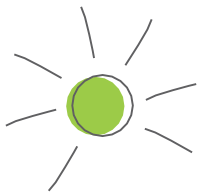
PIXON
Redefining Solar

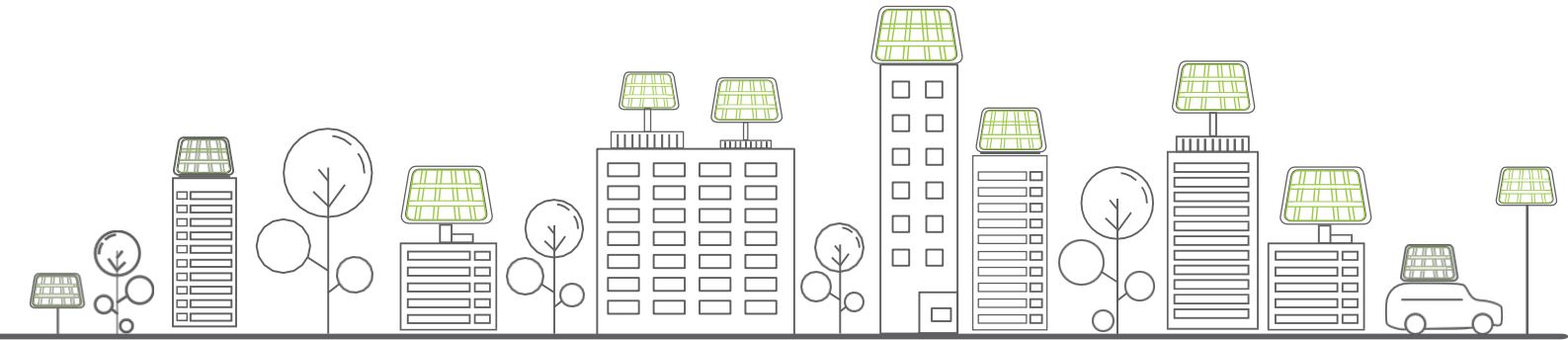
INSTALLATION MANUAL

Applicable Models:

PIX P2 72 XXX (315-350Wp) PIX P2 66 XXX (290-325Wp) PIX P2 60 XXX (260-295Wp) PIX P2 54 XXX (230-265Wp) PIX P2 48 XXX (200-235Wp) PIX P2 36 XXX (145-180Wp) PIX PH2 144 XXX (325-360Wp) PIX PH2 120 XXX (260-295Wp) PIX PD2 72 XXX (310-345Wp) PIX PD2 66 XXX (275-310Wp) PIX PD2 60 XXX (250-285Wp) PIX PD2 54 XXX (220-255Wp)
PIX PD2 48 XXX (190-225Wp)
PIX PD2 36 XXX (135-170Wp)
PIX MP3 72 XXX (360-400Wp)
PIX MP3 66 XXX (330-365Wp)
PIX MP3 66 XXX (330-365Wp)
PIX MP3 60 XXX (300-335Wp)
PIX MP3 54 XXX (265-300Wp)
PIX MP3 48 XXX (230-265Wp)
PIX MP3 36 XXX (165-200Wp)
PIX MPH3 144 XXX (370-410Wp)
PIX MPH3 120 XXX (305-340Wp)
PIX MPB3 72 XXX (365-400Wp)
PIX MPB3 60 XXX (300-335Wp)
PIX MPB3 54 XXX (265-300Wp)
PIX MPB3 48 XXX (230-265Wp)
PIX MPB3 36 XXX (165-200Wp)
PIX MPHB3 144 XXX (375-410Wp)
PIX MPHB3 120 XXX (305-340Wp)
PIX MPG 72 XXX (370-400Wp)
PIX MBTB 72 XXX (370-400Wp)
PIX MBHTB 144 XXX (525-545Wp)
PIX MBHTB 120 XXX (580-600Wp)
PIX MBHG 144 XXX (525-545Wp)
PIX MBHG 120 XXX (580-600Wp)
PIX MPH 144 XXX (525-545Wp)
PIX MPH 120 XXX (580-600Wp)



Solar is the new Green!



INDEX

1. INTRODUCTION

Thank you for choosing Pixon Green Energy Private Limited (PGEPL) Solar PV modules.
This manual contains information regarding handling, storage, installation, operation, maintenance and safety in dealing with the PGEPL photovoltaic modules. Before installation or using the PGEPL PV modules, it is must to read this manual and understand the instructions carefully.

2. DISCLAIMER OF LIABILITY

This Installation Manual is applicable for Pixon Green Energy Private Limited (PGEPL) PV Modules.
- This manual is for authorized & trained users only. PGEPL is not responsible for any type of mishandling or failure to follow instruction manual. Any type of Loss, Damage, Hazard, Injury or Expense because of improper installation, handling, usage and maintenance is not in scope of PGEPL.
- PGEPL assumes no responsibility for the infringement of intellectual property rights or other rights of third parties that may result from use of the module. No license is granted in this regard, either in expression or implicitly, or under any patent rights.
- Information contained in this Instruction Manual is based on PGEPL information and expertise. This manual and specification can be changed by the company without giving any prior notice or information.
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3. LAWS & REGULATIONS

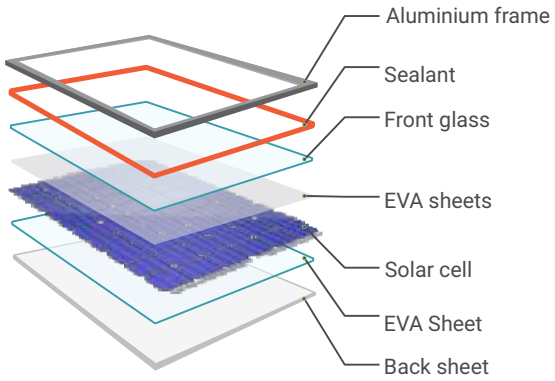
Mechanical and electrical installation of PV modules shall follow proper regulations such as electric law, building law and electrical-connection requirements. These regulations vary with different installation sites, such as building roof, ground mounted installation, vehicle-mounted application and the place of locality based on city and country. Requirements may also vary with DC or AC System and different installation system voltage. Please contact local authorities for specific clauses in terms of laws and regulations.

4. GENERAL INFORMATION & SAFETY

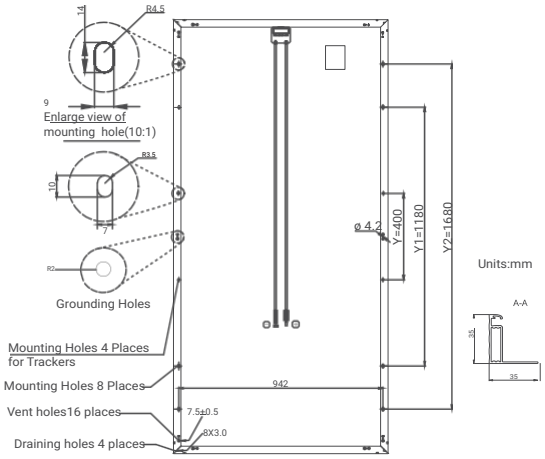
4.1 MODULE IDENTIFICATION

Each module is pasted with labels providing information below:

1. **Name Plate:** It describes Product Type, Standard Rated Power, Rated Current, Rated Voltage, Open Circuit Voltage, Short Circuit current under testing conditions, Certification Indicator, Maximum System Voltage etc.
2. **Current Level Label:** It describes modules according to their optimal working current.
3. **Serial No:** Each module has a unique serial number which is solidified inside the module permanently and it can be seen from front top of the module. Each serial number is put in before laminating of the module. In addition, you can find the same serial number on the module name plate.



Solar Module Constituents



Module Specifications

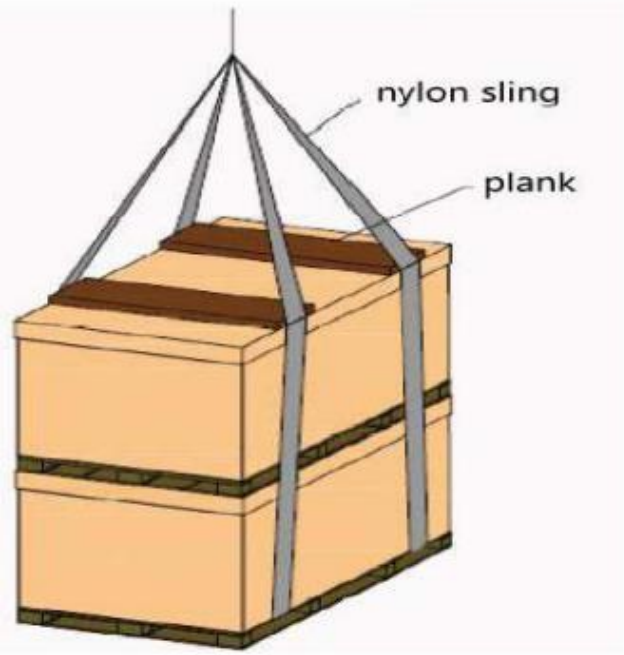
4.2 PV MODULE UNLOADING, STORAGE AND UNPACKING

Modules are fragile electronics which need immense care even while they lay in storage. The unpacking of the modules also needs substantial care and concern. Follow the PV module storage and unpacking instructions as listed below:

4.2.1 Module Unloading

Upon arrival of the modules, please check the packaging box is in good condition, and check whether the module type and quantity on the outer packaging are consistent with the delivery order, if anything is wrong, please contact Trina Solar logistics and sales staff immediately

Crane unloading



Note: Without Plank Crane unloading not allowed

When crane is used to unload the modules, please choose and use specialized tooling according to the weight and size of the module. Please adjust the position of the sling to keep the modules steady. To ensure the safety of the module, wooden sticks, boards or other fixtures of the same width as the outer packing cases should be used on the upper part of the box to prevent the sling from squeezing the pallet and damaging the modules. When placing the modules, do not lower the packing box too quickly and put it on a flat ground. For vertically landscape packages, do not lift up more than TWO pallets of modules at once; for vertically portrait packages, do not lift up more than ONE pallet of modules at once. Do not unload modules under the weather conditions of wind more than 6 class (in Beaufort scale), heavy rain or heavy snow.

