

Installation and Safety Manual

SOLON AG für Solartechnik SOLON Corporation

**P130/6+/01 (NA)
P130/6+/07 (NON-NA)
P180/6+/01 (NA)
P180/6+/07 (NON-NA)
P220/6+/01 (NA)
P220/6+/07 (NON-NA)
P250/6+/01 (NA)
P250/6+/07 (NON-NA)**

**M130/6+/01 (NA)
M130/6+/07 (NON-NA)
M180/6+/01 (NA)
M180/6+/07 (NON-NA)
M230/6+/01 (NA)
M230/6+/07 (NON-NA)**

**M230/6+/01
M230/6+/07**



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Read Me

Thank you for buying our SOLON photovoltaic (PV) modules. SOLON combines years of experience in photovoltaic module production and system integration with a commitment to bringing the benefits of solar electricity to people around the world.

The Solon module you have chosen is a highly efficient, extremely rugged, and is designed to provide the longest life span of any photovoltaic (PV) module in the industry.

This manual covers both types of modules - polycrystalline (P) and monocrystalline (M). Note that P220/6+/01 module consists of polycrystalline solar cells and M230/6+/01 module consists of monocrystalline solar cells.

Note only the P-series modules are UL-listed. The M-series modules are NOT UL-listed. Description of the manufacturing facility:

- T = SOLON CORPORATION ; Tucson
- G = SOLON NORD GmbH; Greifswald
- B = SOLON PV GmbH; Berlin
- S = SOLON Hilber Technologie GmbH; Steinach am Brenner

**Description of the manufacturing date:
01/01/07 = MM/DD/YY (January 01 2007)**

This manual describes the installation and maintenance instructions for the modules intended for use in North America (NA) and else with outside North America (NON NA). The modules include: P130/6+/01 (NA), P130/6+/07 (NON NA), P180/6+/01 (NA), P180/6+/07 (NON NA) P220/6+/01 (NA) P220/6+/07 (NON NA), P250/6+/01 (NA), P250/6+/07 (NON NA), M130/6+/01 (NA), M130/6+/07 (NON NA), M180/6+/01 (NA), M180/6+/07 (NON NA), M230/6+/01 (NA) and M230/6+/07 (NON NA), photovoltaic modules. Most of the instructions in this manual apply to all of the models. The full model number will be called out for instructions that apply exclusively to that model.

Before installing, wiring and using a module, it is important to thoroughly read this manual and understand the instructions. Installers must understand the basic principles of electricity and electrical apparatuses as well as article 690 of the National Electrical Code. Special attention must be given to the safety instructions.

Disclaimer of Liability

Since the use of this Safety and Installation Manual and the conditions or methods of installation, operation, use and maintenance of the module are beyond the control of SOLON, SOLON does not assume responsibility and expressly disclaims liability for loss, damage injury or expense arising out of or in any connected with such installation operation, use or maintenance of the module.

SOLON AG fur Solartechnik assumes no responsibility for infringement of patents or other rights of third parties which may result from use of the module. No license is granted by implication or otherwise under any patent or patent rights. The information in this Manual is based on SOLON's knowledge and experience and is believed to be reliable; but such information including product specifications (without limitations) and suggestions do not constitute a warranty, expressed or implied. SOLON reserves the right to make changes to the product, specification or the Manual without prior notice.

Note: This document may be provided in multiple languages, if there is a conflict among versions, the **German** language version is dominate.

Important Safeguards/Warnings

Read this section carefully before installing, using, repairing or performing maintenance on the PV modules or the PV power system.

WARNING

- **Lethal voltages and/or shock hazard may be present in modules and arrays during sunlight hours, even at low light level. This hazard increases when multiple modules are connected together to provide higher system voltage or current levels. Dangerous voltages may also be present at night from connections to batteries and feedback from inverters or other parts of the system.**

SOLON modules should only be installed by qualified installers with adequate solar installation experience. You must comply with the standards and regulations applicable to PV installations, such as National Electrical Code (NEC) and other building codes, the grid operator's technical connection requirements, and trade association rules concerning accident prevention. Failure to comply can lead to significant personal injury and equipment damage.

