SREW SRI RAGHAVENDRA™ ENGINEERING WORKS

Safety and Installation Instructions

SREW SRI RAGHAVENDRA™ ENGINEERING WORKS

SREW
Panels

Maximum system voltage 1500 vdc
Model: 60 Cell

ELECTRICAL DATA (STC)

Pmax (Wp)	SR-260-EW	SR-265-EW	SR-270-EW
Power Tolerance (%)		±3%	
Open Circuit Voltage - Voc (V)	38	38	38
Short Circuit Current - Isc (A)	8.85	8.88	9
Voltage at Peak Power Point - Vmp (V)	30.8	31	31.5
Current at Peak Power Point - Imp (A)	8.45	8.55	8.58
Module Efficiency (%)	16	16	16

STC (Standard Test Condition): Irradiance of 1000W/m2, AM1.5G and cell temperature (25±2)°C

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Model: 36 Cell

ELECTRICAL DATA (STC)

Pmax (Wp)	SR-150-EW	SR-155-EW	SR-160-EW
Power Tolerance (%)		±3%	
Open Circuit Voltage - Voc (V)	22	22.3	22.3
Short Circuit Current - Isc (A)	8.64	8.8	8.95
Voltage at Peak Power Point - Vmp (V)	18.4	18.5	18.5
Current at Peak Power Point - Imp (A)	8.15	8.4	8.65
Module Efficiency (%)	15	15	15

STC (Standard Test Condition): Irradiance of 1000W/m2, AM1.5G and cell temperature (25±2)°C

Model: 72 Cell

ELECTRICAL DATA (STC)

Pmax (Wp)	SR-320-EW	SR-325-EW	SR-330-EW
Power Tolerance (%)		±3%	
Open Circuit Voltage - Voc (V)	46	46	46
Short Circuit Current - Isc (A)	8.89	9.12	9.79
Voltage at Peak Power Point - Vmp (V)	39	38.2	37.7
Current at Peak Power Point - Imp (A)	8.2	8.5	8.8
Module Efficiency (%)	16.8	17	17

STC (Standard Test Condition): Irradiance of 1000W/m2, AM1.5G and cell temperature (25±2)°C

Minimum Cable Diameter : 6.1mm±0.1mm

With 1Meter Length

Temperature of Connector=-40°C to +85°C

Diode Details

Type: D20SQ045

Rating: 20A

SREW SRI RAGHAVENDRA™ ENGINEERING WORKS

1.0 Introduction

This manual provides safety and installation instructions for SREW (Sri Raghavendra Engineering Works)

IMPORTANT! ***Please read this manual before installing, wiring, or using this product in any way. Failure to comply with these instructions will invalidate***

1.1 Disclaimer of Liability

The installation techniques, handling, and use of this product are beyond company control. Therefore, Solar Philippines assumes no responsibility for loss, damage or expense resulting from improper installation, handling, or use.

2.0 Safety Precautions

Before installing this product, read all safety instructions in this document.

Notice

- The fire rating of this module is valid only when mounted in the manner specified in the mechanical mounting instructions.
- Modules that fall under this application class may be used in system operation at more than 50V DC or 240W, where general contact access is anticipated. Modules qualified for safety under IEC 61730-2 and within application class are considered to meet the requirements for Application class A.
- Installing and repairing a PV system requires specialized knowledge, especially the installation and wiring of the PV modules. This works should only be carried out by suitable qualified and authorized persons. Non-related personnel should not be allowed near the installation while work is being carried out.
- Check with local authorities for guidelines and requirements concerning fire safety for any building or structure that the modules will be mounted on or attached to.
- Follow the safety regulations for all other system components, including wires and cables, connectors, charging regulators, inverters, storage batters, rechargeable batteries, etc.
- For field connections, use minimum No.12 AWG Copper wired.
- Consult your local authority for guidelines and requirements for building or structural fire safety.
- Roof constructions and installations may affect the fire safety of a building; improper installation may create hazards in the event of a fire.
- Use components such as ground fault circuit breakers and fuse as required by local authority.
- Do not use panels near equipment or in places where flammable gases may be generated.
- The modules have been rated Fire Class C, and are suitable for mounting on to alas A roof.
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DANGER

- Make sure that all electrical connections are completely dry before they are assembled.
- Materials, tools and working conditions need to be clean and dry.
- Short circuits on the DC side of the installation can cause arcing. This is a burn and fire hazard.
- Do not use any damaged solar module. Broken front Glass or damaged laminate back sheet can expose personal to hazardous voltages. Modules should not be disassembled. Do not lift the module by grasping the module's junction box or electrical leads.
- Do not stand or step on module.
- Do not drop the module or allow objects to fall on the module.
- The back sheet of the PV module must be kept from any damage or scratching to prevent electric shock and fire.