Forklift unloading

Please choose a suitable forklift according to weight.
The fork should go into the pallet at least 3/4 of the pallet depth during unloading.
Drive slowly and do not allow forks to hit the cartons or pallets.

It is recommended to operate the forklift from the Aluminium frame side of the module and not touch the glass side. If the operation must be carried out on the glass side, please place buffer protection material in advance to prevent the inside modules being damaged due to the external force.

It is recommended to extend the height or width of the forklift backrest so that the force is distributed on the modules' aluminium frame.

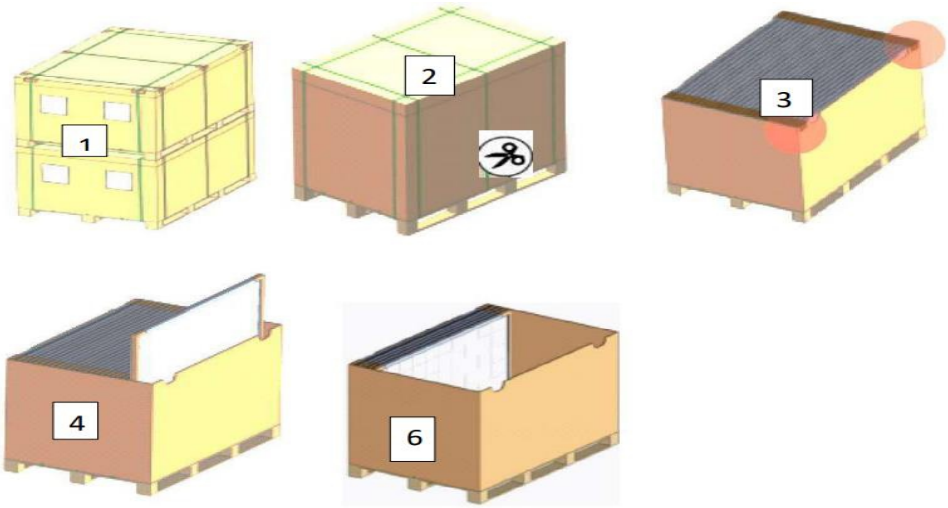
4.2.2 Storage Location Guidelines

Don't Store Pallets on Uneven surface
Don't remove the original package and keep the wrapping film and carton box in a good condition, if the modules require long-distance transport or long-term storage.
In rainy weather, please fully cover the modules and pallets with a rain protection and take moisture-proof measures on pallets and cartons to prevent collapse and moisture ingress.

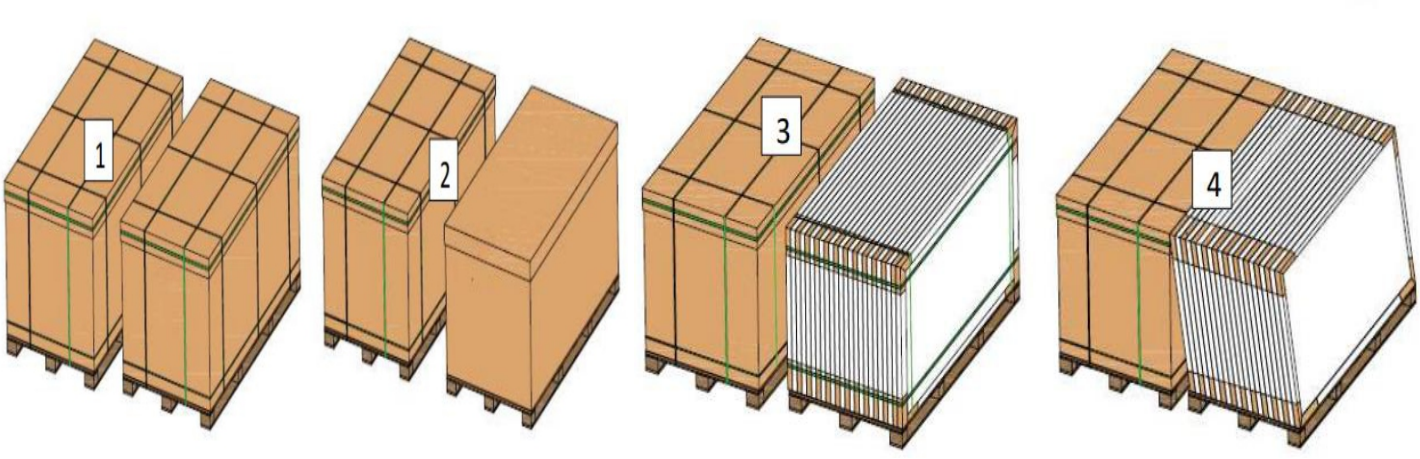
Don’t allow unauthorized persons to access the module storage area.
Don’t leave modules unsupported or unsecured.
Don’t stack modules on the project site

4.2.3 MODULE UNBOXING METHOD

Method A



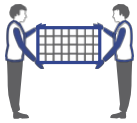
METHOD-B



DO'S

1. Check your order specification.

2. Store in dry ventilated place.



3. Handle a module by 2 persons only (from edges).

4. Wear safety gloves to avoid injury.

5. Open PGEPL packing carton following the unpacking manual instructions.

6. Storage area should have well-established fire-system.

DONT'S

1. Stack more than 2 high.

2. Damage packaging.

3. Drop or stack 1 module on another.

4. Lift module by junction box or cables.

5. Remove name-plate of module or its parts. The warranty would go void in such case.

6. Keep or use flammable objects near module storage.

4.3 OPERATION SAFETY

Solar module is a high voltage producing electronic. Thus, it is important to be familiar with the general PV operation safety rules to minimize your risk of injury due to accidental electric shock or other physical harm.

DO'S

1. Handle panels using fork-lift truck only.

2. Be careful in placing modules on a surface, especially with the corners.

DONT'S

1. Put heavy objects or drop anything on module.

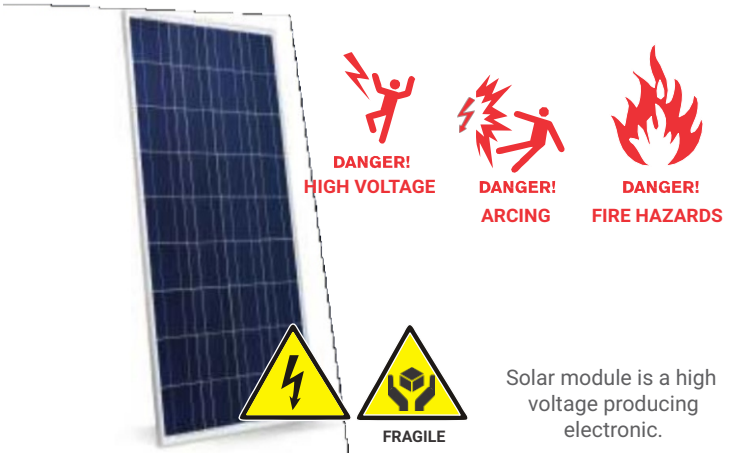
2. Paint module surface or apply glue.

3. Drill frame of modules. It can reduce frame loading capacity.

1. Damage, grad or scratch the back film of modules. It can lead to frame corrosion.

4.4 INSTALLATION SAFETY

Solar module is a high voltage producing electronic. On direct exposure to sunlight, it can produce electricity whether it is loaded or not. Thus, there is no main switch to put off this electricity and one should handle modules with uber care.



Solar module is a high voltage producing electronic.

Safety Installation Kit

DO'S

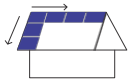
1. Wear safety clothing you well and free movement.

2. Must use insulated that fit installation tools to avoid allow electrical hazards

3.Carry installation under sun-covering sunshades only.

4. Modules should be dry at installation or time.

5.Only a qualified/ certified person should conduct installation or maintenance.



6. Follow "top-to-bottom" or "left-to-right" principle for rooftop installation.

✕ DONT'S

1. Touch junction box or cable connector ends with bare hands.

2. Install or handle any PV modules in unfavourable weather conditions like rains, snow, storms or even a windy day.

3. Install modules where flammable gases are present.

4. Let artificial sunlight focus on PV modules.

5. Use sharp objects to wipe glass or rear cover.

6. Use different specification modules in same array system.

Always wear protective head gear, insulating gloves and safety shoes (with rubber soles) and other protective measures during installation.

When installing or maintaining the photovoltaic system, please do not wear metal rings, watches and other metal products, so as not to cause electric shock danger and damage the modules.

Keep the PV module packed in the carton until installation. Once the modules are removed from the packing box, they should be installed and connected to the bus box in time. If they are not installed immediately, protective measures (such as adding rubber joint cover, etc.) should be taken on the connection head

Do not touch the PV module unnecessarily during installation. The glass surface and the frame may be hot. There is a risk of burns and electric shock

Do not work in rain, snow or windy conditions

Due to the risk of electrical shock, do not perform any work if the terminals of the PV module are wet

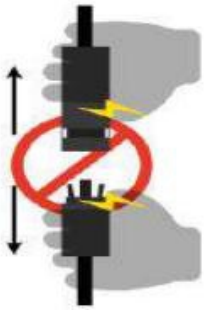
Use insulated tools and do not use wet tools

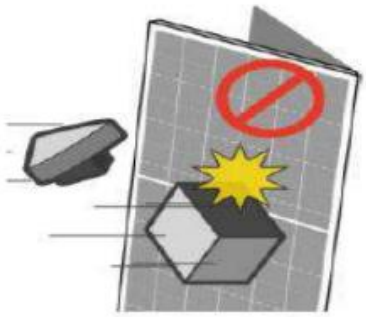
When installing PV modules, do not drop any objects (e.g., PV modules or tools).

Make sure flammable gasses are not generated or present near the installation site.

Insert module connectors fully and correctly. An audible "click" sound should be heard. This sounds confirms the connectors are fully seated. Check all connections

Connect the male and female connectors correctly, check the wiring condition, all wires shall not be separated from the modules, and secure the wires with cable ties so that the wires do not scratch or squeeze the back sheet of the modules.





Do not touch the junction box and the end of the interconnect cables (connectors) with bare hands during installation or under sunlight, regardless if the PV module is connected to or disconnected from the system.

The junction box must be protected from direct sunlight and water. The connector must meet the IP68 water-tight standard after being connected. However, it is not recommended to use the connector under water for a long time

Do not expose the PV module to excessive loads on the surface of the PV module or twist the frame.

