corrosion.
- Check for electrical leaks to ground.

## **9. CONTACTS**

EXIOM photovoltaic solar modules do not contain any parts that can be repaired by the user.

If you suspect that your installation is not working properly, contact your installer.

Any questions or extra information necessary can contact the technical department of EXIOM SOLUTION S.A.



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