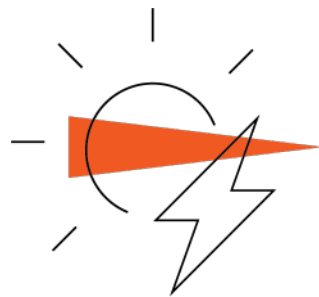




# Installation Manual for Heliene Photovoltaic Modules







## Table of Contents

Table of Contents .....	1
1. Introduction.....	2
2. Safety Precautions .....	2
3. Fire Rating .....	3
4. General Information.....	3
5. General Installation Requirements .....	3
6. Bifacial Modules .....	4
7. Transportation, Unpacking, and Storage.....	5
Transportation .....	5
Unpacking .....	5
Storage.....	5
8. Electrical Installation.....	5
Wiring .....	6
Grounding .....	6
9. Mechanical Installation: .....	7
Site Selection and Preparation:.....	7
General Mounting Instructions: .....	7
Mounting Using Bolts: .....	7
Mounting Using Clamps: .....	8
Additional Information for Rooftop Installations:.....	10
10. Maintenance .....	10
11. Warranty .....	10
12. Disclaimer .....	10
13. Limitation of Liability .....	11
14. Module Specifications:.....	12
Electrical and Mechanical Properties: .....	12
Connector Information:.....	12
15. APPENDIX - Module Drawings .....	13

## 1. Introduction

- This Manual contains information about installation, maintenance, and use of Heliene's photovoltaic modules.
- All instructions should be read and understood before installation is performed. Failure to follow these instructions may result in property damage, personal injury, or death.
- Installation and operation of solar modules require specialized skills. Only trained personnel should perform installation.
- The terms "solar module", "photovoltaic module" and "module" are used interchangeably in this document and refer to one or more electrically connected solar modules.
- Please keep this Manual in a safe place for future reference.

## 2. Safety Precautions

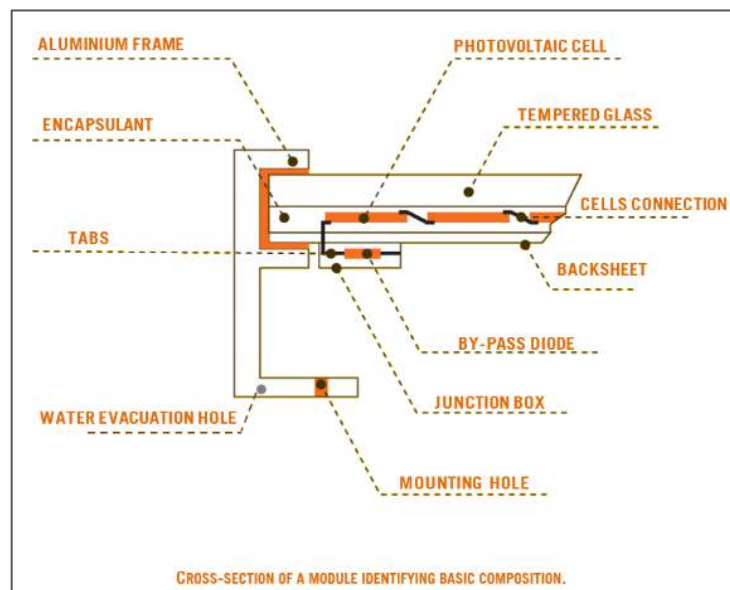
- Before unpacking, installing, wiring, or operating photovoltaic modules - responsible personnel should read and understand all safety precautions.
- Module installation should be conducted by personnel certified in electrical and photovoltaic system installation.
- Installation and operation of modules by personnel who are not certified in relevant safety requirements will result in dangerous situations.
- All installation work must comply with applicable local, national, and international codes, regulations, guidelines, norms, and standards.
-  Warning – Explosion Hazard - Do not disconnect modules while circuit is live. Please refer to applicable electrical safety codes for additional information.
-  Warning – Electrical Shock Hazard - Photovoltaic modules produce DC voltage/current when exposed to sunlight or other light source. Contact with any electrically active parts can result in injury or death.
-  Caution - Avoid installing/ handling modules in wet/ high wind environment.
- 
  - Do not connect or disconnect modules when they are energized.
  - Do not connect or disconnect modules in the presence of flammable substances.
  - Do not concentrate/ focus light onto the module
  - Do not disassemble modules or remove any of its parts. There are no serviceable parts in the module.
  - Do not install modules with broken, damaged, or scratched parts
  - Do not submerge modules in water.
  - Do not stand on or walk on the module. Do not put heavy objects on the module.
  - Do not drop modules.
  - Do not bend the output cable at sharp angles as this will damage the insulation.
  - Do not handle modules with bare hands as corners or edges may be sharp.