Do not hit or put excessive load on the glass or back sheet, this may break the cells or cause micro cracks.

During the installation or operation, don't use sharp tools to wipe the back sheet and glass. Scratches can appear on the module.

Do not drill holes in the frame. It may cause corrosion of the frame

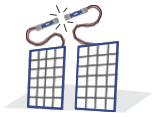
When installing modules on roof mounted structures, please try to follow the "from top to bottom" and/or "from left to right" principle, and don't step on the module. This will damage the module and would be dangerous for personal safety.

Modules will have thermal expansion and cold contraction effect. When installing, the interval between two adjacent conventional modules is recommended > 10mm.If there are special requirements subject to PGEPL approvals.

4.5 FIRE SAFETY

The solar system is subject to fire hazards due to electricity and loose circuits. PV modules may continue to produce a dangerous voltage, even if they have been disconnected from the inverter, have been partly or entirely destroyed, or the system wiring has been compromised or destroyed. Consider following aspects to ensure the fire safety precautions.

DO'S



1. Disconnect the panels and complete array.

2. Mount on fire-resistant roof only. Consult an expert.

3. Inform the crew for fire hazard. Stay away during and after the fire is down. Let it be rectified to ensure PV system usage safety.

NOTE:

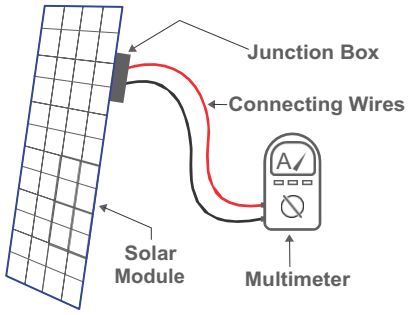
- PGEPL PV Modules (for modules under UL spec) have a Type 1 fire resistance rating in accordance with UL 1703 certification.
- The fire rating of provided PV module is valid only when mounted in manner specified in the mechanical mounting instructions.

4.6 ELECTRICAL PERFORMANCE SAFETY

As discussed earlier, PV Modules can produce DC current under illumination and do not have a switch. Thus, it is mandatory to handle it with substantial care considering the electrical safety and precautions listed further:

NOTE:

- Follow cleaning instructions when cleaning the module. (mentioned in the chapter 9).
- Snow and water in surrounding environments will intensify light reflection and lead to increase of output current and power. Module voltage and power also increase under low temperature condition.

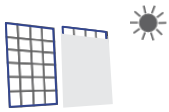


PV Modules can produce DC current under minor illumination also.

DO'S

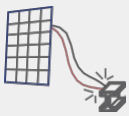
1. Use installation insulated tools.

2. Wear rubber gloves and other safety accessories.

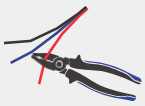


3. Keep module surface covered by cloth, hard-board or light-proof material when not in use.

DONT'S



1. Bring metal in contact with module's connection wires.



2. Break down electrical connections in loaded conditions. It can lead to electric arc or shock.

3. Deal with modules or its connectors when they are wet.

5. ENVIRONMENTAL CONSIDERATIONS

5.1 CLIMATE CONDITIONS

All the PGEPL Solar modules qualify Application Class A and are tested for following:

IS 14286, IS/IEC 61730 - 1 & 2
Design / Type & Safety

IEC 62759 - 1
Transportation Test

UL 61730 - 1 & 2, 1730
Standard for Safety

IEC 60904 - 1 & 7
Calibration

IEC 62716
Ammonia Test

IEC EE CB SCHEME 61215, 61730 - 1 & 2 (2016)
Design for safety Test

IEC 61701
Salt Mist Test

IEC 61853 - 1
Power Rating Standard

IEC 60068 - 2 -68
Sand & Dust Test

IEC 62804
PID

OPERATING RANGE

Ambient temperature:	-40°C to +50°C.
Operating temperature:	-40°C to +85°C.
Storage temperature:	-20°C to +50°C.
Humidity:	≤85 RH%
Design Load:	+5400Pa and -1600 Pa
Safety Factor:	>1.5
Mechanical Load Pressure:	5400Pa (112.8lb/ft2) from front and 2400 from the rear (50.12lb/ ft2).

5.2 STABILITY OF STRUCTURE

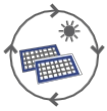
Structure matching the mounting hole-pitch of different types of modules is used to survive the load required and fatigue of the outdoor application. The structure should be coated to survive in external environment till lifecycle of PV module of 30 Years. Please consult the PGEPL technical support department for more information on the use of modules in special climates, such as an altitude greater than 2000 m.

NOTE: The mechanical load bearing capacity depends upon the installer's mounting methods and failure to follow the instructions in this manual may result in variations to withstand snow and wind loads. The system installer should ensure that the installation methods used meet these requirements as well as any local codes and regulations pertaining to their locality and country.

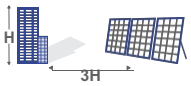
5.3 SITE SELECTION

PV modules place of installation plays key role in Electric Power generation and performance. Consider the following site selection and other parameters:

DO'S

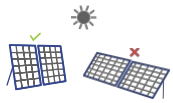


1. Install at a place with no shading throughout the year.

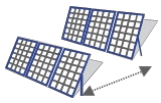


2. Distance between a shading-object and solar array should be 3 times > than height of shading-object.

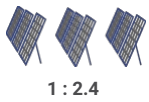
3. Module facing should be: South in Northern Hemisphere & North in Southern Hemisphere



4. Prefer portrait PV-modules layout for minimal dirt-shading.

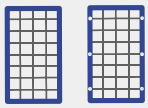


5. Maintain sufficient row-to-row gaps to avoid module shading each other.

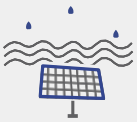


6. Slope of 1:2.4 is must to maintain fire class rating.

DONT'S



1. Use mounting-methods that block drainage holes.



2. Install with PV module immersed under water.

3. Install PV module on moving objects like vehicle or vessel. Different modules are used for different applications.

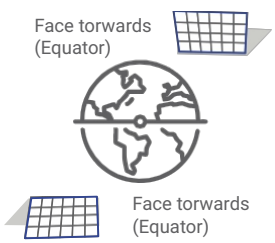
NOTE:

- PGEPL solar module is fire rated with Type C.

5.4 TILT ANGLE SELECTION

- PV modules placed at an angle, that faces the sun directly for 365 days, increases the output power performance.
- The tilt angle is measured between the PV module's surface with the horizontal ground (Figure 1).
- For standalone systems with batteries or grid-connected installation with permanent structure, the tilt angle of the PV modules should be selected based on seasonal load and sunlight.
- Recommended Tilt Angle for a fixed system is as shown in the world map.

Optimal angle for fixed solar panels depending on installation position.



Module facing should be: South in Northern Hemisphere & North in Southern Hemisphere for optimum energy production.

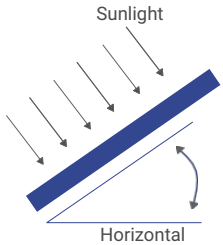


Figure 1

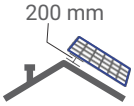
6. MOUNTING INSTALLATION

6.1 IMPORTANT INSTRUCTIONS FOR MOUNTING

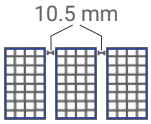
The PGEPL modules should be mounted carefully by trained professionals only.

DO'S

1.Mounting system can withstand 2400 Pa of wind-load and 5400 Pa of snow-load.

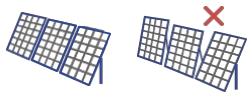


2. Minimum clearance between module frame and roof surface should be 200 mm.



3. Minimum distance between each PV module should be 10.5 mm.

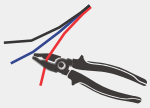
4. Module facing should be: South in Northern Hemisphere & North in Southern Hemisphere. Power reduces significantly with modules facing east or west.



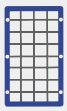
5. Angle of all modules connected in series should be same. Different angles can lead to current fluctuations and loss in power output.

DONT'S

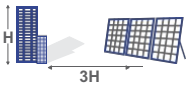
1. Avoid wiring loop formations.



2. Disconnect or cut module cables when connected with load.



3. Drainage holes blockage while installation.



6. Distance between a shading-object and solar array should be 3 times > than height of shading-object.

7. Install modules at recommended tilt angles as listed in above chapter of tilt angle showing the world map.

NOTE:

- Thermal expansion of support structures should not cause any PV module breakage. This would not be part of PGEPL Warranty.
- Ground mounted modules should be at a height enough to prevent the lowest edge of module to be covered in snow for long time in places experiencing heavy snowfall.
- Clearing of snow, dust, dirt and other foreign particles from mounting structure & PV module is must for long-term reliability of PV setup.
- The module is considered to be in compliance with UL 1703 only when the module is mounted in the manner specified by the mounting instructions.
- Any module without a frame (laminate) shall not be considered to comply with the requirements of UL 1703 unless the module is mounted with hardware that has been tested and evaluated with the module under this standard or by a field Inspector certifying that the installed module complies with the requirements of UL 1703.
- Shadow on the solar module is only acceptable if the irradiation is lesser than 200 W/m2.

6.2 MOUNTING METHODS

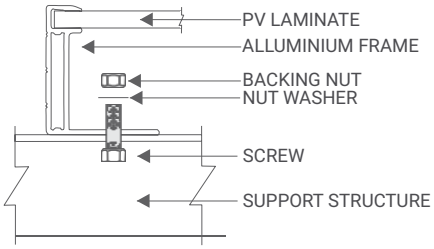
PV modules can be installed or fixed by Bolt method or by Clamp method.

Refer Annexure 1, 2, 3, 4, 5, and 6

And Mechanical drawing of Module.

A. Bolt Type Fixing

- Use corrosion resistant, stainless steel M8 bolt, washer & nut.
- The bolt and module should be tightened to minimum torque of 16-25 Nm. Each module frame contains 8 mounting holes of 9 mm X 14mm.