Lethal voltages and/or shock hazard may be present in modules and arrays during sunlight hours, even at low light level. This hazard increases when multiple modules are connected together to provide higher system voltage or current levels. Dangerous voltages may also be present at night from connections to batteries and feedback from inverters or other parts of the system.

Underwriters Laboratories Information (U.S. Only)

Only SOLON P- series modules are UL 1703 listed. This UL standard covers flat-plate photovoltaic modules and panels intended for installation on or integral with buildings or to be freestanding (not attached to buildings), in accordance with the National Electrical Code (NFPA 70), appropriate Building Codes, and any other applicable Local Codes in the US.

Also, UL Listed SOLON P- -series modules are ratted class C and intended to be installed on “Class A” fire rated roofs, residential or commercial, per local codes in US.

For non-integral “Class C” modules, the assembly is to be mounted over a fire resistant roof covering rated for the application.

Under normal conditions, a photovoltaic module is likely to experience conditions that produce more current and/or voltage than reported at standard test conditions. Therefore, the values of Isc and Voc marked on this module must be sized according to section 690-8 of the National Electrical Code for all component voltage ratings, conductor ampacities, fuse sizes, and size of controls connected to PV output.

Use only UL Listed grounding lug (UL CCN KDER) supplied with the P- series modules. USE conductor cable of minimum 10 AWG and minimum 90°C temperature rating, which is also sunlight resistant rated, for modules and interconnect wiring that is exposed to weather as per NEC.

National Electrical Code (NEC)

The National Electrical Code (NEC) covers the installation of photovoltaic systems and must be adhered to when systems are designed and installed. Article 690, Solar Photovoltaic Systems, of the NEC applies to solar photovoltaic electrical energy systems including the array circuit(s), power conditioning unit(s) and controller(s) for such systems.

All wiring shall be in accordance with the NEC, and grounding method of the frame of arrays shall comply with the NEC, article 250.

IEC, TUV, USL/CNL

The SOLON AG modules are qualified per the European codes such as IEC 61215, Safety Class II and CE. Please consult SOLON AG website at www.solonag.com for more information.

All USL/CNL installations shall be in accordance with CSA C22.1, Safety Standard for Electrical Installations, Canadian Electrical Code, Part 1.

SOLON Module Electrical Characteristics

Model	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)	Maximum Series Fuse, (A)
P130/6+/01 120 Wp	21.9	17.6	600	6.9	7.5	120	15
P130/6+/07 120 Wp	21.9	17.6	860	6.9	7.5	120	15
P130/6+/01 125 Wp	22	17.9	600	7	7.6	125	15
P130/6+/07 125 Wp	22	17.9	860	7	7.6	125	15
P130/6+/01 130 Wp	22.2	18	600	7.3	7.8	130	15
P130/6+/07 130 Wp	22.2	18	860	7.3	7.8	130	15
P130/6+/01 135 Wp	22.4	18.1	600	7.55	7.95	135	15
P130/6+/07 135 Wp	22.4	18.1	860	7.55	7.95	135	15
P180/6+/01 165 Wp	30.4	24.6	600	6.7	7.4	165	15
P180/6+/07 165 Wp	30.4	24.6	860	6.7	7.4	165	15
P180/6+/01 170 Wp	30.5	24.8	600	6.9	7.5	170	15
P180/6+/07 170 Wp	30.5	24.8	860	6.9	7.5	170	15
P180/6+/01 175 Wp	30.6	24.9	600	7.1	7.7	175	15
P180/6+/07 175 Wp	30.6	24.9	860	7.1	7.7	175	15
P180/6+/01 180 Wp	30.7	25	600	7.3	7.8	180	15
P180/6+/07 180 Wp	30.7	25	860	7.3	7.8	180	15
P180/6+/01 185 Wp	30.9	25.3	600	7.4	7.9	185	15
P180/6+/07 185 Wp	30.9	25.3	860	7.4	7.9	185	15
P220/6+/01 200 Wp	36.5	29	600	6.9	7.5	200	15
P220/6+/07 200 Wp	36.5	29	860	6.9	7.5	200	15
P220/6+/01 205 Wp	36.6	29.3	600	7	7.6	205	15
P220/6+/07 205 Wp	36.6	29.3	860	7	7.6	205	15
P220/6+/01 210 Wp	36.7	29.6	600	7.1	7.7	210	15
P220/6+/07 210 Wp	36.7	29.6	860	7.1	7.7	210	15
P220/6+/01 215 Wp	36.8	29.9	600	7.2	7.75	215	15
P220/6+/07 215 Wp	36.8	29.9	860	7.2	7.75	215	15
P220/6+/01 220 Wp	37	30.1	600	7.35	7.8	220	15
P220/6+/07 220 Wp	37	30.1	860	7.35	7.8	220	15
P220/6+/01 225 Wp	37.3	30.2	600	7.4	7.95	225	15
P220/6+/07 225 Wp	37.3	30.2	860	7.4	7.95	225	15
P220/6+/01 230 Wp	37.45	30.35	600	7.6	8.1	230	15
P220/6+/07 230 Wp	37.45	30.35	860	7.6	8.1	230	15
P220/6+/01 235 Wp	36.85	29.4	600	8	8.65	235	15
P220/6+/07 235 Wp	36.85	29.4	860	8	8.65	235	15
P250/6+/01 250 Wp	40	33	600	7.6	8	250	15
P250/6+/07 250 Wp	40	33	860	7.6	8	250	15
P250/6+/01 255 Wp	40.5	33.3	600	7.65	8.1	255	15
P250/6+/07 255 Wp	40.5	33.3	860	7.65	8.1	255	15
P250/6+/01 260 Wp	41.5	33.7	600	7.7	8.2	260	15
P250/6+/07 260 Wp	41.5	33.7	860	7.7	8.2	260	15
P250/6+/01 265 Wp	42.1	34	600	7.75	8.25	265	15
P250/6+/07 265 Wp	42.1	34	860	7.75	8.25	265	15