### 3. Fire Rating

- Heliene's photovoltaic modules are type-1(1500V) and type-2(1000V) fire rated according to UL61215/UL61730.
- The fire rating of modules is valid only when mounted in the manner specified in this installation manual.
- System Fire Class Rating is the combination of module fire type and UL2703 certified mounting configuration.
- Mounting system manufacturers must clearly specify any limitations to maintain a specific System Fire Class Rating in their installation instructions.
- For rooftop installations, ensure modules is mounted over a fire-resistant roof covering rated for the application and meet slope requirements for the target fire class rating.

### 4. General Information

- Photovoltaic modules convert solar radiation to electrical energy and are designed for outdoor use.
- The drawings in here shows cross-section of a typical photovoltaic module - showing key materials and design features.
- Design of module and choice of materials enable Heliene to make aesthetically superior modules that deliver more energy annually.
- Heliene solar modules use advanced photovoltaic technology and are built using advanced materials, processes, and equipment.
- Heliene modules come with a permanently attached junction box and cables terminated in standard photovoltaic module connectors.
- Proper design of mounting and support structures is the responsibility of the system designer and installer.



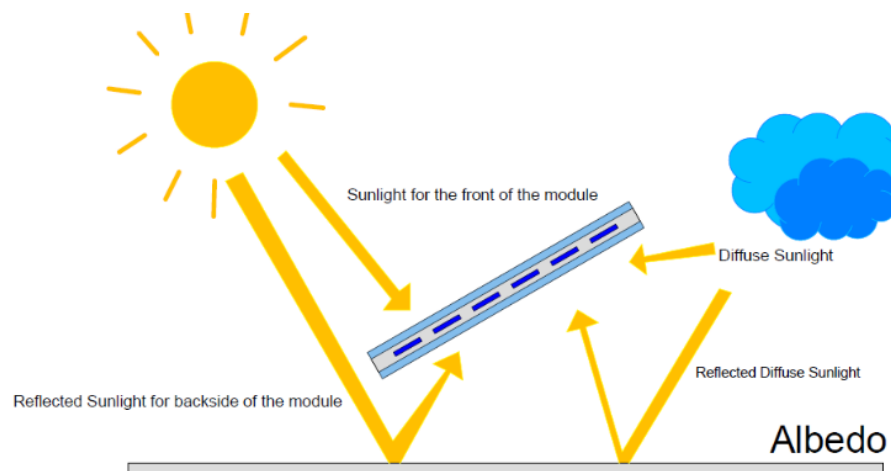
### 5. General Installation Requirements

- The module is in compliance with UL61215/UL61730 only when the module is mounted in the manner specified by installation instructions.
- A module with exposed conductive parts is in compliance with UL61215/UL61730 only when it is electrically grounded in accordance with the instructions presented in this manual and the requirements of the National Electrical Code.

