

Installation Manual
Frame Solar Modules - V.1
Mxxx-L3H & Mxxx-I3H

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1. Safety Precautions & Handling Of Modules

1.1 Manual Disclaimer

The information presented in this manual is subject to change by Mitrex without prior notice. Mitrex gives no warranty of any kind whatsoever, either explicitly or implicitly, with respect to the information herein. In the case of any inconsistency between different language versions, the English version shall overcome and take control in all respects.

1.2 Limitation Of Liability

Mitrex 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.

1.3 General Information

The following instructions relate to the safety and intended use of PV modules. Failure to comply with any instructions below may result in product damage, physical injury and/or death.

This installation manual contains essential information for the electrical and mechanical installation that you must know before installing modules. All information described in this manual are intellectual property and based on technologies and experiences that have been acquired and accumulated throughout years.

The installation of PV modules requires a great degree of skill and should only be performed by a qualified licensed professional, including licensed contractors and licensed electrifications. Please be aware that there is a serious risk of various types of injury occurring during the installation including the risk of electric shock. All modules are equipped with a permanently attached junction box that will accept variety of wiring applications or with a special cable assembly for ease of installation, and they do not require special assembly.

1.4 General Warning

- All modules must be installed by licensed electricians in accordance with the applicable geographic electrical codes and standards.
- Do not connect or disconnect modules when current from the modules or an external source is present.
- Always use appropriate Personal Protective Equipment when installing PV modules.
- Modules should be stored in a dry and ventilated environment to avoid direct sunlight and moisture.
- Always use electrically insulated tools to reduce the risk of electric shock.
- The PV module does not contain any serviceable parts. Do not attempt to modify or repair any part of the module.

WARNING: 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 connectors from being exposed to moisture or sunlight, like using connector endcaps.

- Perform all work in safe and dry conditions.
- External or artificially concentrated sunlight shall not be directed onto the PV module.
- Do not use or install damaged modules.
- Modules must always be handled and installed by two people.
- Do not carry the module by its cables.
- Do not stand, step, walk and / or jump on modules under any circumstances.
- Handle the module in a way that avoids breakage, scratching, bending of the glass and backsheet.
- Do not drop or place objects (such as tools) on the modules.
- Always handle the modules by the frame.
- Do not use sharp instruments on the modules.
- Do not lift modules by their wires or junction box, lift them by the frame.
- Keep all connectors clean and dry at all times.
- Do not place excessive loads on the module or twist the module frame.
- Do not expose the modules and its connectors to any unauthorized chemical substance (e.g. oil, lubricant, pesticide, etc.).
- Do not leave modules unsupported or unsecured.
- Particular care should be taken to avoid module backsheets being damaged by sharp objects, as scratches may directly affect product safety.

2. Product Information

2.1 Product Certifications

Mitrex products meet and/or exceed the requirements set forth by UL 61730, UL 61215, CSA C22.2 NO. 61730, CSA C22.2 NO. 61215, IEC 61730 and IEC 61215 for PV modules. These UL, CSA and IEC are freestanding. To satisfy the listing for this product the modules must be mounted with a rack or standoff structure. The module is considered to be in compliance with UL 61215/61730, CSA 61215/61730 and/or IEC 61215/61730 only when the module is mounted in the manner specified by the mounting instructions contained in this document.

2.2 Limited Warranty

Mitrex provides a 25-year hardware warranty, and we guarantee that after 25 years, the efficiency of the panel will be no less than 80% of the original energy generation.

2.3 Technical Specifications

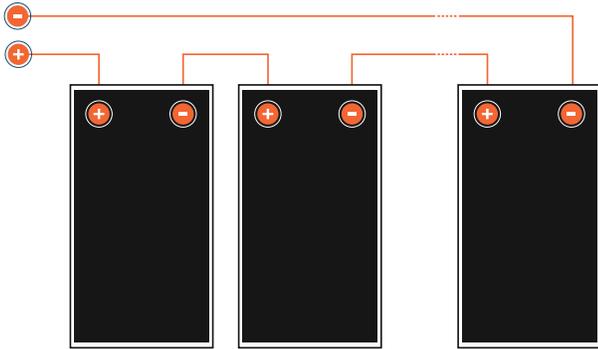
A full list of mechanical and electrical technical specifications for the PV modules can be found in the Appendix section. Electrical test data is according to standard test conditions (IEC 60904-3).

Under normal conditions, a photovoltaic module is likely to experience conditions that produce higher current and/or voltage than reported at standard test conditions. Accordingly, the values of Isc and Voc marked on the PV module should be multiplied by a factor of 1.25 when determining component voltage ratings, conductor current ratings, and size of controls (e.g. inverter) connected to the PV output.