Mechanical Drawing of Bolt

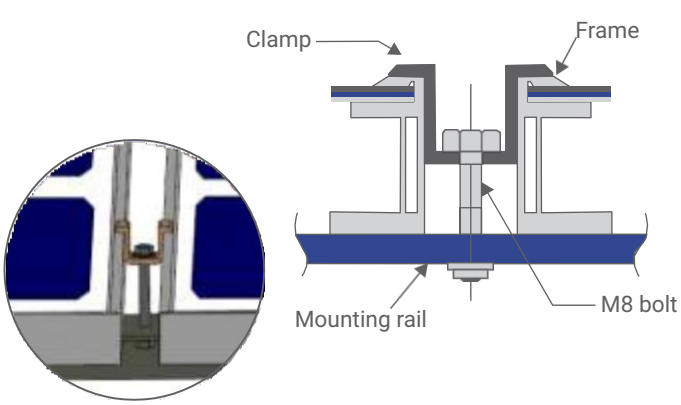
A. Clamp Type Fixing

- 4 clamps are required to fit a module.
- Clamps should not touch glass to avoid breakage.

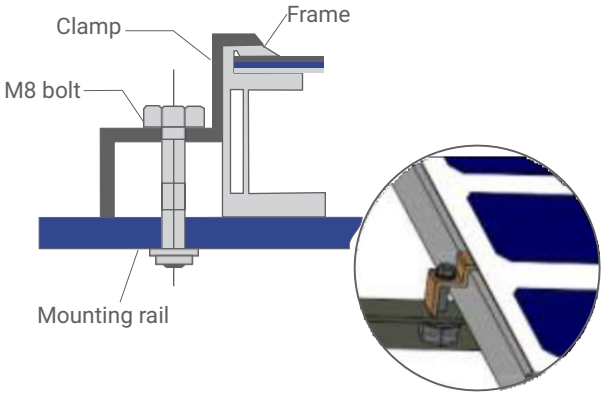
NOTE: PGEPL has done number of tests on clamps and on the basis of that test results, it is recommended to use clamps with EPDM or with insulating type washer only. More clamps can be used to bear extra load at places experiencing heavy snow or storms.

Recommended Accessories by PGEPL as per ISI Standard:

Accessories	Make / Model
Bolt	Any Accessory qualified by ISO and or ISI standard make.
Washer	
Spring Washer	
Nut	



Centre-Clamping Method



Side-Clamping Method

Technical Specifications - Please refer Annexure 7

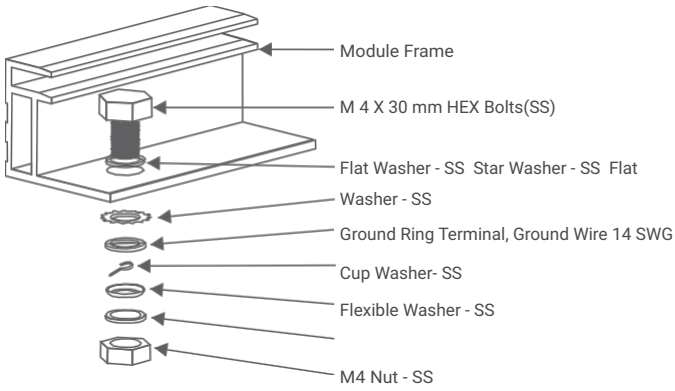
6.3 PV MODULE GROUNDING

As per National Electrical code (NEC Guidelines clause 250) all the PV Module (modules under UL spec) frames and mounting structures must be properly grounded for safety of people on the site.
Appropriate grounding is done by fixing the module frames and all the metallic structure together with the help of a grounding conductor made of copper, copper alloy or other material which follow national standards. The grounding connector should be connected to earth with the help of earth ground electrode.
In case of metallic support, the surface of the frame must be electroplated.
It is recommended to ground every module at the provided grounding holes (4 mm or 5/32 inch diameter marked with ground symbol.

Grounding Procedure 1

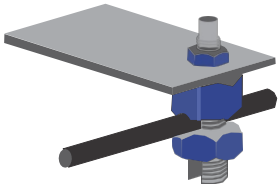
Recommended Accessories by PGEPL as per ISI Standard:

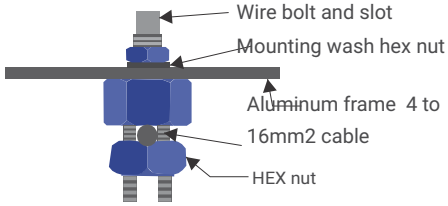
Accessories	Make / Model
Bolt	Any Accessory qualified by ISO and or ISI standard make.
Hex Bolts	
Star Washer	
Cup Washer	
Flexible Washer	
Nut	



Grounding Procedure 2

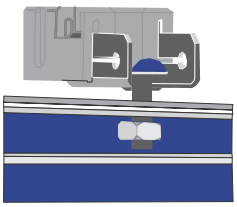
- Grounding wire dimension should be considered of 6 to 12 AWG solid bar copper and installed under the wire binding bolt.
- Tightening of wire binding bolt must be done at proper torque level 5.08 Nm.

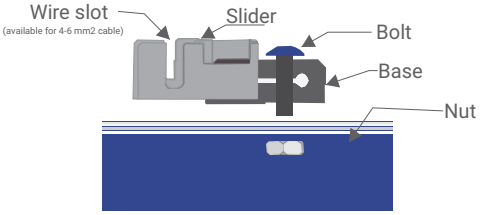




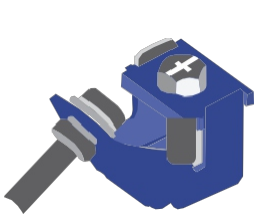
Grounding Procedure 3

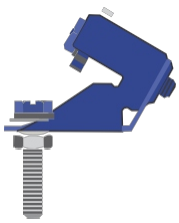
- Electrical contact should be developed by penetration of anodized coating of the aluminum frame and tightening the mounting hex nut by applying proper torque of 2.82 Nm. Hex nut comes with a star washer.
- Grounding wire dimension should be considered of 6-12 AWG solid bar copper and installed under the wire binding bolt.
- Tightening of wire binding bolt must be done at proper torque level 5.08 Nm.

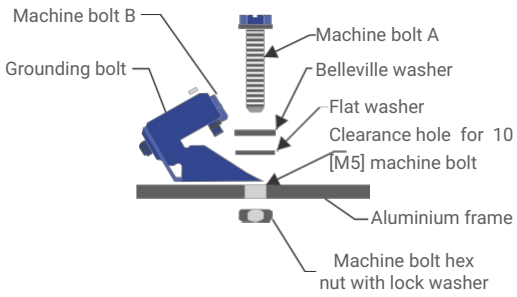




Grounding Procedure 4 – Erico Grounding Bolt



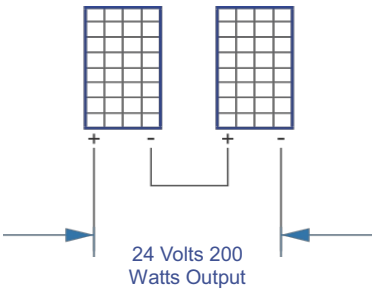




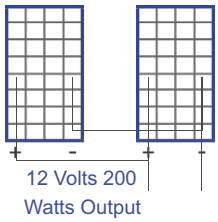
- To secure grounding bolt to the module frame machine bolt A should be torqued to 3.96 Nm.
- Grounding bolt can be used with only 6-12 AWG bare copper wire.
- Machine bolt must be torqued up to 3.96 Nm for the proper wire binding.
- It is recommended that lug should be installed on a surface that is larger than the bottom surface of the lug(clip).
- Lug should be fixed on the grounding hole present on the PV module.

6.4 ELECTRICAL WIRING

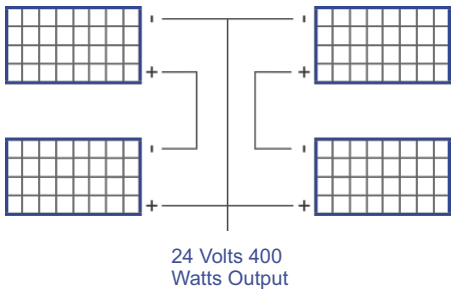
All wiring should be performed by well-trained installers as per the local codes and regulations. It is recommended to connect only n number of modules in series such that the system voltage should not exceed the rated value at any time of the year. The engineer should choose the appropriate design based on the Inverter MPPT ratings and operating voltage conditions and the environmental conditions considering the lowest temperature at the site.
The wiring are done in following three ways:



Series Wiring Connection
Meant to increase voltage



Parallel Wiring Connection
Meant to increase current



Series - Parallel Wiring Connection
Balance voltage & current

- System voltage should not exceed the rated value.
- Reverse polarity may lead to permanent product damage which can't be repaired or replaced.
- PGEPL recommends a maximum of 2 strings to be connected in parallel with appropriate string fuse for circuit protection.

For maximum system voltage, below formula can be used:
System voltage =
X * Voc * [1 + ((T-Voc (%) x (25 - Tmin))] Where;
X - No: modules which are connected in series.
Voc - Open circuit voltage of each module (Refer to the Data Sheet)
T-voc - Thermal coefficient of open circuit voltage for the module in Percentage
Tmin - Minimum ambient temperature of the location of the plant

6.5 CABLES & CONNECTORS

PGEPL PV modules are provided with two stranded, sunlight resistant output cables that are terminated with PV Connectors ready for most installations.
The minimum wire size should be 12 AWG. The temperature range of the cables is -40°C to +90°C. (Figure 2)

Correct Routing of cable

Incorrect Routing of cable

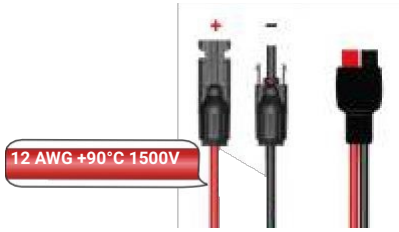


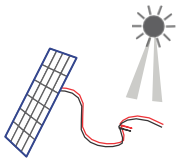
Figure 2

The positive (+) terminal has a female connector while the negative (-) terminal has a male connector. (Figure 2)

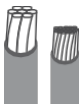
The MC-4 connecters are used at end of the cables provided in PGEPL PV modules.

MC-4 connector

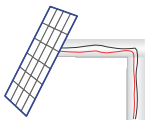
DO'S



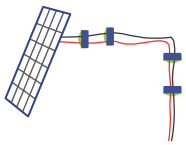
1. Use sunlight resistant cables only.