- Any module without a frame (known as a laminate) shall not be considered to comply with the requirements of UL61215/UL61730 unless the module is mounted with hardware that has been tested and evaluated with the module under this standard or by a field Inspection certifying that the installed module complies with the requirements of UL61215/UL61730.
- Installation must comply with all local building codes. The mounting design must be certified in the USA and Canada by a registered professional engineer. Also mounting design and procedures should comply with local codes and meet requirements set forth by authorities having jurisdiction.
- Tools used to connect the modules must comply with all applicable electrical safety regulations. They must be dry and have the correct level of insulation.
- Heliene modules are not permitted for installation in the following locations:
  - In a location or near an equipment where flammable gas or vapors are present
  - Where modules may be exposed to hazardous or harmful chemicals
  - Underwater or in water features
  - Where modules may be exposed to artificially concentrated light

## 6. Bifacial Modules

- Bifacial Photovoltaic Modules can utilize sunlight on the front and reflected light on the back simultaneously. Total energy been produced by bifacial modules is calculated by the sum of energy from the front and the back of the module.
- System design should consider the potential increased of power output because of bifacial characteristics.
- Increased power depends on the amount of irradiance reflected onto the module.
- Refer to Heliene's Specification Sheets for Bifacial Modules for electrical parameters in presence of reflected radiation (Albedo).



## 7. Transportation, Unpacking, and Storage

### Transportation

- Heliene recommends the modules be stored in its original packaging strapped to the pallets until they reach the installation site and are ready to be installed.
- Do not remove any strapping or packaging materials if the modules require secondary transportation or long-term storage.
- Transport modules in the box firmly strapped to pallet as supplied by Heliene
- Load and Unload module pallets with a forklift. Avoiding hitting, banding, dropping or damage to the packaging or the modules.
- Always keep electrical contacts clean and dry.
- Do not stand, step on, walk or jump on the modules.
- The modules should be stored in a dry and controlled environment.
- Always keep modules and pallets on a flat and balanced surface.
- Always set the modules onto surfaces bigger than the module perimeter size. Ensure module weight transfer to the aluminum frame only.

### Unpacking

- Read and follow the unpacking instructions carefully. This process requires two people minimum.
- Before unpacking, have module box in a level, dry area - free of excessive dust, debris.
- Cut the straps with blade or scissors, remove box top vertically and lift it over to the side.
- Be careful when removing the packaging. Do not scratch module surfaces.
- Remove modules with two hands at each side, each person lifting on opposite ends. Never lift by Junction Box Cables or Box.
- Never leave a module unsupported or lean it against mounting posts.
- If there are modules left in the box after unpacking, the remaining modules should be repackaged to protect from damage - 26 modules maximum per pallet.

### Storage

- Store pallets of modules on a levelled surface, in a dry and controlled environment.
- Pallets are not weatherproof, and modules are not meant to be exposed to weather elements until installed.
- Store modules where objects will not fall onto them.
- Stack only 2 pallets high maximum, and never put any other materials on top of them.

## 8. Electrical Installation

- All wiring should be performed by registered installers and comply with local and national codes and standards.
- Wiring must ensure that the loss of nominal voltage is less than 2% and loss of nominal power is less than 1%.

- Heliene modules are provided with insulated photovoltaic cables. The recommended rating for wiring connections is 6 mm<sup>2</sup>. Only use cable listed by UL4703 PV wire, 90°C thermally insulated in accordance with all the local fire, building, and electrical codes.
- The maximum voltage of the system must be less than the maximum certified voltage and less than the maximum input voltage of the inverter and the other electrical devices installed in the system. Heliene's modules are rated for 1000V or 1500V. Please check module specification sheet before installation.
- The rated electrical values at STC conditions (Standard Test Conditions - Irradiation 1000W/m<sup>2</sup>, AM 1.5, Cell temperature 25°C) of Heliene modules are included in this manual.
- The electrical values carry tolerance of:  $I_{SC} \pm 4\%$ ,  $V_{OC} \pm 3\%$ ,  $P_{MPP} \pm 3\%$ .
- A photovoltaic 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) should be followed to address these increased outputs.
- In installations not under the requirements of the NEC, the values of  $I_{SC}$  and  $V_{OC}$  marked on this module should be multiplied by a factor of 1.25 when determining component voltage ratings, conductor ampacities, overcurrent device ratings, and size of controls connected to the module output.

