MODULE INSTALLATION AND USER MANUAL - PERC AND MONO SERIES

MISSION SOLAR ENERGY™

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CONGRATULATIONS

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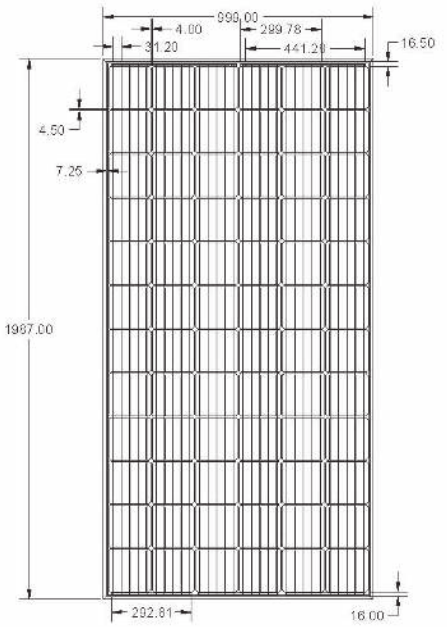
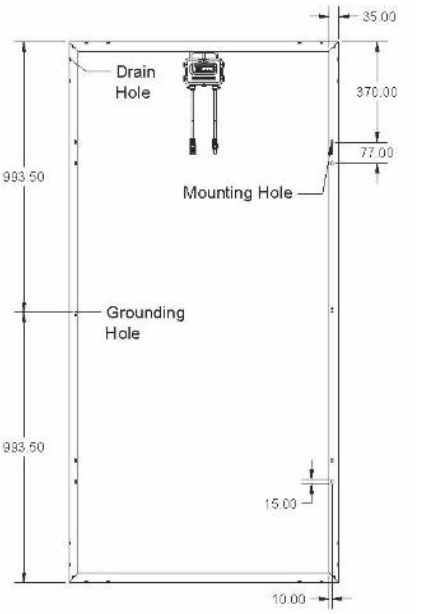
4.0 GENERAL INSTRUCTIONS

This manual provides important safety instructions regarding installation, maintenance and handling of Mission Solar Energy photovoltaic modules. All the users should read this manual carefully and follow the instructions strictly. The installation of solar modules requires specialized skills and experience and should only be performed by licensed professionals.

FIGURE 1: OVERVIEW OF MSE PERC / MONO 72

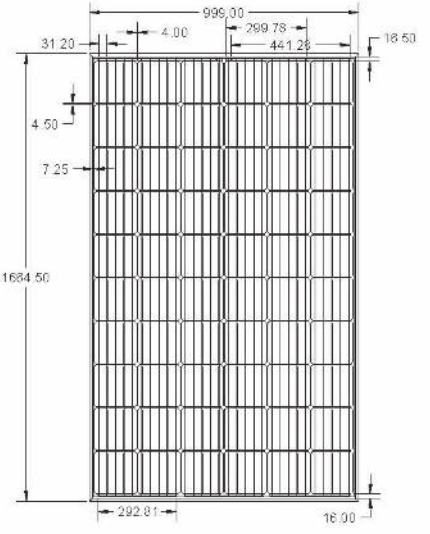


Front View

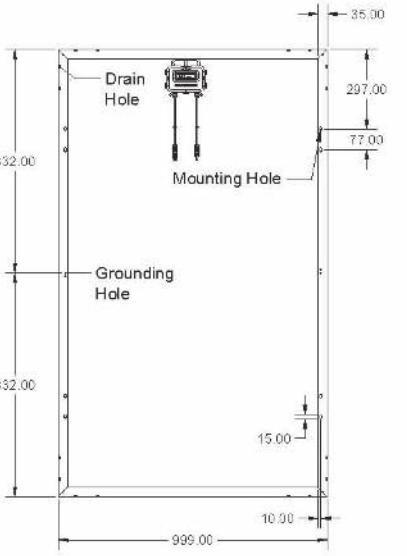


Back View

FIGURE 2: OVERVIEW OF MSE PERC 60 CELL



Front View



Back View

5.0 SAFETY

WARNING

5.1 GENERAL WARNING

You must understand and follow all applicable local, state, federal regulations in addition to standards for building construction, electrical design, fire, and safety. Check with local authorities to determine applicable permitting requirements before attempting to install or maintain PV modules.