Warning

- All protective measures regarding working at heights and preventing falls specified in national and health and safety codes and regulations should be implemented before and during all work on roof-mounted and other PV array structures, and all necessary scaffolding and other protective measures applied at the site of the installation.
- Do not wear metallic rings, watchbands, ear, nose, lip rings or other metallic devices while installing or troubleshooting photovoltaic systems.
- The solar array should never be disconnected from the inverter while the inverter is connected to the public grid.
- When an inverter is switched off/disconnected, it is necessary to wait for the time specified by the manufacturer before working on it. Its high voltage components need sufficient time to discharge.
- The inverter manufacturer's installation, handling and operating instructions should be followed at all times.
- Do not apply paint or adhesive to module top surface.
- Do not use mirrors or other magnifiers to concentrate sunlight onto the modules. Obtain a building permit if necessary.
- To avoid glass breakage, do not place any heavy objects on the module. Be cautious when setting the module down onto a surface.
- Inappropriate transport and installation may break the module.
- All modules must be earthed.
- Modules should be carried using both hands;
- Modules should not be allowed to sag or bow under their own weight when being carried.

3.0 Unpacking and Storing the Modules

Warning and instructions on the packing should be observed. Every module has its own serial number label. If it is necessary to put the module into temporary storage, they should be kept in dry and properly ventilated room. Modules should be handled with care. The following points need to be observed when the modules are being unpacked, transported or stored:

- Modules should be carried using both hands; the junction box should NOT be used as a grip.
- Modules should not be allowed to sag or bow under their own weight when being carried.
- All electrical contacts should be kept clean and dry.

4.0 Mechanical Installation

4.1 Site Selection

In most applications, modules should be installed in a location where they will receive maximum sunlight throughout the year. The modules should be facing south in northern latitudes and north in southern latitudes. Optimal tilting of module is almost the same as the latitude of installation location. For the best

elevation tilt angle, refer to standard solar photovoltaic installation guides or a reputable solar installer or system integrator.

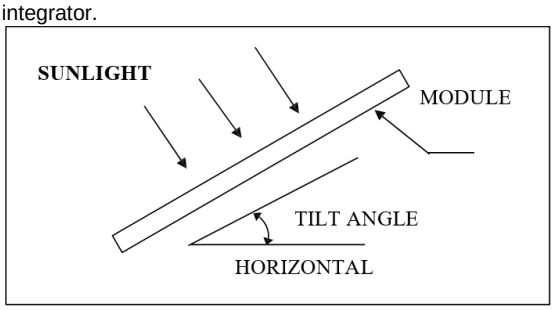


Figure 1 Module Tilt Angle

Indication of any slope less than 5 in/ft (127 mm/305 mm) required to maintain a fire class rating.

The module should not be shaded at any time of the day. Shading causes loss of output even though the factory fitted bypass diodes of the module will minimize any such loss.

Do not install the module near naked flame or flammable materials.

Do not install the module in a site where would be immersed in water or continually exposed to water from a sprinkler or fountain etc.

4.2 Support Frame Selection

The module frame is made of anodized aluminum, and therefore corrosion can occur if the module is subject to a salt water environment with contact to a rack of another type of metal.

To avoid dissimilar metal corrosion, use of stainless steel fastening materials are the preferred choice, but galvanized or hot dipped zinc plated fasteners are acceptable.

Module support structures that are to be used to support modules at correct tilt angles should be wind and snow load rated for use by the appropriate local and civil codes prior to installation.

The support module mounting structure must be made of durable, corrosion-resistant and UV-resistant material.

Do not attempt to drill holes in the glass surface of the modules. It will void the warranty.

Do not drill additional mounting holes in the frame of the module. It will void the warranty.