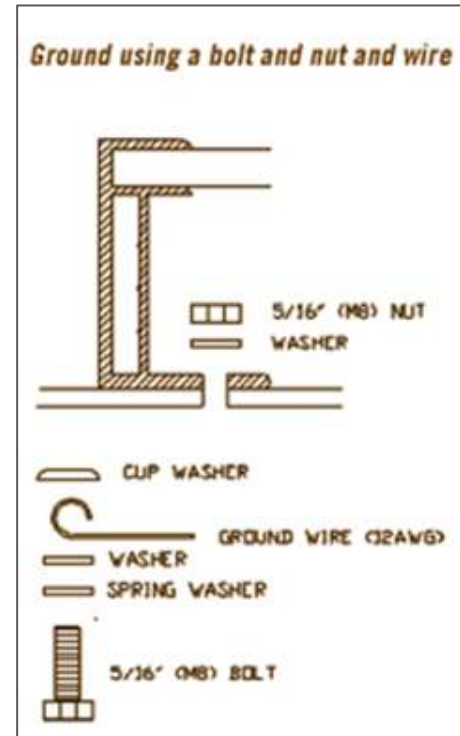
## Wiring

- Modules connected as part of a single solar array should be of the same model, type, and electrical rating.
- The maximum number of panels in a string can be calculated by dividing the maximum system voltage of the panel by its  $V_{OC}$  accounting for the lowest ambient temperature at site.
- Do not exceed the maximum system voltage - 1500 V or 1000 V.
- All Heliene modules are equipped with multiple bypass diodes. Bypass diodes turn on to electrically disconnect underperforming string(s) in the event of shading or other issues thus enabling other strings in the module to continue delivering maximum power.
- Connectors are identified and tested with compatible mating part and are to be of the same type and brand to avoid risk of loose connection which can result in arcing. Mating connectors with different types or brands is not allowed. Refer to Product Specification section for information on connectors.

## Grounding

- All module frames and mounting racks must be grounded in accordance with NEC and applicable local and national codes.
- For grid connected modules in U.S and Canada: All modules must be grounded by electrical connection from the module frames to the ground. A UL-listed grounding lug or UL approved clamp should be used.
- Connect module frames to each other using cables with cable lugs. All connections on the conductive connection must be fixed. Metal containing iron in the conductive connection should be treated against corrosion and rusting.

- Another method is to ground the frame of the module to racking structure in accordance with NEC requirements.
- Self-Tapping screw (10 x 3/4 size) can be used to attach a wire terminal loop to one of the Grounding Holes provided on the module frame.
- Grounding connections using spikes at the clamping point which are UL approved are permitted.
- All screws and nuts shall be tightened to a torque of 4~5 Nm (2.95~3.69 ft-lb).
- A UL-Listed grounding lug may be used if the mounting holes are not used for mounting.
- Where common grounding hardware (nuts, bolts, star washers, split-ring lock washers, flat washers and the like) is used to attach a listed grounding/bonding device, the attachment must be made in conformance with the grounding device manufacturer's instructions.
- Common hardware items such as nuts, bolts, star washers, lock washers and the like have not been evaluated for electrical conductivity or for use as grounding devices and should be used only for maintaining mechanical connections and holding electrical grounding devices in the proper position.



## 9. Mechanical Installation:

### Site Selection and Preparation:

- Heliene's solar modules are designed for installation up to 2000m (6500ft) above sea level.
- To maximize the power output, it is recommended to install solar modules at an optimized tilt and orientation angle. Refer to standard solar photovoltaic installation guides and requirements.
- Select a site for installation that is free of daily and seasonal shading as much as possible.