- Module interconnects pass direct current (DC) when exposed to sunlight or other light sources.
- Contact with electrically active parts of the module, such as terminals, can result in injury or death, whether the module is connected or disconnected.
- Never wear metallic rings, watch bands, ear, nose or lip rings or other metallic devices when installing or trouble shooting a photovoltaic system

5.2 MECHANICAL

- Rooftop PV systems should only be installed on dwellings that have been formally analyzed for structural integrity, and confirmed to be capable of handling the additional weighted load of PV system components including PV modules by a certified building specialist or engineer. For your safety, do not attempt to work on a rooftop until safety precautions have been identified and taken, including without limitation fall protection measures, ladders or stairways, and personal protective equipment (PPE).
- For your safety, do not install or handle PV modules under adverse conditions, including and without limitation - strong or gusty winds and wet or frosted roof surfaces.
- The flat-plate PV module construction consists of a laminated assembly of solar cells encapsulated within a insulating material with a rigid glass surface and an insulated substrate. The laminated assembly is supported by an aluminum frame that is also used for mounting the module.

5.3 ELECTRICAL SHOCK HAZARD

- PV modules can produce current and voltage when exposed to light of any intensity. Electrical current increases with higher light intensity.
- DC voltage of 30 Volts or higher is potentially lethal. Contacting the live circuitry of a PV system operating under light can result in lethal electric shock.
- Use insulated tools and do not wear metallic jewelry while working with PV modules.
- In order to avoid arcing and electrical shock, do not disconnect electrical connections under load.
- Faulty connections can also result in arcing and electrical shock.
- Keep connectors dry, clean, and ensure that they are in proper working condition.
- Never insert metallic objects into the connectors, or modify them in any way in order to secure an electrical connection.
- Do not touch or handle PV modules with broken glass, separated frames or a damaged back sheet unless th PV modules are first disconnected and you are wearing proper PPE.
- Avoid handling PV modules when they are wet unless cleaning the PV modules as directed in this manual. **See 12.2 Cleaning.**
- Never touch electrical connections that are wet without protecting yourself with insulated gloves.
- Artificially concentrated light should not be directed on the module or panel.

5.4 FIRE

- Mission Solar Energy modules have a Type 1, Class C fire resistance rating in accordance with the IEC 61730 and UL 1703 standard.
- The fire rating of this module is valid only when mounted in the manner specified in the mechanical mounting instructions. **See 9.0 Mechanical Installation**
- PV modules are electricity generating devices that may affect the fire safety of a building.
- The use of improper installation methods and/or defective parts may result in the unexpected occurrence of an electrical arc during operation.
- The recommended standoff height is no less than 150mm (6 inches). If other mounting means are employed this may affect the fire class ratings. A minimum slope of 5in/ft. for installation over a roof is required to maintain the class C fire rating. Modules must be mounted over a fire resistant roof covering rated for the application.
- In order to mitigate the risk of fire in this event, PV modules should not be installed near flammable liquids, gases, or locations with hazardous materials.
- In the event of a fire, 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.
- In the event of fire, inform the fire crew about the particular hazards from the PV system, and stay away from all elements of the PV system during and after a fire until the necessary steps have been taken to make the PV system safe.

6.0 OPERATING CONDITIONS

6.1 TEMPERATURE

All the modules must be mounted in environments that ensure they operate within the following maximum and minimum operating temperatures.

- Maximum Operating Temperatures: +90°C (194°F)
- Minimum Operating Temperatures: -40°C (-40°F)

6.2 INSTALLATION CONDITIONS

Orient the module correctly. Mount the modules with the junction box in the uppermost position and hang the wires downwards to avoid the ingress of water. For optimal module performance install PV modules facing true south in northern latitudes and true north in southern latitudes. Shading will reduce electrical production. This installation is applicable when the module is in portrait orientation. The modules have been evaluated by UL standards for mounting using the recommended mounting positions.