4.3 Mounting

The modules are not suitable for installation as overhead or vertical glazing. The array mounting structure should be able to withstand anticipated wind and snow loads. At the bottom of the module frames there are openings which allow rain water to flow away.

Do not cover the corner drainage holes shown in Figure 2.

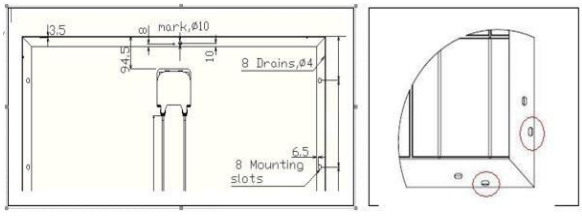


Figure 2 Drainage Holes

Each module must be securely fixed to the mounting structure at a minimum of four points. The long sides of the module frame have been stress tested and are to be used for fixing the modules to the mounting structure. Fastening the structure. Refer to Figure 3

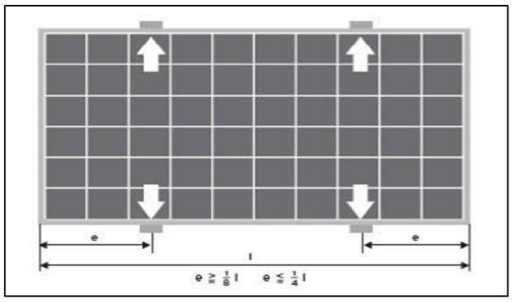


Figure 3 Long Side Mounting

4.4 Fixing the Modules to an Array Mounting Structure

Mounting Structure

Always use structures and materials specifically designed and certified for PV module installation. The support structure must adhere to maximum permissible load requirements, and should be wind and snow load rated by appropriate local and civil codes prior to installation.

Ground Mount

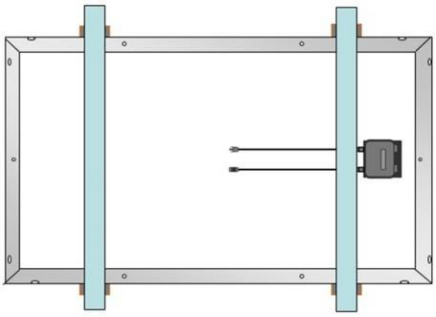
Modules should be mounted using specialized clamps as shown in Figure 4.

a. Modules should be attached on a supporting structure rail by metal clamps. It is recommended to use the clamps under the following condition or approved by system installation:

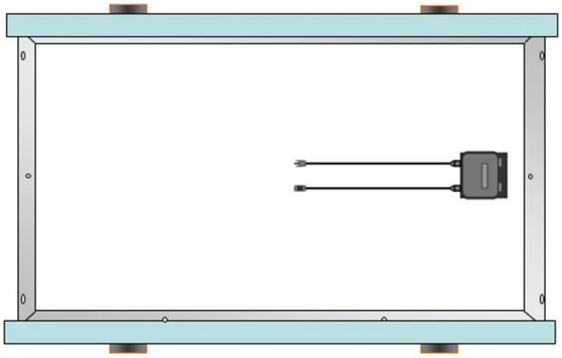
Width: No less than 38mm; Thickness: No less than 3mm; Material: Aluminum Alloy; Bolt: M8;

b. Installation type of supporting structure rail

Type 1:



Type 2:



c. The solar module frame must be attached to a support structure using M8 stainless steel hardware in a minimum of four (4) places symmetrical on the solar module. The stainless hardware used for securing the module frame should secured with an applied torque of 8~20Newton-meters (about 6~15 foot-pounds).

d. The Modules clamps must not contact the front glass or deform the frame in any way, the contact area of clamp with the front of frame must be smooth, otherwise maybe damage the frame bring about the modules broken. Avoid shading effects from the Modules clamps. Drainage holes on the Modules frame must not be closed or obscured by the clamps.

e. GIN X6-72-XXX series 1/4L = 489 mm
GIN X6-66-XXX series 1/4L = 450 mm
GIN X6-60-XXX series 1/4L = 410 mm
GIN X6-54-XXX series 1/4L = 370 mm
GIN X6-48-XXX series 1/4L = 331 mm
Refer to Appendix A