### General Mounting Instructions:

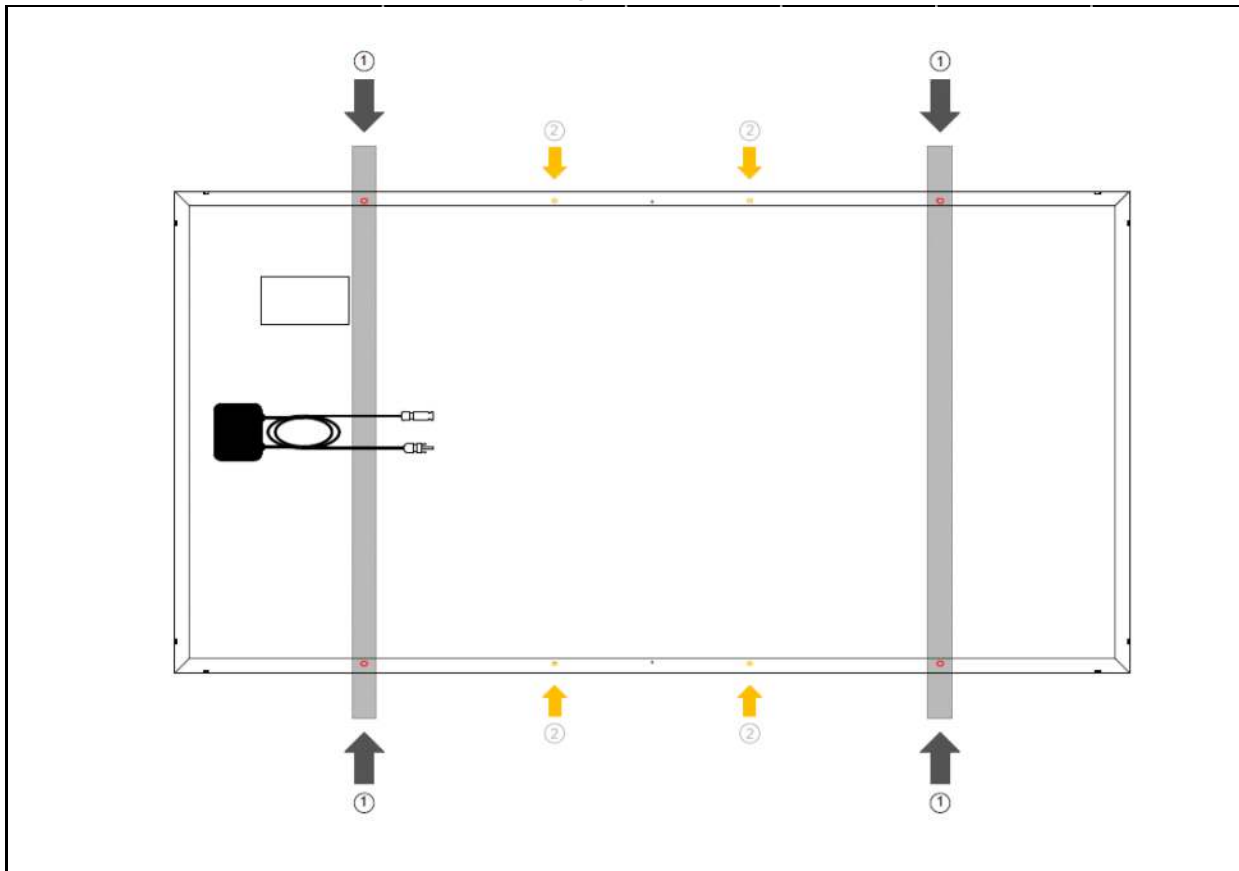
- Follow instructions below for methods of fastening a module to a support structure.
- Use a torque wrench for installation and follow torquing instructions
- Modules shall be bolted or clamped to the racking system. Follow maximum allowed downforce and uplift loading conditions for the specific mounting method being used.
- Mounting outside of these limits without written approval from Heliene will void the warranty.

### Mounting Using Bolts:

- Use M8(5/16") stainless steel bolts with nuts, four spring washers, and eight flat washers, tightened to a minimum torque of 10~15 Nm (7.37-11.06 ft-lb).
- Module can be mounted using outer holes [①] and/or inner holes [②] of the frame.



- Each module should be securely fastened at a minimum four points symmetrically.
- Specific information on module dimension, mounting locations, hole size and location is provided in the 'module drawing' section of this document.