Credit: Go Smart Solar

7.0 UNPACKING AND STORAGE

7.1 GENERAL INSTRUCTIONS

Store modules in an environment consistent with prudent solar industry practices, including, storage in dry conditions such that modules (or any part thereof) are not immersed in water.

Do not allow children or unauthorized persons near the installation site or storage area of modules.

Do not use forklifts with less than 72 inch forks to handle module pallet.

Unpack the module pallet with care and follow the unpacking steps in this manual. Be careful when unpacking, transporting and storing the modules.

Do not carry a module by its wires or junction box. At least two or more people are recommended to carry the module for safe handling.

Do not place modules directly on top of each other and prevent modules from touching one another.

Do not place excessive loads on the module or twist the module frame.

Do not stand, step, walk and/or jump on the module.

Do not carry the module above the head.

Do not drop or place objects such as tools on the modules.

Do not mark the modules with sharp instruments.

Particular attention should be taken to avoid module back sheet contact with sharp objects. Scratches may directly affect product safety.

Do not leave a module unsupported or unsecured.

Do not change the wiring of bypass diodes.

Keep all electrical contacts clean and dry.

7.2 UNPACKING

Prior to unpacking, ensure pallet is set on a level surface and proper PPE is equipped by all personnel. Proper PPE for unpacking includes but is not limited to eye protection, cut-resistant gloves, and steel-toe footwear.

Cut the two green strips of banding material with scissors. These strips are under high tension and will snap when cut. Eye protection is highly recommended.

Lift the pallet lid and set away from unpacking area.

Using a box cutter, carefully cut along the corner from the top to the middle of the box on the packing slip side. Ensure the blade stays on the outside of and does not cut through the white corner protectors.

After both corners have been cut, fold the lengthwise side of the box halfway down allowing easy access to the modules. Cut the internal banding material as well being careful to avoid contact with the modules.

Peel back sides of box to allow additional access to modules.

(Optional) Apply no-residue tape across the plastic corner clips to provide additional support to stack as modules are removed.

(Optional) Tape must reach at least 6 inches down on opposite side of box to maintain hold.

Remove white corner protectors.

7.2 UNPACKING

(Optional) If tape has been used to provide additional support to module stack, peel tape back as needed to remove individual modules.

The first module must be separated and pulled out with additional care so as to not scratch the modules. Continue removing modules by peeling back tape, moving the module forward, and pulling it up.

When four modules remain, the stack will inherently become prone to tipping over. At this point, ensure two personnel are available to secure the stack.

Slide the remaining modules to the front of the box.

Carefully lower modules down to a horizontal position with the glass side down.

Remove box sleeve allowing easy access to remaining modules from the horizontal stack.

8.0 PRODUCT ELECTRICAL SPECIFICATIONS

PV Modules have been certified for a maximum static load on the back of the module of up to 2400 Pa (i.e. wind load) and a maximum static load on the front of the module of up to either 2400 Pa or 5400 Pa (i.e. wind and snow load). For UL 1703 only, PV modules are tested to a front side and rear side applied load of 5631Pa. The performance of solar modules is defined on the uniform standard test conditions. These conditions define performance at an incident sunlight of 1000 W/m2, a cell temperature of 25°C (77°F) and an AM of 1.5 (AM = Air Mass). The air mass determines the radiation impact and the spectral combination of the light arriving on the earth's surface. Modules have been evaluated by UL for a maximum positive test load of 117.6 lbs/ft2 and negative test loading of 117.6 lbs/ft2.

Rated electrical characteristics (excluding the rated maximum power) are within 10 percent of measured values at Standard Test Conditions of: 1000 W/m2, 25°C cell temperature and solar spectral irradiance per ASTM E 892". Only rated maximum power is within -0/~3%.