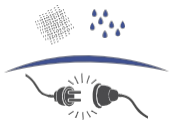
2. Use wiring with suitable cross-sectional areas.



3. Mount cables to avoid damage to both cables & modules.



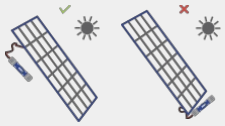
4. For fixing, use sunlight resistant cable ties and or specifically designed wire management tool clips.



5. Protect unplugged connectors from dust, moisture and pollution.

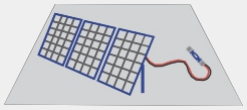
6. Ensure connector ends are hand-tight and locked.

DONT'S



1. Direct sunlight exposure.

2. Water immersion of cables.



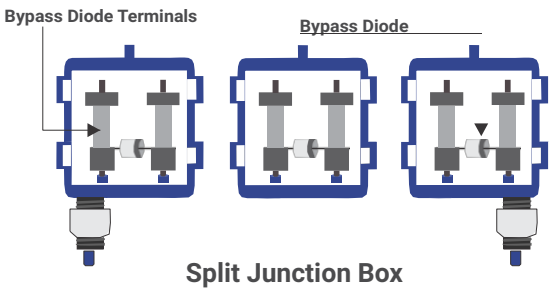
3. Leave connectors resting on ground.

The PGEPL modules are equipped with connectors that comply with the standard for connectors for use in photovoltaic system - UL 6703.
The PV wiring connectors used for mating, from different manufactures, should include following:

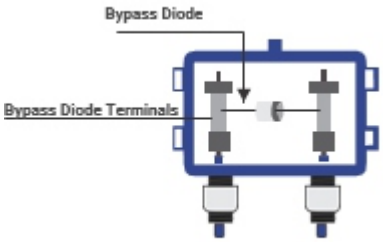
- Means to identify each distinct PV connector manufacturer's product - such as a picture or illustration, unique physical features, markings, company logos, etc.
- Allowable mating connector manufacturer and model number(s) listed for each distinct cable connector manufacturer's product(s), as well as contact information and/or website of the PV connector manufacturer.

6.6 BYPASS DIODES

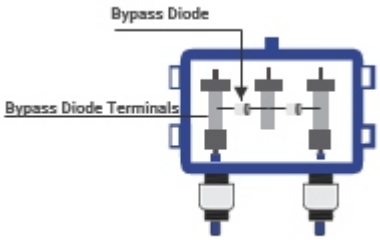
PGEPL Solar Module Junction box contains Bypass diode which is in parallel connection with the PV cell strands.
In case the diode goes out of order, the complete Junction box has to be replaced.
NOTE: Diodes are used to bypass the shaded area and can minimize both heating and array current reduction.



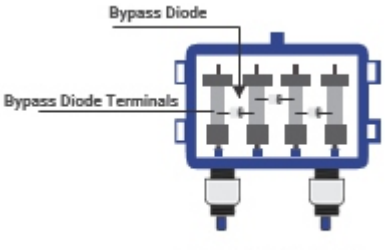
Split Junction Box



2-Rail 1-Diode



3-Rail 2-Diode



4-Rail 3-Diode

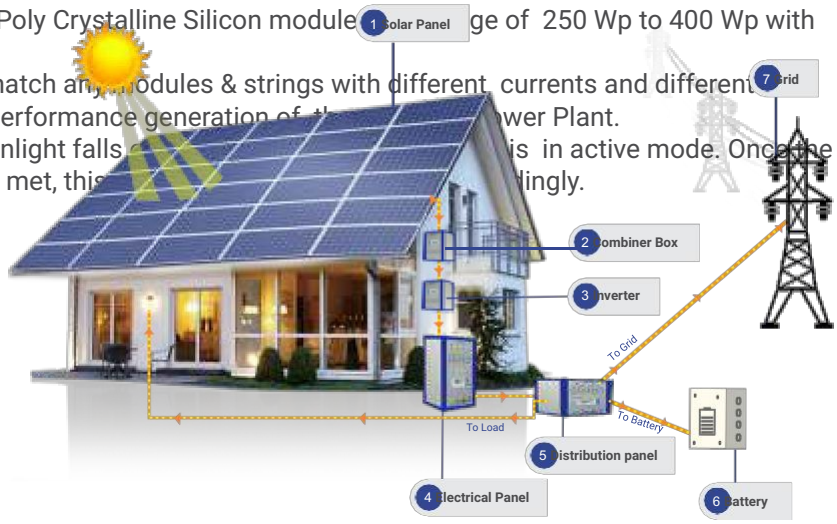
07. ELECTRICAL & MECHANICAL PARAMETERS

Refer Annexure 7 and 8 for the electrical and mechanical parameters of the modules.

08. ELECTRICAL CONFIGURATION

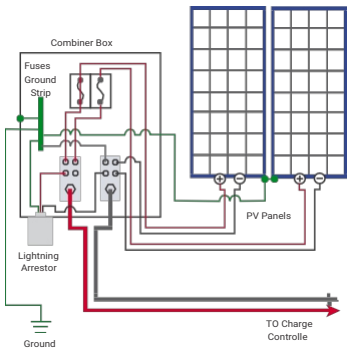
It is recommend that all the Solar Module, Module array and the DC combiner box should be handled by only trained person. PGEPL is not responsible for any causality or hazards on the site.
The brief of electrical configuration is:
- The PV module laminates are inserted into anodized aluminium frame. IP67 rating terminal box made of plastic material which is resistant to high temperature contains connection terminals and bypass diodes. In aluminium frames there is number of holes to attach the modules with structure in field.
- The products can be used in grid connected Utility & standalone system in houses, rooftop, PV stations, communication stations, petrol, ocean, meteorological, traffic and solar building etc.

- The maximum power of all PGEPL Mono and Poly Crystalline Silicon module ge of 250 Wp to 400 Wp with tolerance of ±3%.
- The EPC / Customer is advised to not to mismatch a odules & strings with different currents and different voltages which can lead to adverse effects of performance generation of th wer Plant.
- A solar array generates DC electricity when sunlight falls is in active mode. Once the minimum voltage and current requirements are met, this lingly.



8.1 FUSE RATING

- All PGEPL modules fuse rating is 15A, applicable for 1500V system.
- This fuse rating value also corresponds to the maximum reverse current that a module can withstand (when one string is shaded then the other parallel strings of modules will be loaded by the shaded string and current will flow) and therefore impacts the number of strings in parallel.
- When fuses are fitted they should be rated for the maximum DC voltage and connected in each, Non-grounded pole of the array (i.e. if the system is not grounded then fuses should be connected in both the positive and negative poles).
- While we use a 15A fuse in regular power plant, the bifacial module produces excess current. It is thus necessary to refer to the datasheet and design the fuse rating accordingly taking the onsite conditions into consideration.



8.2 SELECTION OF INVERTER & COMPATIBILITY

- In a solar array, connect the quantity of modules that corresponds to the voltage specifications of the inverters used in the system.
- If galvanically isolated inverter with transformers are used, the negative pole of the array must be connected to earth. If a transformer-less inverter is used, the installer should ensure that the right active negative earthing/grounding or PID Controller kit is installed by consulting with the inverter supplier and taking approval from the inverter supplier.
- Both methods are required in order to prevent the modules from potential induced degradation in the field.

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The brief of electrical configuration is:
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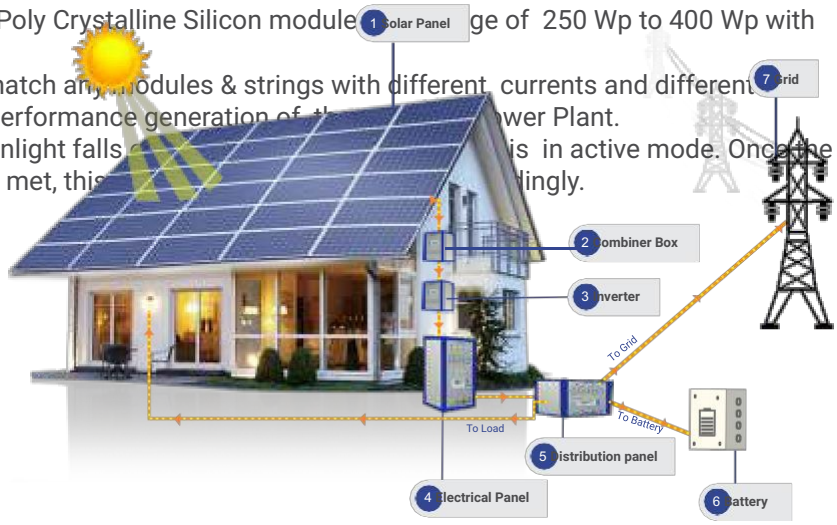

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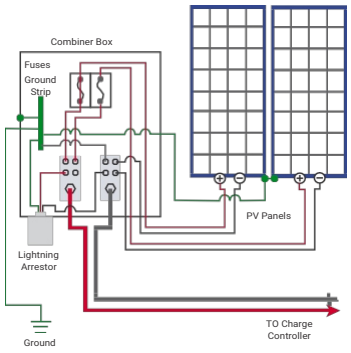

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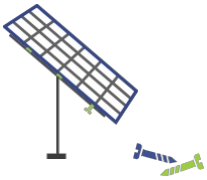
- Both methods are required in order to prevent the modules from potential induced degradation in the field.

9. PV MODULE MAINTENANCE AND CARE

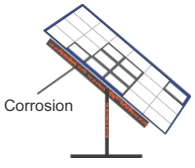
It is recommended to do yearly or half-yearly plant maintenance-check and cleaning by trained professionals.

9.1 VISUAL INSPECTION

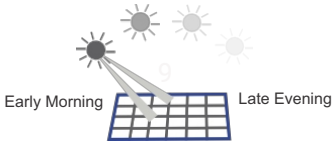


Check for any loose or damaged screws between the modules and bracket. If so, replace or fix it in time.

Check no sharp objects are in contact with the PV modules.



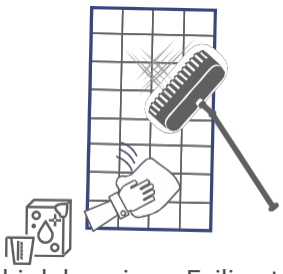
Check for the corrosion along cell's bus-bars and rear cover. It is caused by moisture intrusion.