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Model	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)	Maximum Series Fuse, (A)
P250/6+/01 270 Wp	42.6	34.35	600	7.8	8.3	270	15
P250/6+/07 270 Wp	42.6	34.35	860	7.8	8.3	270	15
P250/6+/01 275 Wp	43	34.75	600	7.9	8.4	275	15
P250/6+/07 275 Wp	43	34.75	860	7.9	8.4	275	15
P250/6+/01 280 Wp	44	35.1	600	8	8.45	280	15
P250/6+/07 280 Wp	44	35.1	860	8	8.45	280	15
P250/6+/01 285 Wp	44.9	35.65	600	8	8.5	285	15
P250/6+/07 285 Wp	44.9	35.65	860	8	8.5	285	15
P250/6+/01 290 Wp	45.2	36.15	600	8	8.65	290	15
P250/6+/07 290 Wp	45.2	36.15	860	8	8.65	290	15
M130/6+/01 130 Wp	21.5	16.7	600	7.85	8.6	130	15
M130/6+/07 130 Wp	21.5	16.7	860	7.85	8.6	130	15
M130/6+/01 135 Wp	21.6	17	600	7.95	8.7	135	15
M130/6+/07 135 Wp	21.6	17	860	7.95	8.7	135	15
M130/6+/01 140 Wp	21.9	17.55	600	8	8.7	140	15
Model	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)	Maximum Series Fuse, (A)
M130/6+/07 140 Wp	21.9	17.55	860	8	8.7	140	15
M130/6+/01 145 Wp	22	17.8	600	8.1	8.8	145	15
M130/6+/07 145 Wp	22	17.8	860	8.1	8.8	145	15
M180/6+/01 180 Wp	29.85	23.1	600	7.8	8.5	180	15
M180/6+/07 180 Wp	29.85	23.1	860	7.8	8.5	180	15
M180/6+/01 185 Wp	30.2	23.6	600	7.85	8.65	185	15
M180/6+/07 185 Wp	30.2	23.6	860	7.85	8.65	185	15
M180/6+/01 190 Wp	30.4	24.1	600	7.9	8.7	190	15
M180/6+/07 190 Wp	30.4	24.1	860	7.9	8.7	190	15
M180/6+/01 195 Wp	30.6	24.6	600	7.95	8.75	195	15
M180/6+/07 195 Wp	30.6	24.6	860	7.95	8.75	195	15
M180/6+/01 200 Wp	30.65	24.7	600	8.1	8.8	200	15
M180/6+/07 200 Wp	30.65	24.7	860	8.1	8.8	200	15
M230/6+/01 205 Wp	35.2	26.6	600	7.7	8.3	205	15
M230/6+/07 205 Wp	35.2	26.6	860	7.7	8.3	205	15
M230/6+/01 210 Wp	35.4	27.05	600	7.75	8.4	210	15
M230/6+/07 210 Wp	35.4	27.05	860	7.75	8.4	210	15
M230/6+/01 215 Wp	35.6	27.55	600	7.8	8.5	215	15
M230/6+/07 215 Wp	35.6	27.55	860	7.8	8.5	215	15
M230/6+/01 220 Wp	35.8	28.05	600	7.85	8.6	220	15
M230/6+/07 220 Wp	35.8	28.05	860	7.85	8.6	220	15
M230/6+/01 225 Wp	36	28.3	600	7.95	8.7	225	15
M230/6+/07 225 Wp	36	28.3	860	7.95	8.7	225	15
M230/6+/01 230 Wp	36.35	28.75	600	8.0	8.75	230	15
M230/6+/07 230 Wp	36.35	28.75	860	8.0	8.75	230	15
M230/6+/01 235 Wp	36.5	29.35	600	8.0	8.75	235	15