TABLE 1: ELECTRICAL RATINGS OF MSE PERC 72 (4BB) MODULE SERIES

Model-P PERC Crystalline	Open Circuit Voltage at STC, (V dc)	Rated Voltage at STC, (V dc)	Maximum System Voltage, (V dc)	Rated Current at STC, (A dc)	Short-Circuit Current at STC, (A dc)	Rated Maximum Power at STC, (Watts)
MSE355SQ4S/ MSE355SQ6S	47.68	38.98	1000/1500	9.19	9.76	355
MSE360SQ4S/ MSE360SQ6S	48.08	38.28	1000/1500	9.28	9.79	360
MSE365SQ4S/ MSE365SQ6S	48.12	39.32	1000/1500	9.32	9.81	365

TABLE 2: ELECTRICAL RATINGS OF MSE PERC 60 (4BB) MODULE SERIES

Model-P PERC Crystalline	Open Circuit Voltage at STC, (V dc)	Rated Voltage at STC, (V dc)	Maximum System Voltage, (V dc)	Rated Current at STC, (A dc)	Short-Circuit Current at STC, (A dc)	Rated Maximum Power at STC, (Watts)
MSE290SQ5T	39.81	32.54	1000	8.95	9.44	290
MSE295SQ5T	40.11	32.72	1000	9.03	9.52	295
MSE300SQ5T	40.18	32.80	1000	9.17	9.61	300

TABLE 3: ELECTRICAL RATINGS OF MSE MONO 72 (4BB) MODULE SERIES

Model-P PERC Crystalline	Open Circuit Voltage at STC, (V dc)	Rated Voltage at STC, (V dc)	Maximum System Voltage, (V dc)	Rated Current at STC, (A dc)	Short-Circuit Current at STC, (A dc)	Rated Maximum Power at STC, (Watts)
MSE335SO4J/ MSE335SO6J	46.14	37.89	1000/1500	8.87	9.38	335
MSE340SO4J/ MSE340SO6J	46.35	38.02	1000/1500	8.95	9.49	340
MSE345SO4J/ MSE345SO6J	46.52	38.14	1000/1500	9.05	9.52	345

TABLE 4: ELECTRICAL RATINGS OF MSE PERC 72 (5BB) MODULE SERIES

Model-P Mono PERC	Open Circuit Voltage at STC, (V dc)	Rated Voltage at STC, (V dc)	Maximum System Voltage, (V dc)	Rated Current at STC, (A dc)	Short-Circuit Current at STC, (A dc)	Rated Maximum Power at STC, (Watts)
MSE370SQ9S / MSE370SQ7S	48.08 ± (0~+ 3%)	39.59 ± (0~+ 3%)	1500/1000	9.323 ± (0~+ 3%)	9.767 ± (0~+ 3%)	370.00 ± (0~+ 3%)
MSE375SQ9S / MSE375SQ7S	48.16 ± (0~+ 3%)	39.76 ± (0~+ 3%)	1500/1000	9.432 ± (0~+ 3%)	9.826 ± (0~+ 3%)	375.00 ± (0~+ 3%)
MSE380SQ9S / MSE380SQ7S	48.17 ± (0~+ 3%)	39.78 ± (0~+ 3%	1500/1000	9.552 ± (0~+ 3%)	9.904 ± (0~+ 3%)	380.00 ± (0~+ 3%)

TABLE 5: ELECTRICAL RATINGS OF MSE MONO 72 (5BB) MODULE SERIES

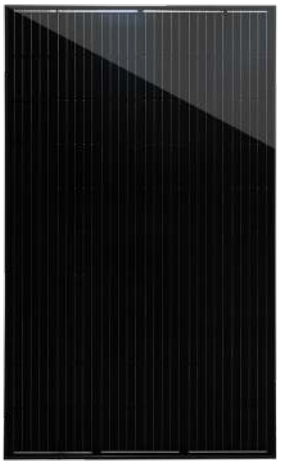
Model-P Mono normal	Open Circuit Voltage at STC, (V dc)	Rated Voltage at STC, (V dc)	Maximum System Voltage, (V dc)	Rated Current at STC, (A dc)	Short-Circuit Current at STC, (A dc)	Rated Maximum Power at STC, (Watts)
MSE340SO9J / MSE340SO7J	46.21 ± (0~+ 3%)	37.77 ± (0~+ 3%)	1500 / 1000	9.002 ± (0~+ 3%)	9.505 ± (0~+ 3%)	340.00 ± (0~+ 3%)
MSE345SO9J / MSE345SO7J	46.47 ± (0~+ 3%)	37.99 ± (0~+ 3%)	1500 / 1000	9.082 ± (0~+ 3%)	9.583 ± (0~+ 3%)	345.00 ± (0~+ 3%)
MSE350SO9J / MSE350SO7J	46.69 ± (0~+ 3%)	38.14 ± (0~+ 3%)	1500 / 1000	9.183 ± (0~+ 3%)	9.681 ± (0~+ 3%)	350.00 ± (0~+ 3%)