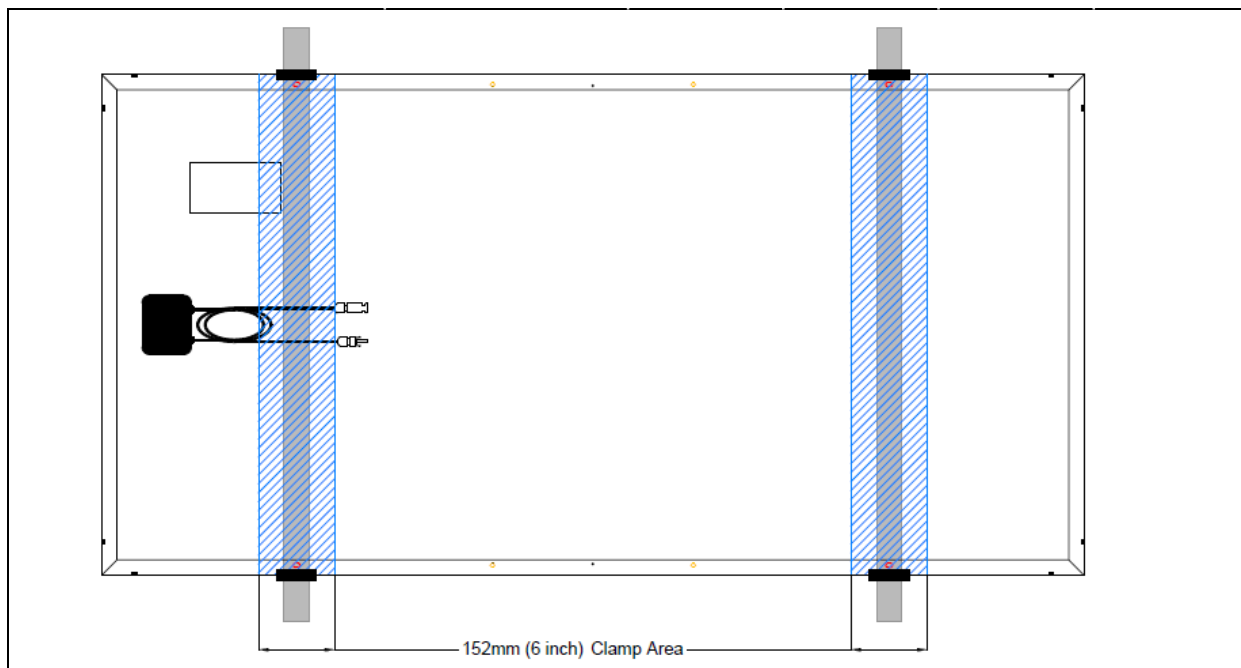
Bolting on long frame side using four mounting holes.  
 Mounting rails must run perpendicularly to the long frame side.

	Mounting Hole	Maximum Tested Load		Maximum Design Load	
ALL SERIES	①	+5400Pa	-2400Pa	+3600Pa	-1600Pa
60M G1	②	+5400Pa	-2400Pa	+3600Pa	-1600Pa
120HC M6	②	+5400Pa	-2400Pa	+3600Pa	-1600Pa
132HC G1	②	+5400Pa	-2400Pa	+3600Pa	-1600Pa
72M G1/72M G1 BIFACIAL	②	+3600Pa	-2400Pa	+2400Pa	-1600Pa
144HC M6/144HC M6 BIFACIAL	②	+3600Pa	-2400Pa	+2400Pa	-1600Pa

### Mounting Using Clamps:

- Each clamp must provide minimum 5mm x 25mm surface clamping onto top surface from the side.
- If the clamps are being used to support two modules, it must have a minimum of 25mm on each module frame surface.

- Use minimum 4 clamps to attached modules to the mounting rails. The clamps should be positioned symmetrically and according to the authorized position zones defined in in table below.
- Frames must not be deformed by clamps
- Clamps should not touch the glass or otherwise cause shading on the solar cells in the module.
- Contact Heliene for instructions if the system requires clamps to be outside of the specified region or to be on the short side (landscape mounting).
- Clamping Range:



Use four clamps on the long side.  
 Mounting rails run perpendicularly to the long side frame.  
 Clamping Range is measured from end of the long frame.