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Model	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)	Maximum Series Fuse, (A)
M230/6+/07 235 W _p	36.5	29.35	860	8.0	8.75	235	15
M230/6+/01 240 W _p	36.7	29.65	600	8.1	8.8	240	15
M230/6+/07 240 W _p	36.7	29.65	860	8.1	8.8	240	15

Module bypass diode type, voltage rating, current rating, and configuration of the diode

Module series	Total # of Diodes	Diodes # in Parallel for each string	Diode Manufacturer	Diode Type	Diode Ratings	
					(A)	(PIV)
P130/6+/01	4	2	Diotec	F1200D	12	200
P180/6+/01	6	2	Diotec	F1200D	12	200
P220/6+/01	6	2	Diotec	F1200D	12	200
P250/6+/01	6	2	Diotec	F1200D	12	200

NOTE

DO NOT attempt to open the diode housing or junction box located on the back side of any Solon module. There are no user serviceable parts inside.

SAFETY INSTRUCTIONS

Handling Safety

1. DO NOT drop, allow objects to fall on, or stand or step on modules.
2. DO NOT install during high winds.
3. Never leave a module unsupported or unsecured. If a module falls, the glass could break. A module with broken glass cannot be repaired and must not be used.
4. DO NOT disassemble the module, or remove any part installed by SOLON. Use modules for their intended use only and follow all manufacturers' instructions.
5. DO NOT attempt to remove snow or ice from the module.
6. DO NOT direct artificially concentrated sunlight on the module.

Installation Safety

1. DO NOT attempt to install or service any portion of the PV system unless you understand the electrical operation and are fully qualified to do so.

2. DO NOT drill holes in the frame or glass of the module. Doing so will void the warranty.
3. Have a fire extinguisher, and first aid kit when performing field work on all energized equipment where the system open circuit voltage is 30 volts or greater.
4. Since sparks may be produced, do not install module where flammable gases or vapours are present
5. DO NOT attempt to open the diode housing or junction box located on the back side of any Solon module. There are no user serviceable parts inside.
6. DO NOT work on modules when modules are wet. If a wet module is cracked or broken the full system voltage may be present.

Fire Safety

1. Refer to your local authority for guidelines and requirements of building or structural fire safety.
2. It may be necessary to use components such as earth ground fault circuit breakers, fuses and circuit breakers
3. Do not use modules near equipment or locations where flammable gasses can be generated or can collect.

Electrical Safety

1. Rated electrical characteristics are within ± 10 percent of the indicated values of I_{sc} , V_{oc} , P_{max} under Standard Test Conditions. (Irradiance of 100 W/cm, Am 1.5 spectrum and a cell temperature of 25°C (77°F).
2. Under normal conditions, a photovoltaic module may experience conditions that produce more current and/or voltage than reported at Standard Test Conditions. Accordingly, the values of I_{SC} and V_{OC} marked on UL Listed modules should be multiplied by a factor of 1.25 when determining component voltage ratings, conductor capacities, fuse sizes and size of controls connected to the module output. Refer to Sec. 690-8 of the National Electric Code for an additional multiplying factor of 125 percent (80 percent of rating) which may be applicable.
3. DO NOT wear jewellery when working on the modules.
4. A two-person team is to be used while performing field work on all energized equipment where the system open circuit voltage is 30 volts or greater.
5. Wear electrical insulating gloves rated at 1000 volts and suitable eye protection when working on systems where the system open circuit voltage is 30 volts or greater.
6. DO NOT touch terminals while the module is exposed to light without wearing electrical insulating gloves.
7. DO NOT use modules in systems that can exceed 600 volts open circuit under any combination of solar irradiation and ambient temperature.