Check for shading on PV modules. Obstructions should be removed. Early morning or late evening shadowing should not exceed 200 W/m sq.

9.2 CLEANING

PV Module Cleaning should be done only by properly trained personnel who understand the risks of using water to electrical components.
Cleaning can be performed by Wet Cleaning, Soft Cleaning, Compressed Air cleaning, Rotating Brush, Dry Brush cleaning.
Cleaning should be performed in a way that no stress on PV modules is caused which may lead to cracks on solar cells.
Usage of soft module cleaning kit is recommended. Soft cloth and slight detergent can be used as an alternate solution.
Climbing of personnel on the PV modules is strictly prohibited as it can cause irreversible damage to the solar cells of the PV modules.
Water used for cleaning should be of same temperature as of module, as the temperature difference can create thermal shocks by which PV module can be damaged and will not be a part of the Warranty.
The water should be regularly checked for TDS. It is immediately recommended to install RO at the site if the TDS of the water is deviating from appropriate standards and acceptable limit of less than 500mg/l.
Avoid cleaning by sharp edge objects which can damage the material of back sheet and can cause a cut and impact the performance of the PV module and the plant.



The PV Modules are advised to be cleaned regularly ensuring dust/dirt free and devoid of any bird droppings. Failing to clean the same can cause damage to the power output of the PV system.
The rare surface of the module does not require cleaning unless any objects or dirt is stuck on the back sheet.

Method A: Compressed Water

Requirement for water quality:

PH: 5 ~7;

Chloride and Salinity：0 - 3,000 mg/L

Turbidity：0-30 NTU

Conductivity：1500~3000 μs/cm

Total dissolved solids (TDS)：≤1000 mg/L

Water hardness (calcium and magnesium ions)：0-40 mg/L

Non-alkaline water must be used; demineralized water shall be used when conditions are available The maximum water pressure recommended is 4 MPa (40 bar)

Method B: Compressed Air

We recommends using this method to clean the soft dirt (like dust) on modules. This technique can be applied as long as the method is efficient enough to clean the modules considering the on-site conditions.

Method C: Wet Cleaning

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

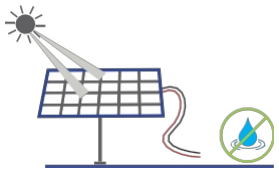
Please make sure that any brushes or agitating tools are constructed with non-conductive materials to minimize risk of electric shock and that they are not abrasive to the glass or the aluminium frame.

If grease is present, an environmentally friendly cleaning agent may be used with caution.

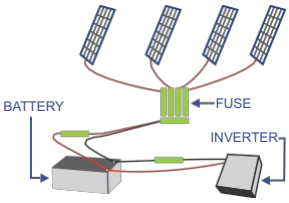
Method D: Robot Cleaning

If a cleaning robot is used for dry cleaning, the brush material is required to be soft plastic material, and the glass surface and aluminium alloy frame of the module will not be scratched during the cleaning process and after cleaning. The weight of the cleaning robot should not to be too large. If the cleaning robot is improperly used, and the resulting module damage and power attenuation are not covered by PGEPL.

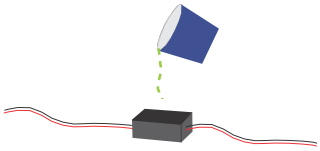
9.3 INSPECTION OF CONNECTOR & CABLE



Ensure all cable assemblies are tightly fitted and no part of the cable is immersed or exposed to water logging.

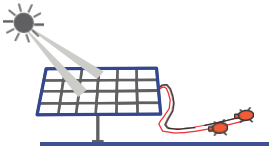


Check for all the strings fuses of each non-earthed pole are working properly and in operation.



Check the sealing gels of the junction box for any damage.

Check that all connections are tight and corrosion-free.



Check for all wiring for possible rodent damage, weathering and electrical leakage to ground.

NOTE:

The dual glass modules of the non-metallic frame should not by earthed.

9.4 PRODUCT RECYCLING & END OF LIFE

Product should be recycled in useful renewable method after the end of its life cycle. Please contact PGEPL at the end of the product life cycle for recycling procedure. Do not discard the e-waste in bins.

10. WARNING

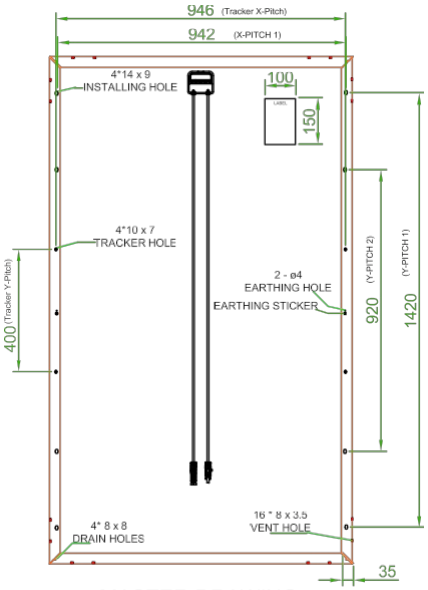
While performing any type of electrical maintenance, all the system should be isolated / shutdown and maintenance should be performed by well trained professionals only. Any failure to follow instructions may result in lethal electric shocks, burns, injuries, other electrical hazards, fire hazards and some time may lead death also. PGEPL is not responsible for any type of accident occurring in Power plant while using the PGEPL panels.

11. CONTACT DETAILS

PV modules do not contain any serviceable parts. If customer has any doubts that installation is not working properly, please contact your installer / EPC / O&M. Immediately and please leave a note to the PGEPL Customer Service Team.

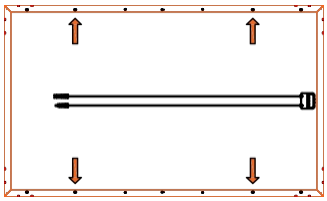
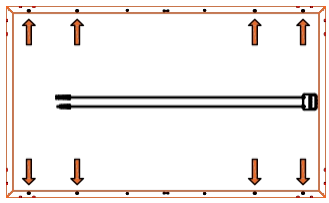
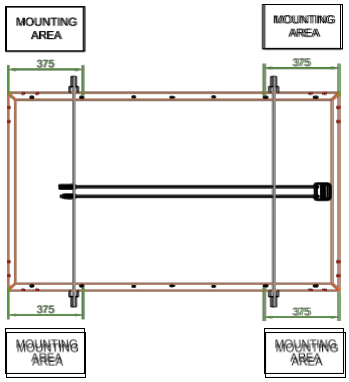
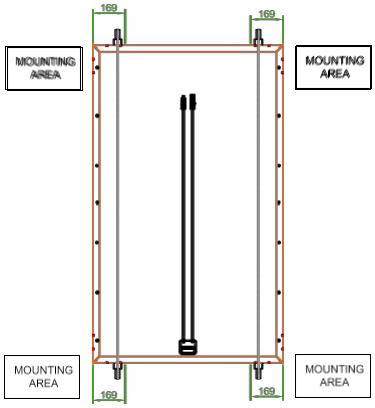
1. Contact PGEPL sales and service team at **+91 281 6170000**.
2. Email customer feedback at **sales@pixonenergy.com**.
3. Reach to us at: **Factory :** Rajkot - Jamnagar Highway, PO: Depaliya, TA: Padadhari, Rajkot - 360110. Gujarat, India.
   Office : 2nd Floor, Star Avenue, Nr. Moti Tanki Chowk, Gymkhana Road, Rajkot - 360001. Gujarat, India.

12. ANNEXURES

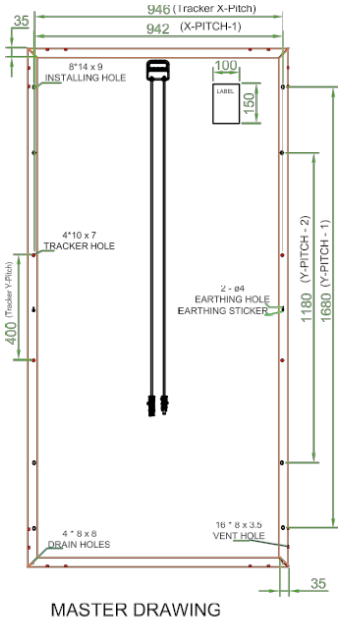


MASTER DRAWING
60 CELL MODULE

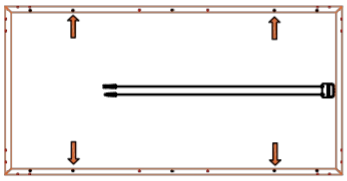
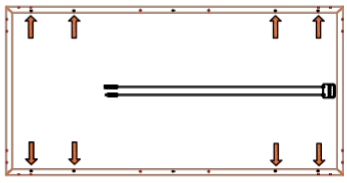
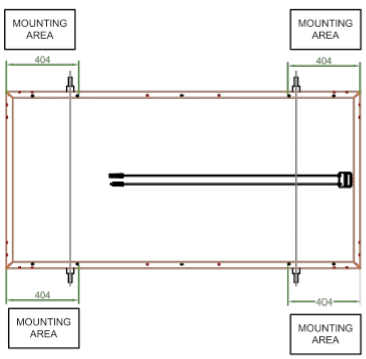
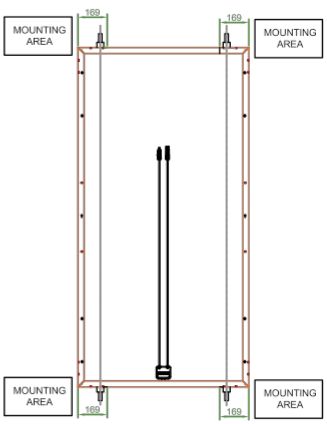
Annexure 1

At 2400 Pa Load Condition	At 5400 Pa Load Condition
Bolt type Fixing	
	
Use four mounting hole	Use eight mounting hole
Short Side Clamping	**Long Side Clamping**
	