	Clamping Range	Maximum Tested Load		Maximum Design Load	
60M G1	254 - 406mm	+5400Pa	-2400Pa	+3600Pa	-1600Pa
120HC M6	277 - 429mm	+5400Pa	-2400Pa	+3600Pa	-1600Pa
132HC G1	264 - 416mm	+5400Pa	-2400Pa	+3600Pa	-1600Pa
72M G1/72M G1 BIFACIAL	327 - 479mm	+5400Pa	-2400Pa	+3600Pa	-1600Pa
144HC M6/144HC M6 BIFACIAL	328 - 480mm	+5400Pa	-2400Pa	+3600Pa	-1600Pa

### Additional Information for Rooftop Installations:

- Ensure to comply with all local building codes.
- Freestanding modules turn a Class B rooftop into a Class C rooftop.
- Use appropriate corrosion-proof fastening materials.
- Top or bottom clamping methods will vary and are dependent on the mounting structures.
- Follow mounting guidelines recommended by the photovoltaic racking Suppliers.

## 10. Maintenance

- Visual inspection should be performed on the module at least once per year to check for damages to the panel and its components.
- Lack of inspection and maintenance will lead to operation, performance, and safety problems.
- Check wiring and connection at least once per year. Check all the parts that make up the wiring and connection system. This process should be done by qualified personnel duly trained and equipped for the job.
- Cleaning of photovoltaic modules will improve energy output. It is recommended that cleaning is performed when solar radiation is at low levels. Use clean water with low calcium concentration without any detergents or abrasives. Do not scratch the glass surface. Use water at temperature level similar to the panel temperature when possible.
- Snow should be removed using a soft brush to clean the surface of the modules. Do not try to remove frozen snow or ice off the modules.
- There are no serviceable parts within the module assembly. Consult Heliene with any questions about damaged parts.

## 11. Warranty

- If the photovoltaic module or installation does not work properly, please inform your installer immediately.
- Should inspection or testing become necessary, ensure it is performed by trained professionals only. Not following safety requirements may result in injury or death.
- If it is established that modules are defective or are not performing satisfactorily, fill out “RMA Submission/ Warranty Inquiry” on Heliene contact page - <https://www.heliene.com/contact>. One of our technical representatives will be in touch within two (2) business days to start the returns process.
- For general information on warranty claims, please send email to [warranty@heliene.com](mailto:warranty@heliene.com)

## 12. Disclaimer

- Heliene reserves the rights to change this Installation Manual without prior notice. Failure of the customer to follow the requirements outlined in this manual will void product warranty.

### **13. Limitation of Liability**

- Heliene disclaim any liability for (including but not limited to) breakage, deterioration, loss of performance, system installation error, and personnel injury or property damage resulting from failure to follow the instructions in this manual.