TABLE 6: ELECTRICAL RATINGS OF MSE PERC 60 PERC (5BB) ALL-BLACK MODULE SERIES

Model-P Mono PERC	Open Circuit Voltage at STC, (V dc)	Rated Voltage at STC, (V dc)	Maximum System Voltage, (V dc)	Rated Current at STC, (A dc)	Short-Circuit Current at STC, (A dc)	Rated Maximum Power at STC, (Watts)
MSE300SQ8T	40.08 ± (0~+ 3%)	33.12 ± (0~+ 3%)	1000	9.058 ± (0~+ 3%)	9.571 ± (0~+ 3%)	300.00 ± (0~+ 3%)
MSE305SQ8T	40.10 ± (0~+ 3%)	33.14 ± (0~+ 3%)	1000	9.202 ± (0~+ 3%)	9.664 ± (0~+ 3%)	305.00 ± (0~+ 3%)
MSE310SQ8T	40.12 ± (0~+ 3%)	33.17 ± (0~+ 3%)	1000	9.345 ± (0~+ 3%)	9.760 ± (0~+ 3%)	310.00 ± (0~+ 3%)

TABLE 7: ELECTRICAL RATINGS OF MSE PERC 60 (5BB) WHITE BACKSHEET MODULE SERIES

Model-P PERC Crystalline	Open Circuit Voltage at STC, (V dc)	Rated Voltage at STC, (V dc)	Maximum System Voltage, (V dc)	Rated Current at STC, (A dc)	Short-Circuit Current at STC, (A dc)	Rated Maximum Power at STC, (Watts)
MSE305SQ8K	39.96 ± (0~+ 3%)	33.02 ± (0~+ 3%)	1000	9.238 ± (0~+ 3%)	9.723 ± (0~+ 3%)	305.00 ± (0~+ 3%)
MSE310SQ8K	40.09± (0~+ 3%)	33.11 ± (0~+ 3%)	1000	9.362 ± (0~+ 3%)	9.819 ± (0~+ 3%)	310.00 ± (0~+ 3%)
MSE315SQ8K	40.13 ± (0~+ 3%)	33.28 ± (0~+ 3%)	1000	9.465 ± (0~+ 3%)	9.917 ± (0~+ 3%)	315.00 ± (0~+ 3%)



9.0 MECHANICAL INSTALLATION

The module is considered to be in compliance with IEC 61730 and UL 1703 only when the module is mounted in the manner specified by the mounting instructions below. We recommend using the following orientation to install the module. The maximum number of modules connected in series /parallel for MSE PERC 72 is 24/1 and maximum number of modules connected in series /parallel for MSE PERC 60 is 19/1.