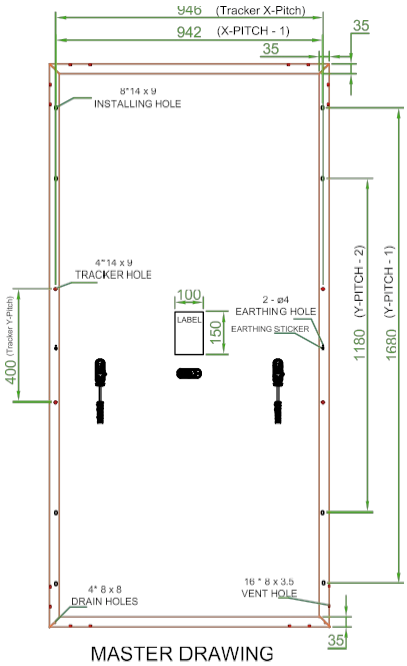
Annexure 2



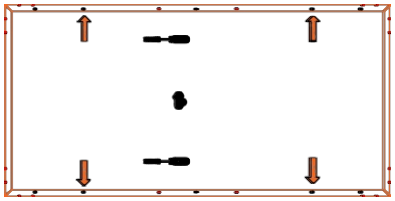
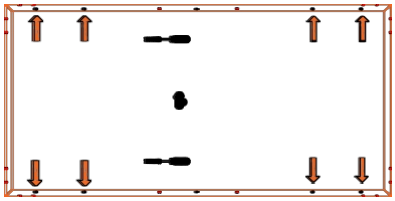
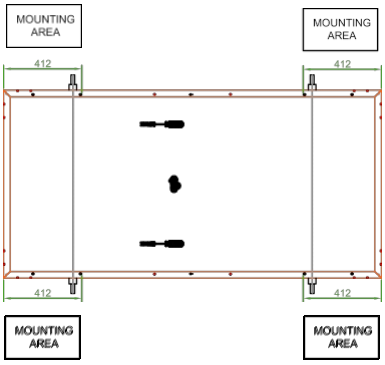
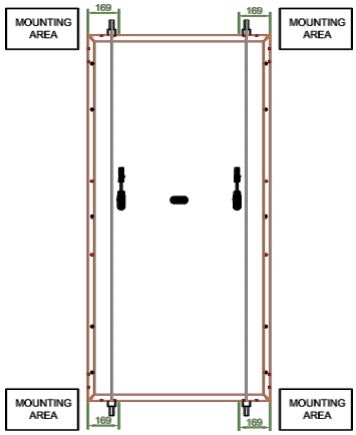
MASTER DRAWING
72 CELL MODULE

At 2400 Pa Load Condition	At 5400 Pa Load Condition
Bolt type Fixing	
	
Use four mounting hole	Use eight mounting hole
Short Side Clamping	**Long Side Clamping**
	

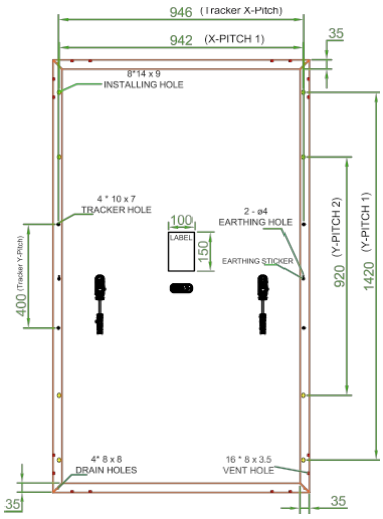
Annexure 3



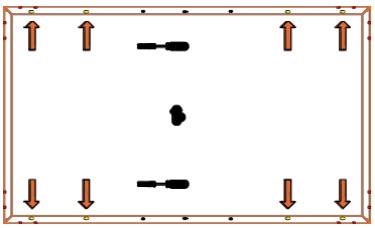
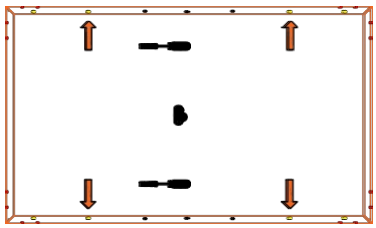
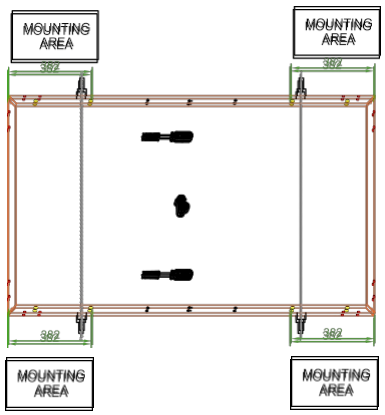
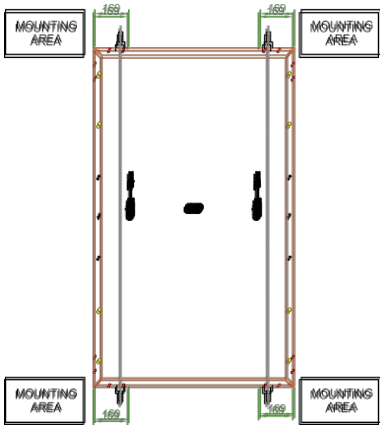
MASTER DRAWING
144 HC CELL MODULE

At 2400 Pa Load Condition	At 5400 Pa Load Condition
Bolt type Fixing	
	
Use four mounting hole	Use eight mounting hole
Short Side Clamping	**Long Side Clamping**
	

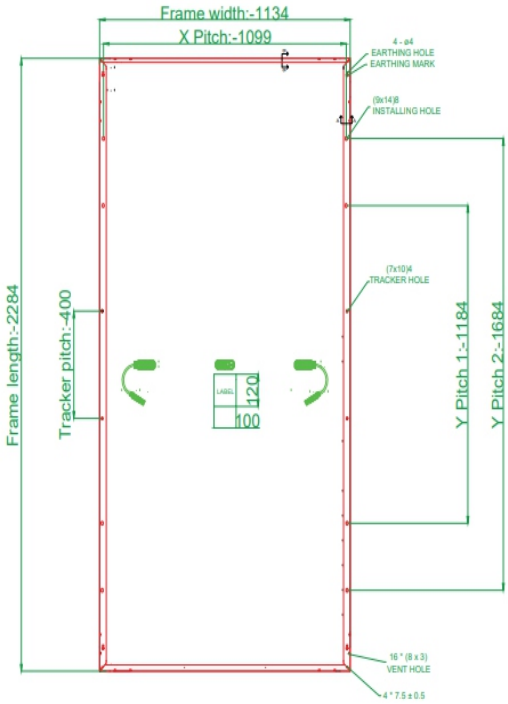
Annexure 4



MASTER DRAWING
120 HC CELL MODULE

At 2400 Pa Load Condition	At 5400 Pa Load Condition
Bolt type Fixing	
	
Use four mounting hole	Use eight mounting hole
Short Side Clamping	**Long Side Clamping**
	