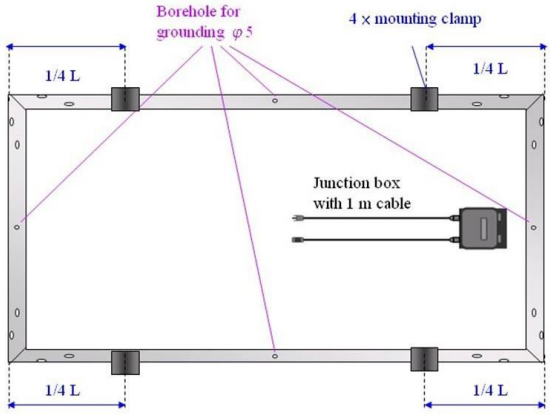


Figure 4 Module Mounting Structure

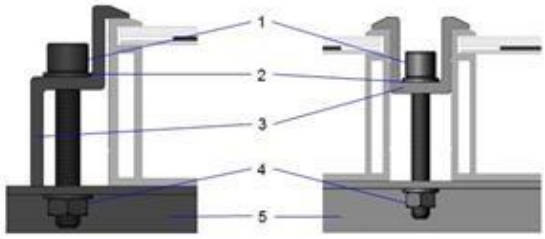


Figure 5 Mounting Clamp

1. Stainless steel M8 (5/16 inch) hexagon-head bolt
2. Stainless steel washer (M8)
3. Aluminum clamp
4. Stainless steel screw nut
5. Structure rails

Roof Mount

A special support frame may be necessary. Please contact with your frame suppliers for detail instruction.

Provide adequate ventilation under a module for cooling (10 cm minimum air space between module and mounting surface).

For a non-integral module or panel, a statement that the assembly is to be mounted over a fire resistant roof covering rated for the application.

When installing a module on a roof of building,

- Ensure that it is securely fastened and cannot fall as a result of wind or snow loads.
- Ensure that the roof construction is suitable and must be properly sealed to prevent leaks.
- Ensure that the fireproofing of the house construction is not against the law.

Pole Mount

Installing a module on a pole must choice a pole and module mounting structure that will withstand anticipated winds for the area

5.0 Electrical Installation

5.1 Grounding

Module frames should be connected to an Earth Ground. The grounding wire must be properly fastened to the module frame to assure good electrical contact. If the support frame is made of metal, the surface of the frame must be electroplated and have excellent conductivity. We recommend the below type of grounded way:

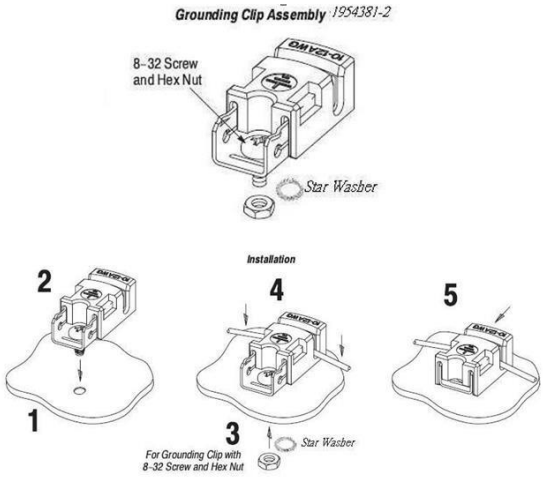


Figure 6 Grounding

1. Please refer to the applicable and local codes in regards to grounding PV modules, and other PV system components. If PV modules individual grounding is requested by the local legislation, modules should be grounded to the module frame using one of the provided grounding holes (figure).
2. Place the grounding clip onto the frame, making sure that the screw straddles the grounding hole. Using a No. 2 cross–recessed screwdriver, thread the screw into the hole until the head is flush with the base and the base is flush with the frame, then tighten the screw with another 1/4 to 1/2 turn. Recommended torque is between 2.3 and 2.8 Nm [20 and 25 in.– lbs].
3. For the grounding clip with the 8–32 and hex nut, thread the hex nut onto the end of the screw, then using a 3/8–in. wrench, tighten the nut. An additional star washer is recommended.
4. Insert the wire into the wire slot. Press down on both ends of the wire (the wire slot will cause the wire to form a slight curve).
5. Manually, or using channel lock pliers, push the slider over the base until it covers the base. This will terminate the wire.