3. Electrical Installation

3.1 General Information

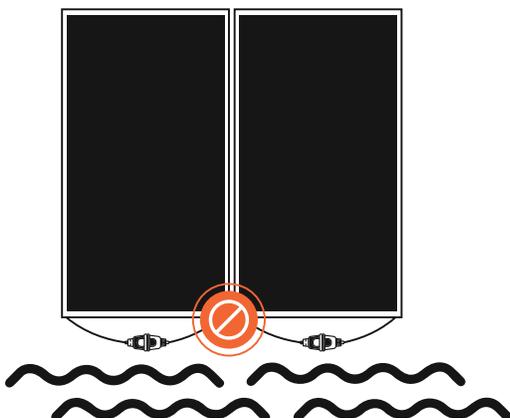
WARNING: Ensure correct polarity when connecting PV modules.



- 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.



- Make sure that all connections are safe and properly mated. An audible click should be heard when mating connectors. The PV connector 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.



WARNING: Ensure cabling is adequately protected from direct sunlight, dirt, debris, moisture, and mechanical friction.

- Ensure that plug connections are secured away from any water-accumulating surfaces. Use UV-resistant cable ties to secure cables to the mounting system. Cables should avoid exposure to direct sunlight.
- Only use dedicated solar cable and suitable connectors (wiring should be sheathed in a sunlight-resistant conduit or, if exposed, should be sunlight-resistant itself) that meet local fire, building and electrical regulations. Please ensure that all wiring is in perfect electrical and mechanical condition.

3.2 Wiring Requirements

- Mitrex recommends that all wiring be double insulated with a minimum rating of 90°C (194°F).
- All wiring should use a flexible copper conductor.
- Minimum size should be determined by applicable codes.
- Mitrex recommends a minimum size of 10AWG.
- All Mitrex solar modules are connected via MC4 connectors.

3.3 Series Connection

- The solar modules may be wired in series to produce the desired voltage output.
- The current of each module connected in series should be the same.
- The maximum PV system voltage for that circuit shall be calculated as the sum of the rated open-circuit voltage of the series-connected PV modules corrected for the lowest expected ambient temperature.

3.4 Parallel Connection

- The solar modules may be combined in parallel to produce the desired current output.
- When modules are combined in parallel, the total current is equal to the sum of currents from each module.
- The voltage of each module connected in parallel should be the same.
- When connecting plural strings of modules in parallel every series string or solar module must be fused prior to combining with other strings.
- Abide with all applicable federal, state, and local codes for additional fusing requirements and limitations on the maximum number of solar modules in parallel.
- Depending on national directives, additional safety factors might be applicable for over current protection.

WARNING: A multiplying factor is required for increased output of the PV modules. Under normal conditions, a PV module is likely to experience conditions that produce more current and/or voltage than reported at standard test conditions.

The requirements of the National Electrical Code (NEC) in Article 690 shall be followed to address these increased outputs. In installations not under the requirements of the NEC, the values of Isc and Voc marked on this PV module should be multiplied by a factor of 125% when determining component

voltage ratings, conductor ampacities, fuse sizes, and size of controls to the PV output.

3.5 Electrical Grounding

- All work must be conducted in conformance with all Federal, State, and local codes and standards.
- Do not drill any extra ground holes for convenience this will void the modules warranty.
- Grounding connections should be performed by a qualified electrician for the safety and maintenance of the system in accordance with all national, state and local electrical codes and regulations and standards.
- Connect module frames together using adequate grounding cables: Mitrex recommends using 4-14 mm² (AWG 12-6) copper wire.
- All bolts, nuts, flat washers, lock washers and other relevant hardware should be made of stainless steel, unless otherwise specified.

WARNING: In most of frames, holes provided for this purpose are identified with a grounding symbol (IEC 61730-1). Otherwise the location is in the middle of long frame on both side of the module. All conductive connection junctions must be firmly fixed.

Where common grounding hardware (nut, bolts, washers) is used to attach a listed grounding device, the attachment must be made in conformance with the grounding device manufacturer's instructions.

- A module with exposed conductive parts is considered to be in compliance with UL only when is electrically grounded in accordance with the instructions presented below and the requirements of the National Electrical Code.

4. Mechanical Installation

4.1 General Information

The module is considered to be in compliance with applicable standards only when the module is either mounted in the manner specified by the mounting instructions, or when the mounting means has been evaluated with this PV module to UL 2703. A module with exposed conductive parts is considered to be in compliance with applicable standards only when it is either electrically grounded in accordance with the manufacturer's instructions and the requirements of the National Electrical Code, ANSI/NFPA 70 (2014-2017), or when the bonding means has been evaluated with this PV module to UL 2703.