Credit: Go Smart Solar

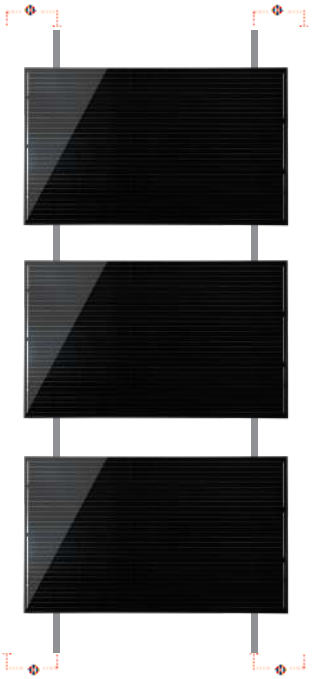


FIGURE 3: LANDSCAPE ORIENTATION
❖SEE A, B, OR C ON TABLE 9

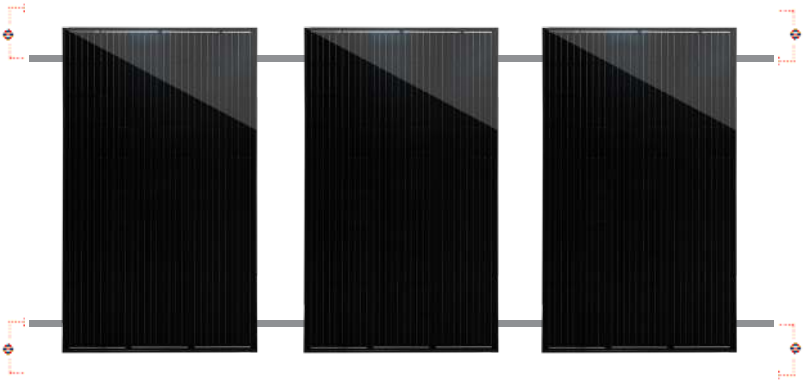


FIGURE 4: PORTRAIT ORIENTATION
❖SEE A, B, OR C ON TABLE 9

TABLE 9: SNOW & WIND LOAD AS SPECIFIED BY UL1703

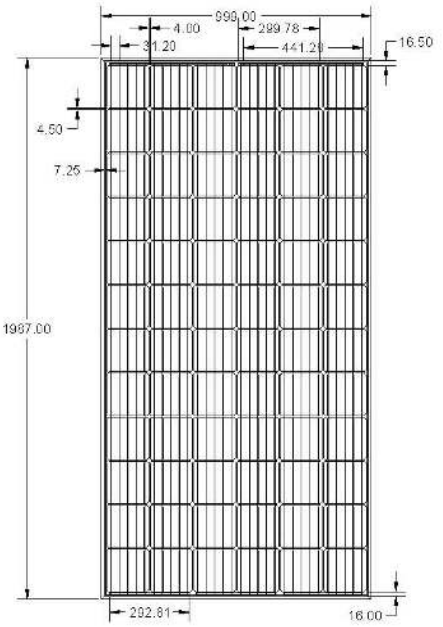
	*Mounting Distance [mm]	Maximum Front (Snow) Load [Pa]	Maximum Back (Wind) Load [Pa]
A	170 – 299	2400	2400
B	300 – 369	4300	3600
C	370 – 450	5600	5600

**Mounting Distance – distance between edge of module and middle of clamp location.*
This is assuming that modules are mounted on a certified railing system.

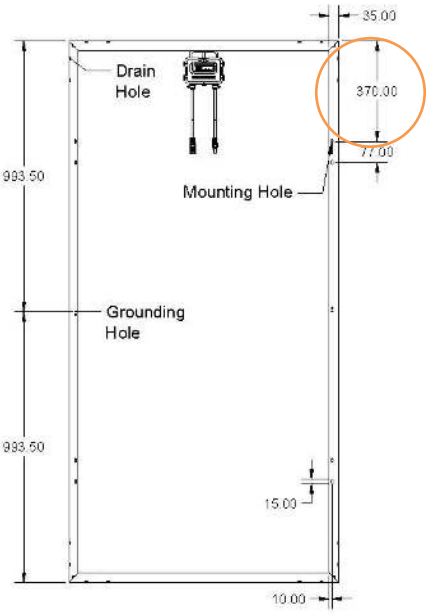
9.1 MOUNTING CLAMPS

Use the mounting holes as a reference - 297 mm (MSE PERC 60) or 370 mm (for MSE PERC 72) for mounting clamp location. **Make sure that the module is evenly between the two rails and sits perpendicular on the railing. If the module is not perpendicular, slightly adjust the end-clamp positions to get the proper alignment.**