UV-resistant cables and connectors approved for use should be used. National electrical codes and regulations need to be followed when selecting cables. For field connections, use minimum 4 mm2 or #12 AWG copper solid wires insulated for a minimum of 90°C.

5.2 Configuration

In order to minimize voltage surges which could be included by indirect lightning strikes, DC cables of the same string should be bundled together so that loops are kept as small as possible. String configurations should be checked before system

commissioning. If the open circuit voltage (Voc) and the short circuit current (Isc) deviates from the specifications, this could indicate a configuration fault.

All connections should be secure, tight and electrically and mechanically sound. Do not touch live terminals with bare hands. Use insulated tools for electrical connections.

Cables should be secured to the array mounting system using UV-resistant device. Loose and unsecured cables should be protected from mechanical damage. Avoid, as far as possible, exposing the cables to direct sunlight. For field connections, use minimum No. 12 AWG copper PV wires insulated for a minimum of 90°C

The module has a pair of male and female waterproof connectors. For a series electrical connection, connect positive (+) connector of first SPV module to negative (-) connector of the following module.

Do not short the positive and the negative. Do not disconnect under load. Be sure connector no gap between the insulators. In case there is a gap, a fire and/or an electrical shock may occur.

The electrical characteristics are within ±10 percent of the indicated values of ISC, VOC, and Pmax under standard test conditions (irradiance of 100 mW/cm2, AM 1.5 spectrum, and a cell temperature of 25°C (77°F)).

The installation shall be in accordance with CSA C22.1, Safety Standard for Electrical Installations, Canadian Electrical Code, Part I. Artificially concentrated sunlight shall not be directed on the module or panel.

5.3 Series

Photovoltaic modules are manufactured to support high voltages. The maximum voltage of the system is indicated on the label of the module's characteristics. Therefore, modules can be connected in series until that voltage is reached. Determined by the capacity of the system configuration. Maximum number of series (N)=Maximum System/Voc, and meets the voltage range of the MPPT of the inverter. Only modules with identical current characteristics must be connected in series.
Ex) with SR -320 EW (Max. System voltage is 1500 V) the maximum series modules configuration number should NEVER can exceed N= 32 (1500 V/46= 32.6).

5.4 CAUTION

The cable must not be bent or crushed on the direct exit of the cable screw joint and cable gland on box side. A minimum bending radius R≥5 x Cable outer diameter must be maintained. The cable must be routed in a way that the tensile stress on the conductor or connections is prevented.

Radius (R) > 5 x Cable Ø

The additional materials stress on cable is not allowed.

6.0 Commission and Maintenance

6.1 Bypass Diodes and Blocking Diodes

When a bypass diode is wired in parallel with the series string, the forced current will flow through the diode and bypass the shaded module, thereby minimizing module heating and array current losses. GIN series bypass diode rating is 20 A. Refer to appendix D for detail specification.
Blocking diodes should be installed in series with each module or series String to prevent possible back flow of energy through the module(s) when modules or strings are connected in parallel or used conjunction with a battery.

In system utilizing a battery, blocking diodes are typically placed between the battery and the module output to prevent battery discharge at night. The maximum overcurrent protective device rating for module is 15 A.
Diodes that are used as blocking diodes must: Have a Rated Average Forward Current [IF(AV)] above maximum system current at highest module operating temperature. Have a Rated Repetitive Peak Reverse Voltage [VRRM] above maximum system voltage at lowest module operating temperature.
Protect yourself from electricity shocks while debugging or maintaining the solar power system.

6.2 Testing, commissioning and troubleshooting

Test all electrical and electronic components of the system before using it. Follow the instruction in the guides supplied with the components and equipment.

Check the open-circuit voltage of every series module by a digital multi-meter. The measure values should correspond to the sun of the open-circuit voltage of the individual module.

Please refer to the relate voltage in the technical specifications of the type of the module used. If the measured value is significantly lower than the expected value, please proceed as described under "troubleshooting an excessively low voltage".

Check the short-circuit current of every series circuit. It can be measured directly by a digital multi-meter connected in the two terminals of a series circuit or module, or with any load such as PV illumination to make a rough measurement.