4.2 Site Considerations

Mitrex Solar Modules should be mounted in a location that meets the following requirements:

- 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.
- Note the operating temperature listed in the Appendix..
- Please consult the Mitrex technical support department for more information on the use of modules in special climates, such as an

altitude greater than 2000m.

- Exposing modules to salt (i.e. marine environments) or sulfur (i.e. sulfur sources, volcanoes) incurs the risk of module corrosion. Special considerations should be made for installations with increased salt content in the air.
- Do not operate solar modules near highly flammable substances.
- Do not expose modules and their connectors to any unauthorized chemical substances (e.g. oil, lubricant, pesticide, etc.), as modules may incur damages.
- Modules should be installed as to minimize shading.
- Do not install modules in an enclosed space.
- Failure to comply with these instructions will void Mitrex limited warranty.

4.3 Bifacial Modules

- The energy output of bifacial module can be affected by albedo of the ground that module installed on, height of module, Ground coverage Ratio (GCR), and Diffused horizontal irradiance.

Snow/ White Paint

Albedo	80 - 95%
Expected Yield Gain	15 - 25%

Green Grass/ Gravel

Albedo	10 - 20%
Expected Yield Gain	6 - 7%

Desert Sand

Albedo	22 - 25%
Expected Yield Gain	10 - 15%

- Installation height of bifacial module is recommended to be higher than 1 meter in order to harvest maximum available reflected and diffused radiation and to reduce shading on the backside.
- Structure, cables and any other component of installation should not cause shading on the backside of the modules.

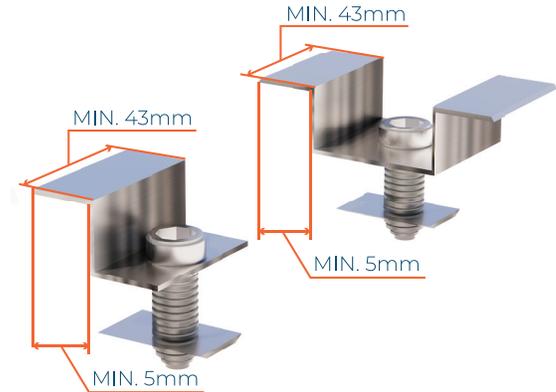
4.4 Module Mounting

- The mounting design must be certified by a registered professional engineer. The mounting design and procedures must comply with all applicable local codes and requirements from all relevant authorities.
- PV modules should be oriented to maximize sunlight exposure.
- A slope less than 5° / ft is required to maintain a fire class rating.
- The fire rating of this module is valid only when mounted as specified in the mechanical mounting instructions.
- When installed on a roof, solar modules must be mounted over a fire-resistant roof covering rated for the application. The fire resistance of the solar module is class C after ANSI/UL790 Edition 2004.
- The PV module is considered to be in compliance with UL61730 only when the module is mounted in the manner specified by the mounting instructions below.
- Ensure modules are not subjected to wind or snow loads exceeding the maximum permissible loads. (5400Pa Wind load-rear side, 5400 Pa snow load front side).

- A clearance of at least 15 cm for 72 type-provided between modules frame and the surface of the wall or roof.
- The minimum distance between two modules is at least (1.5 cm).
- Make sure that drain holes should not be blocked in any case.

4.5 Mounting Via Holes

- There are four holes on each long side of the module's frame used to accommodate dedicated bolts.
- The modules must be fastened to a support using the four bolt holes in the frame.
- The module should be fastened with M8x L50, flat washer, spring washer and hex nut tighten to torque 11.65 - 16.9 ft.lb (15.8 - 23 N.M).
- All fittings should be made of stainless steel.

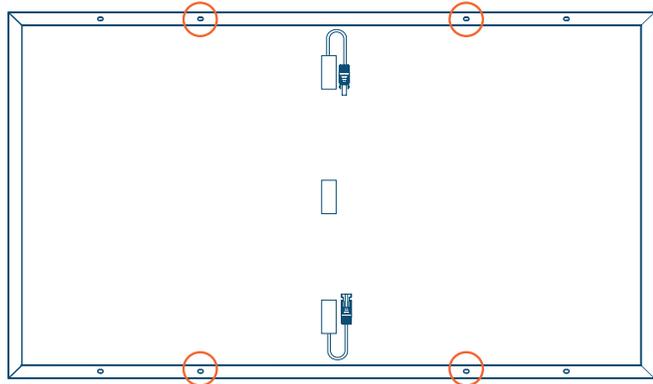


Clamp Specs:

- Clamp width: $\geq 43\text{mm}$ (1.69in).
- Clamp height compliant with a 30mm (1.18in) frame height.
- Clamp depth: 5 – 12mm (0.2in – 0.47in).
- Clamp thickness: $\geq 3\text{mm}$ (0.12in).
- Overlap in length by at least;
 - 80 mm (3.15 in) when $2400\text{ Pa} < \text{uplift load} \leq 5400\text{ Pa}$ is required.
 - 30 mm (1.18 in) when $\text{uplift load} \leq 2400\text{ Pa}$ is required.
- Clamps are not in contact or cast shadows on the front glass.
- Clamps do not damage, deform, or bend the module frame.
- Clamps that satisfy the structural requirements of the installation site.
- Long-term stable clamps that securely affix the module to the mounting frame.
- Applied torque is referring to the bolts that customer use, M8* L50 fully threaded: (11.65 - 16.9 ft.lb: 15.8 - 23 N.m).
- Clamp position "C" should be $L/4 \pm 50\text{mm}$ where L is the length of the module.

Clamp Position C = $L/4 \pm 50\text{ mm}$

L : Module Length



4.6 Mounting Via Clamps

- Mounting using clamps is the only method evaluated by the testing and certifying laboratory.
- Ensure the mounting clamps are compatible with the racking system (mounting frame) being used.
- Clamp material should be anodized aluminum alloy or stainless steel.
- The module may be fastened to a support by using clamps on a minimum of four points on two opposites sides.
- Clamps should be positioned according to the authorized position ranges as defined in the Appendix.
- Clamps should be positioned symmetrically.

5. Appendix

5.1 Electrical Specifications

• Specifications	• Solar Module
Nominal Max. Power (Pmax)	405W
MPP Operating Voltage (Vmp)	31.11V
MPP Operating Voltage (Imp)	13.02A
Open Circuit Voltage (Voc)	37.55V
Short Circuit Current (Isc)	13.73A
Maximum Efficiency	21%
Operating Temperature	-40°C ~ +85°C
Max. System Voltage	1500V (IEC/UL)
Max. Series Fuse Rating	25A
Fire Classification	Type I

5.2 Mechanical Specifications

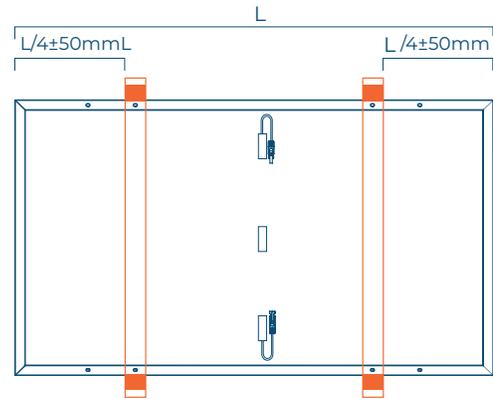
• Specifications	• Solar Module
Cell Type	Mono-crystalline
Cell Arrangement	108 [(6×9)×2]
Dimensions	1722×1134×30mm
Front Cover	3.2mm tempered glass
Frame	Anodized aluminum alloy frame
Weight	20.7 ±1 kg
J-box	IP68, 3 bypass diodes
Cable	4mm², 12AWG (UL)
Max. Static Load Front/Back	5400/5400 Pa

Electrical characteristics have tolerance of +/- 5% under STC conditions.

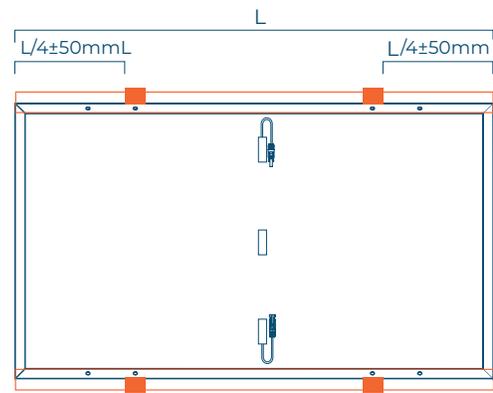
5.3 Temperature Specifications

• Specifications	• All Above Modules
Temperature Coefficient Voc	-0.262% / °C
Temperature Coefficient Isc	0.054% / °C
Temperature Coefficient Pmax	-0.341% / °C
Nominal Module Operating Temperature	42.5 ± 2°C

5.4 Clamping Position



Front Static Load 5400 Pa, Rear Static Load 5400 Pa



Front Static Load 5400 Pa, Rear Static Load 5400 Pa

The module follows this standard only when the module is mounted in the manner specified by the mounting instructions. A module with exposed conductive parts follows this standard only when it is electrically grounded in accordance with the manufacturer's instructions and the requirements of the National Electrical Code ANSI/NFPA 70 (2014-2017).

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