## 14. Module Specifications:

### Electrical and Mechanical Properties:

		Electrical Properties										Mechanical Properties			
Module Series	Model Name	STC					Temperature Coefficient			Fuse Rating (A)	System Voltage (V)	Length (mm)	Width (mm)	Height (mm)	Weight (kg)
		P <sub>max</sub> (W)	V <sub>oc</sub> (V)	I <sub>sc</sub> (A)	V <sub>mpp</sub> (V)	I <sub>mpp</sub> (A)	P <sub>max</sub> (%/°C)	V <sub>oc</sub> (%/°C)	I <sub>sc</sub> (%/°C)						
60M G1 SILVER	60M-315	315	40.32	10.16	33.70	9.33	-0.36	-0.30	0.04	20	1000	1666	1001	40	19.0
	60M-320	320	40.50	10.20	34.10	9.37	-0.36	-0.30	0.04	20	1000	1666	1001	40	19.0
	60M-325	325	40.67	10.23	34.50	9.41	-0.36	-0.30	0.04	20	1000	1666	1001	40	19.0
60M G1 BLACK	60M-310	310	40.13	10.22	33.54	9.27	-0.36	-0.30	0.04	20	1000	1666	1001	40	19.0
	60M-315	315	40.32	10.16	33.70	9.33	-0.36	-0.30	0.04	20	1000	1666	1001	40	19.0
	60M-320	320	40.50	10.20	34.10	9.37	-0.36	-0.30	0.04	20	1000	1666	1001	40	19.0
120HC M6 BLACK	120HC-360	360	40.86	11.59	34.88	10.32	-0.39	-0.33	0.04	20	1000	1760	1048	40	19.5
	120HC-365	365	41.04	11.67	34.99	10.43	-0.39	-0.33	0.04	20	1000	1760	1048	40	19.5
	120HC-370	370	41.22	11.75	35.12	10.54	-0.39	-0.33	0.04	20	1000	1760	1048	40	19.5
	120HC-375	375	41.40	11.83	35.26	10.65	-0.39	-0.33	0.04	20	1000	1760	1048	40	19.5
132HC G1 BLACK	132HC-350	350	44.22	9.84	36.95	9.49	-0.39	-0.33	0.04	20	1500	1860	1001	40	21.0
72M G1 SILVER	72M-385	385	48.62	10.18	39.81	9.67	-0.36	-0.31	0.06	20	1500	1986	1001	40	23.5
	72M-390	390	48.94	10.24	40.11	9.72	-0.36	-0.31	0.06	20	1500	1986	1001	40	23.5
	72M-395	395	49.26	10.29	40.40	9.78	-0.36	-0.31	0.06	20	1500	1986	1001	40	23.5
	72M-400	400	49.58	10.35	40.70	9.83	-0.36	-0.31	0.06	20	1500	1986	1001	40	23.5
	72M-405	405	49.90	10.41	41.00	9.88	-0.36	-0.31	0.06	20	1500	1986	1001	40	23.5
72M G1 BLACK	72M-385	385	48.62	10.18	39.81	9.67	-0.36	-0.31	0.06	20	1500	1986	1001	40	23.5
	72M-390	390	48.94	10.24	40.11	9.72	-0.36	-0.31	0.06	20	1500	1986	1001	40	23.5
72M G1 BIFACIAL	72M-385 Bifacial	385	48.62	10.18	39.81	9.67	-0.35	-0.31	0.06	20	1500	1986	1001	40	23.5
	72M-390 Bifacial	390	48.94	10.24	40.11	9.72	-0.36	-0.31	0.06	20	1500	1986	1001	40	23.5
	72M-395 Bifacial	395	49.26	10.29	40.40	9.78	-0.35	-0.31	0.06	20	1500	1986	1001	40	23.5
	72M-400 Bifacial	400	49.58	10.35	40.70	9.83	-0.35	-0.31	0.06	20	1500	1986	1001	40	23.5
144HC M6 SILVER	144HC-450	450	50.74	11.51	42.17	10.69	-0.38	-0.32	0.05	20	1500	2108	1048	40	25.0
	144HC-460	460	51.26	11.93	42.31	10.88	-0.38	-0.32	0.05	20	1500	2108	1048	40	25.0
144HC M6 BIFACIAL	144HC-450 Bifacial	450	50.74	11.51	42.17	10.69	-0.39	-0.40	0.05	20	1500	2108	1048	40	25.0

### Connector Information:

Manufacturer	Connector Model Name	Website
Staubli Multi-Contact	PV-KBT4/6II-UR	<a href="http://ec.staubli.com">http://ec.staubli.com</a>
	PV-KST4/6II-UR	
Zhejiang Renhe Photovoltaic Technology Co Ltd.	05-8	<a href="http://www.renhesolar.com">www.renhesolar.com</a>
Zhejiang Jiaming Tianheyuan Photovoltaic Technology Co	PV-JM608	<a href="http://en.jmthy.com">http://en.jmthy.com</a>

## **15. APPENDIX - Module Drawings**