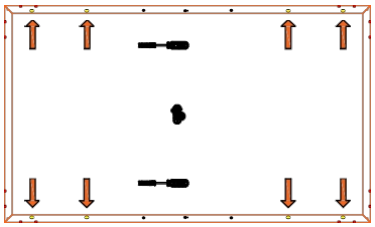
Annexure 5



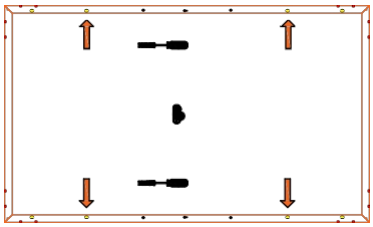
MASTER DRAWING M10
MBB 144 HC CELLS

At 2400 Pa Load Condition	At 5400 Pa Load Condition

Bolt type Fixing

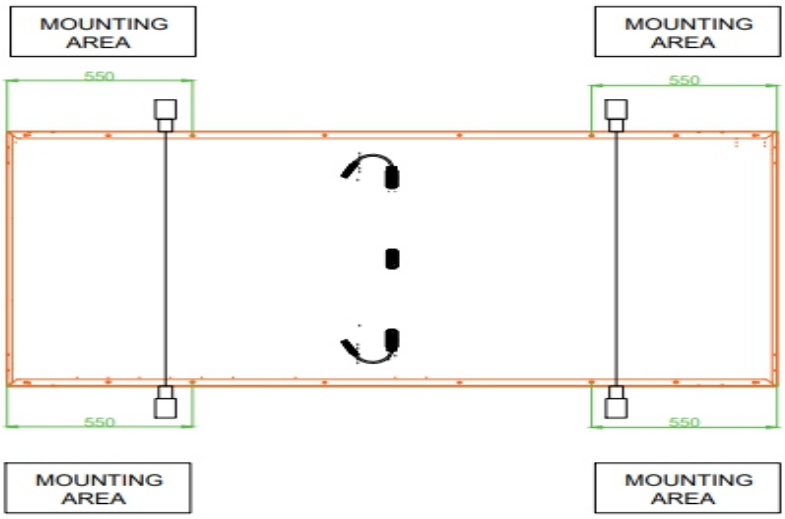


Use four mounting hole

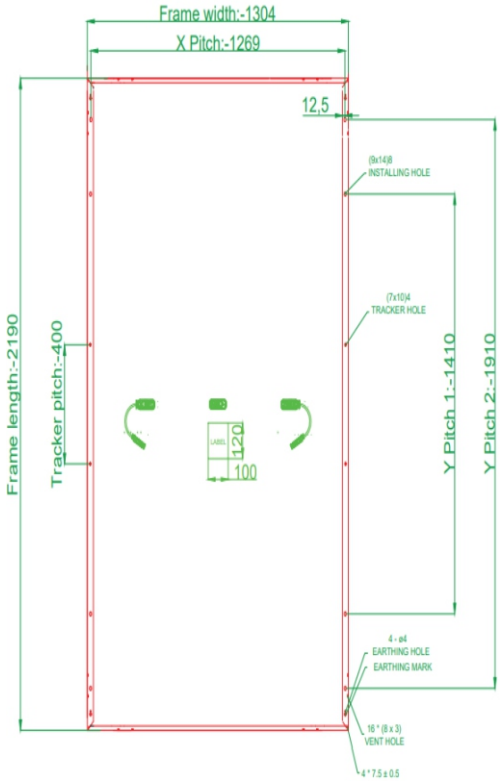


Use eight mounting hole

Short Side Clamping



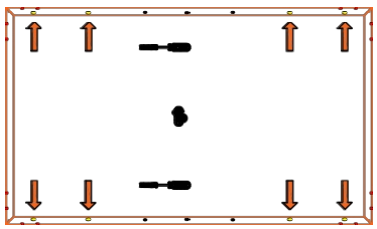
Annexure 6



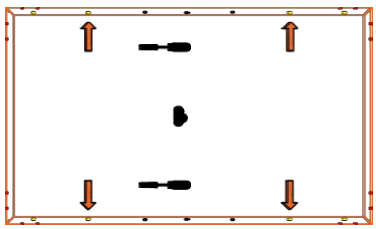
MASTER DRAWING M12
MBB 120 HC CELLS

At 2400 Pa Load Condition	At 5400 Pa Load Condition

Bolt type Fixing

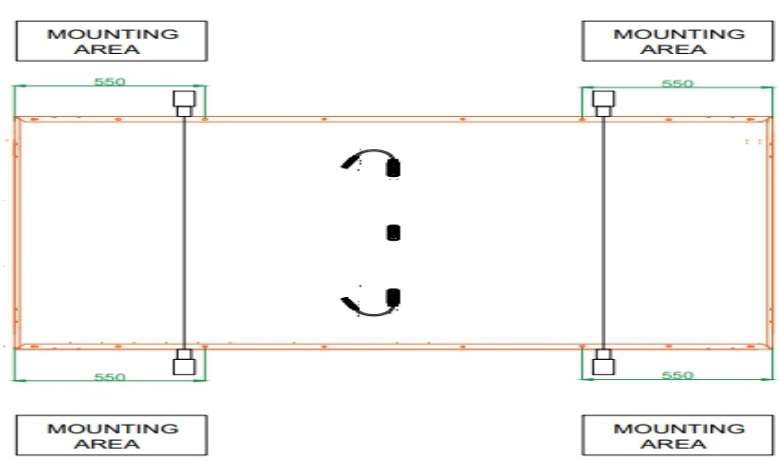


Use four mounting hole



Use eight mounting hole

Short Side Clamping



Annexure 7

Cell Type	Cell Number	Module Name	Output Power (in Watts)								Max. Power Voltage Vmp (in Volts)	Max. Power Current Imp (in Amps)	Open-Circuit Voltage Voc (in Volts)	Short-Circuit Current Isc (in Amps)	Weight	Module Size (L X W X H in mm)
POLY	72	PIX P2	315	320	325	330	335	340	345	350	39.38 - 36.94	8.89 - 8.53	46.73 - 44.21	9.37 - 9.05	22 kg (35 mm frame variant)	1973 X 989 X 35
	60	PIX P2	260	265	270	275	280	285	290	295	33.12 - 30.48	8.91 - 8.54	39.12 - 36.66	9.43 - 9.09	19 kg (35 mm frame variant)	1655 X 989 X 35
	144	PIX PH2	325	330	335	340	345	350	355	360	40.32 - 38.95	8.93 - 8.35	47.16 - 45.72	9.35 - 8.86	22.5 kg (35 mm frame variant)	1990 X 989 X 35
	120	PIX PH2	260	265	270	275	280	285	290	295	33.18 - 30.54	8.89 - 8.52	39.18 - 36.72	9.40 - 9.08	19.5 kg (35 mm frame variant)	1670 x 989 x35
	72	PIX PD2	310	315	320	325	330	335	340	345	39.82 - 38.16	8.67 - 8.13	46.66 - 45.14	9.11 - 8.69	22 kg (35 mm frame variant)	1973 X 989 X 35
	60	PIX PD2	250	255	260	265	270	275	280	285	33.18 - 31.32	8.59 - 7.99	38.82 - 37.32	9.08 - 8.61	19 kg (35 mm frame variant)	1655 X 989 X 35
MONO	72	PIX MP3	365	370	375	380	385	390	395	400	41.69 - 40.03	9.60 - 9.12	48.53 - 46.94	10.10 - 9.81	23 kg (35 mm frame variant)	1994 X 1000 X 35
	60	PIX MP3	300	305	310	315	320	325	330	335	34.68 - 33.03	9.67 - 9.01	40.62 - 39.06	10.12 - 9.71	20 kg (35 mm frame variant)	1673 X 1000 X 35
	144	PIX MPH3	375	380	385	390	395	400	405	410	42.19 - 40.54	9.72 - 9.26	49.25 - 47.45	10.17 - 9.88	23.5 kg (35 mm frame variant)	2010 X 1000 X 35
	120	PIX MPH3	305	310	315	320	325	330	335	340	35.04 - 33.48	9.70 - 9.12	40.86 - 39.24	10.16 - 9.78	20.5 kg (35 mm frame variant)	1687 X 1000 X 35
	72	PIX MPB3	365	370	375	380	385	390	395	400	41.69 - 40.03	9.60 - 9.12	48.53 - 46.94	10.10 - 9.81	23 kg (35 mm frame variant)	1994 X 1000 X 35
	60	PIX MPB3	300	305	310	315	320	325	330	335	34.68 - 34.68	9.67 - 9.01	40.62 - 39.06	10.12 - 9.71	20 kg (35 mm frame variant)	1673 X 1000 X 35
	144	PIX MPHB3	375	380	385	390	395	400	405	410	42.19 - 40.54	9.72 - 9.26	49.25 - 47.45	10.17 - 9.88	23.5 kg (35 mm frame variant)	2010 X 1000 X 35
	120	PIX MPHB3	305	310	315	320	325	330	335	340	35.04 - 33.48	9.70 - 9.12	40.86 - 39.24	10.16 - 9.78	20.5 kg (35 mm frame variant)	1687 X 1000 X 35
	144	PIX MPH	525	530	535	540	545 M10				41.20 - 41.80	12.75 - 13.4	49.05 - 49.65	13.65 13.92	29Kg (35 mm frame variant)	2284 X 1134 X 35
	144	PIX MBHT	525	530	535	540	545 M10				41.20 - 41.80	12.75 - 13.4	49.05 - 49.65	13.65 13.92	29Kg (35 mm frame variant)	2284 X 1134 X 35
	144	PIX MBHG	525	530	535	540	545 M10				41.20 - 41.80	12.75 - 13.4	49.05 - 49.65	13.65 13.92	33Kg (35 mm frame variant)	2284 X 1134 X 35
	120	PIX MPH	580	585	590	595	600 M12				33.85 – 34.65	17.14 – 17.32	41.05 – 41.85	18.13 – 18.31	31.5Kg (35 mm frame variant)	2190 X 1304 X 35
	120	PIX MBHTB	580	585	590	595	600 M12				33.85 – 34.65	17.14 – 17.32	41.05 – 41.85	18.13 – 18.31	31.5Kg (35 mm frame variant)	2190 X 1304 X 35
	120	PIX MBHG	580	585	590	595	600 M12				33.85 – 34.65	17.14 – 17.32	41.05 – 41.85	18.13 – 18.31	35.3Kg (35 mm frame variant)	2190 X 1304 X 35

Note: All modules mentioned in the table got following electrical specifications.
Maximum System Voltage - Vdc = 1500 V
Maximum Fuse Rating 15A/25A/30A
Fire Class Rating = Class C

Annexure 8

Cell Type	Cell Number	Module Name	Output Power (in Watts)								Max. Power Voltage Vmp (in Volts)	Max. Power Current Imp (in Amps)	Open-Circuit Voltage Voc (in Volts)	Short-Circuit Current Isc (in Amps)	Weight	Module Size (L X W X H in mm)
POLY	54	PIX P2	230	235	240	245	250	255	260	265	29.75 - 27.27	8.91 - 8.44	35.21 - 32.78	9.43 - 8.99	17 kg (35 mm frame variant)	1496 X 989 X 35
	48	PIX P2	200	205	210	215	220	225	230	235	26.40 - 23.95	8.91 - 8.36	31.25 - 28.75	9.42 - 8.90	15 kg (35 mm frame variant)	1337 X 989 X 35
	36	PIX P2	145	150	155	160	165	170	175	180	20.05 - 17.60	8.98 - 8.25	23.65 - 21.28	9.48 - 8.82	10.5 kg (35 mm frame variant)	1496 X 989 X 35
	54	PIX PD2	220	225	230	235	240	245	250	255	29.81 - 28.08	8.54 - 7.84	34.83 - 33.53	9.02 - 8.45	17 kg (35 mm frame variant)	1496 x 989 x35
	48	PIX PD2	190	195	200	205	210	215	220	225	26.40 - 24.38	8.53 - 7.80	30.86 - 29.42	9.01 - 8.29	15 kg (35 mm frame variant)	1337 X 989 X 35
	36	PIX PD2	135	140	145	150	155	160	165	170	19.87 - 18.04	8.57 - 7.49	23.22 - 21.31	9.03 - 8.19	10.5 kg (35 mm frame variant)	1496 X 670 X 30
MONO	54	PIX MP3	265	270	275	280	285	290	295	300	31.21 - 29.81	9.62 - 8.89	36.45 - 34.99	10.11 - 9.64	18 kg (35 mm frame variant)	1512 X 1000 X 35
	48	PIX MP3	230	235	240	245	250	255	260	265	27.65 - 26.30	9.59 - 8.75	32.16 - 30.86	10.10 - 9.55	16 kg (35 mm frame variant)	1351 X 1000 X 35
	36	PIX MP3	165	170	175	180	185	190	195	200	20.81 - 19.48	9.61 - 8.47	24.26 - 22.93	10.08 - 9.36	11 kg (35 mm frame variant)	1512 X 678 X 30
	54	PIX MPB3	265	270	275	280	285	290	295	300	31.21 - 29.81	9.62 - 8.89	36.45 - 34.99	10.11 - 9.64	18 kg (35 mm frame variant)	1512 X 1000 X 35
	48	PIX MPB3	230	235	240	245	250	255	260	265	27.65 - 26.30	9.59 - 8.75	32.16 - 30.86	10.10 - 9.55	16 kg (35 mm frame variant)	1351 X 1000 X 35
	36	PIX MPB3	165	170	175	180	185	190	195	200	20.81 - 19.48	9.61 - 8.47	24.26 - 22.93	10.08 - 9.36	11 kg (35 mm frame variant)	1512 X 678 X 30

Note: All modules mentioned in the table got following electrical specifications.
Maximum System Voltage - Vdc = 1500 V
Maximum Fuse Rating = 15 A
Fire Class Rating = Class C

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