Under normal conditions, a PV module is likely to experience condition 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 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 PV output.

6.3 Troubleshooting Low Voltages

Identify the commonly low voltage and excessively low voltage and excessively low voltage. Commonly, the low voltage mentioned here is the decrease of open-circuit voltage of the module, which is caused by the temperature rising of solar cells or lower irradiance. Excessively low voltage is typically caused by improper connections at the terminals or defective bypass diodes.

- First, check all wiring connections at the terminals or defective bypass diodes.
- Next, check the open-circuit voltage of each module:
  1. Fully cover the modules with an opaque material.
  2. Discount the wiring at both terminals of the modules.
  3. Remove the opaque material from the module to be checked and measure the open-circuit voltage at its terminals.
  4. If the measured voltage is only half of the rate, this indicates a defective bypass diode.
- In the case of not very low irradiance, if the voltage across the terminals differs from the rated value by more than 5 percent, this indicates a bad electrical connection.

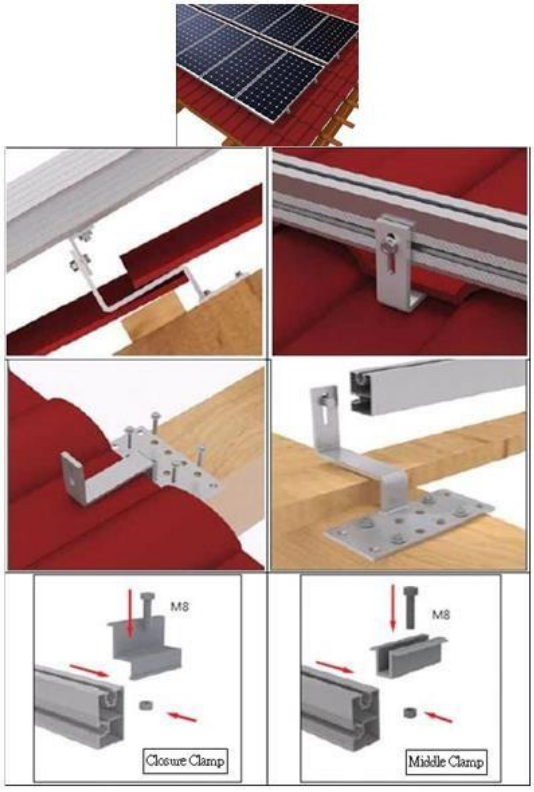
6.4 Maintenance

If the array has a sufficient tilt-it will generally not be necessary to clean the modules – the rain will usually do so. Dirt on the module surfaces causes cell shading and can lead to reduced power output. If necessary, clean the modules with plenty of water (using a hose) – without cleaning agents-circumstances should dirt be scraped or rubbed micro- scratches on the surface of the modules and reduce the transparency of the module glass. The system should be inspected regularly and the following items checked.

- All fasteners are secure, tight and free of corrosion.
- All electrical connections are secure, tight, clean, and free of corrosion.
- The mechanical integrity of the cables is intact.
- All bonding points to Earth Ground are tight, secure, and free of corrosion to ensure continuity between the modules and ground.

6.5 Safety Information

MAX SYSTEM VOLTAGE	**1500 VDC**
MAX SERIES FUSE RATINGS	**20 A**
IEC PROTECTION CLASS	**SAFETY CLASS II**
FIRE SAFETY CLASSIFICATION	**CLASS C**
IEC MAX SNOW TEST LOAD	**5400 N/m2**



7.0 Liability Limitation

SREW SRI RAGHAVENDRA™ ENGINEERING WORKS

SREW accepts no liability for the usability and functionality of its solar modules if the instructions in this guide are not followed. Since compliance with this guide and the conditions and methods of installation, operation, use and maintenance of the modules are not checked or monitored by SREW, accepts no liability for damage arising from improper use or incorrect installation, operation, use or maintenance. This does not apply to damages due to a module fault, in case of loss of life, bodily injury or damage to health or in the event of a grossly negligent breach of obligations on the part of SREW and/or in the event of an intentional or grossly negligent breach of obligations by a legal representative or vicarious agent. reserve the right to change the manual, the PV product, the specifications or product information sheets without prior notice.

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