MSE PERC 72 / MONO 72

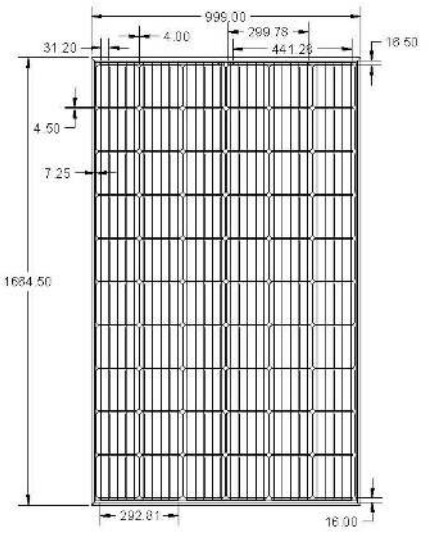


Front View

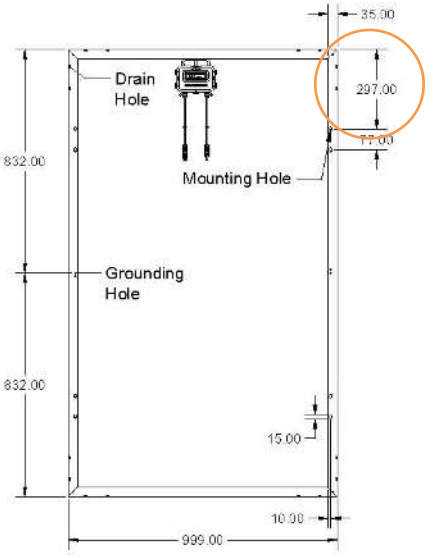


Back View

MSE PERC 60



Front View



Back View

10.0 GROUNDING INSTRUCTIONS

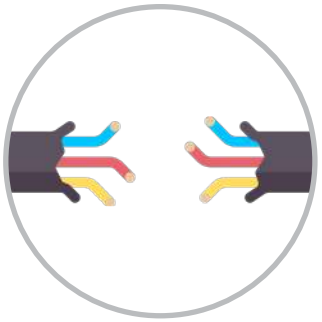
A module with exposed conductive parts is considered to be in compliance with UL 1703 and IEC 61730 only when it is electrically grounded in accordance with the instructions presented below and the requirements of the National Electric Code. To reduce the possibility of electrical shock, ground the frame of the module or array before wiring the circuit using a grounding method that meets NEC requirements for grounding solar electrical systems. In order to install, Mission Solar Energy modules shall be grounded using grounding hardware that has been certified to meet requirements for grounding systems in UL467, UL1703, or UL1741 on anodized aluminum frames. Mission Solar Energy recommends one of the following methods of grounding the module frame. Where common grounding hardware (nuts, bolts, star washers, spilt-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 for electrical conductivity. Such devices, where supplied with the module and evaluated through the requirements in UL 1703, may be used for grounding connections in accordance with the instructions provided with the module.

In addition to the grounding and/or mounting methods included in these instructions, this module may be grounded and/or mounted using the instructions provided with a racking system in compliance with UL Outline (Standard) 2703 where this module has been evaluated with that racking system.

11.0 ELECTRICAL INSTALLATION

11.1. LOCAL/NATIONAL CODE AND LOCAL REGULATIONS



To carry out installation, local regulations that may apply should be taken into account such as NEC (USA) or Canadian Electrical Code (Canada). Wiring should be performed by a qualified and licensed professional. Wiring should be protected to help ensure personal safety and to prevent damage. All modules connected in series should be of same model number and/or same type. Do not connect modules in parallel without using a combiner box or equivalent.

Under normal conditions, a photovoltaic module is likely to experience conditions that produce current and/or voltage other than reported at standard test conditions. The requirements of the National Electric 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 capacities, over current device ratings and the size of controls connected to the PV output.

11.2. WIRING

Mission Solar PV modules come with a factory assembled Junction Box. Do not open the junction box in any case. Wiring must be done in accordance with local/national code and regulations; wear protective gloves and shoes to avoid electric shock. Address the following recommendations.

- The modules combined in parallel will produce a specific current output. Each series string or module is required to be fused. Table 1 describes the maximum fuse size allowed.
- Do not connect the modules if the connectors are wet.
- Be sure to put the cables away from sharp edges
- If you need additional cables you must use exclusively solar cable of 12AWG/4mm² minimum cross-sections, with ability to work in a temperature range of at least -40° C and 90°C.
- Install the modules so that water from rain or condensation cannot penetrate inside the cable conduits.
- Fix cables to the structure so that the connectors are protected from water ingress. Cables should be held by UV resistant clamps or ties.
- To minimize possible effects of lightning induced voltages, the surface of all conductive loops must be as small as possible.
- Check that the wiring is correct before starting operating the installation by verifying that the open voltage is within expected values.
- Unprotected cables that could suffer mechanical damage must be protected.
- Avoid direct sunlight on cables.
- Maximum series fuse rating is 20A.
- Details for wiring in accordance with the NEC, and that the grounding method of the frame of arrays shall comply with the NEC, article 250.
- Installation shall be in accordance with CSA C22.1, Safety Standard for Electrical Installations, Canadian Electrical Code, and Part 1.
- Modules may be connected in series (voltage additive) and/or in parallel (current additive) to produce the appropriate electrical output. When connecting modules in parallel, each module (or series string of modules so connected) shall be connected according to the maximum series fuse as specified.
- Recommended series connection of module open circuit voltage should not exceed 80% limits range of the system voltage and the fuse should be connected at the end of each array.
- The installation instructions specify that grounding is achieved through securement to the array frame. The array frame must be grounded in accordance with NEC Article 250.

11.3. CONNECTORS

- Keep connectors dry and clean. Ensure that connector caps are hand-tight before connecting the modules.
- Do not attempt to make an electrical connection with wet, soiled, or otherwise faulty connectors.
- Avoid sunlight exposure and water immersion of the connectors. Avoid allowing connectors to rest on the ground.
- Ensure cable connectors are UL and Canadian code complaint.
- Faulty connections can result in arcs and electrical shock.
- Check that all electrical connections are securely fastened.
- Make sure that all locking connectors are fully engaged and locked.

11.4. DIODES

- The junction boxes used with Mission Solar Energy modules contain bypass diodes wired in parallel with the PV cell strings.
- In the case of partial shading, the diodes bypass the current generated by the non-shaded cells, thereby limiting modules heating and performance losses. Bypass diodes are not over-current protection devices.
- Bypass diodes divert current from the cell strings in the event of partial shading. In the event of a known or suspected diode failure, installers or maintenance providers should contact Mission Solar Energy.
- Never attempt to open the junction box.

12.0 MAINTENANCE

12.1. VISUAL INSPECTION

Mission Solar Energy recommends that PV systems be periodically inspected by the installer or other qualified personnel. The purpose of the PV system inspection is to ensure that all system components are functioning properly. At a minimum, this inspection should confirm the following:

- All cables and connector attachments are undamaged and properly secured.
- No sharp objects are in contact with the PV module surfaces.
- PV modules are not shaded by unwanted obstacles and/or foreign material.
- Mounting and grounding components are tightly secured with no corrosion.
- Defects should be addressed immediately.

12.2. CLEANING

- The dust accumulated on the front transparent substrate may reduce the power output, and may even cause regional hot-spot effect.
- It's usually not dangerous for the accumulated dust to reduce the sunshine because the light intensity is still homogeneous and power reduction is not usually obvious.
- When modules are installed avoid environmental influence factors that cast shadows and cover part or all of the modules. This includes other modules, system support, bird drops, dust, and so on. This debris may distinctly reduce the power output.
- The cleaning frequency depends on the accumulation frequency and can vary from 6 months - 2 years. Do not use alkaline, abrasive, alkali or acid materials, detergents, or cleaining solutions to clean the module.
- It is recommended to wipe the glass surface with a wet sponge or soft cloth. Please do not clean the glass with a cleaning agent which contains acid or alkali.

12.3. DISPOSAL

- For disposal, refer to local rules and regulations.

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