8. **DO NOT** connect or disconnect a module unless the array string is open-circuited or all of the modules in the string are covered.

Mechanical Installation

Installation

NOTE

The maximum wind and snow loads on a module mounted in any position must not exceed a resultant surface load of 30lb/ft² over the module surface. Reference ASCE 7-95 for determining the proper wind and snow load calculations for each location. All installations should also be in accordance with local building codes and regulations. For proper structural design, it is recommended to retain the services of a structural engineer experienced with the installations of PV systems.

NOTE

It is the sole responsibility of the user and/or installer to verify that the module mounting system and mounting method are properly engineered and in accordance with local building codes and regulations.

Clearance Between Modules

A clearance of 6mm/.25" between modules is sufficient in most installations to accommodate thermal expansion. However, the appropriate clearance is dependent upon installation specific factors including the module mounting system, temperature at the site and the maximum operating temperature of the module. The maximum distance between modules should not exceed 12" based on using standard wiring.

Orientation, Tilt Angle & Shading

Photovoltaic modules generate maximum power when facing directly towards the sun. PV systems can track the sun or remain in a fixed tilt position. Tracking systems will produce more energy but are more costly and require more maintenance. PV systems are predominantly set at a tilt. The further North from the equator, the more tilt. Since applications and needs are different, consult a PV system integrator or use a commercially available software program to determine the expected energy output. The following chart may serve as a rule of thumb.

Site Latitude	Horizontal Tilt Angle
0-10	= 10 Degrees
11-20	= Latitude
21-30	= Latitude + 5~
31-40	= Latitude + 10~
41+	= Latitude + 15~

The following paragraphs list some other general rules of thumb:

It is not recommended to set the tilt angle below 10-15 degrees. Dirt tends to accumulate on modules installed at flatter angles and does not wash off as readily during rainfall. Dirt accumulation or any debris, even snowfall on the module will reduce its energy output.

Modules should be located in areas with an unobstructed view of the sun where they will receive maximum exposure of sunlight for the longest possible time during the day. Shadowing caused by buildings, trees, utility poles and other obstructions, significantly reduces the module energy output.

In systems that are configured with multiple rows of modules, the rows must be spaced far enough apart to minimize the impact of shading on other rows. This distance is dependent on the latitude and tilt angle at which the system is installed. The closer to the equator, requires a lower tilt angle and therefore the shorter this distance. The further from the equator, higher tilt angle and therefore the greater this distance needs to be. If there are questions regarding the optimum configuration in which to arrange, mount or wire the modules, obtain assistance from your SOLON dealer or distributor or retain the services of an engineer familiar with the proper design of PV systems.

Suggested Mounting Methods

The information in this section only suggests possible methods of securing the PV modules to a 'module mounting system.'

It is the sole responsibility of the user and/or installer to verify that the module mounting system and mounting method is properly engineered and is in accordance with local building codes and regulations.

Solon PV modules can be arranged in either landscape or portrait position on flat or sloped roofs or surfaces and at flat or tilted angles.

The modules shall be mounted so that the junction box shall be in the uppermost position to minimize the ingress of water.

NOTE

Always use caution when mounting a module on tilted angles or sloped roofs so the module does not slide out of position while attaching it to the module mounting system.

CAUTION

Never leave a module unsupported or unsecured. If a module falls, the glass could break. A module with broken glass cannot be repaired and must not be installed.



There are only two methods for mounting a SOLON Module:

Method 1 is to bolt the module frame flange directly to a module mounting system

Method 2 utilizes mounting clips to clamp the module frame to a module mounting system

Refer to Figure 2, Details A, B, and C for three examples of different methods using various hardware for attaching the PV module to the module mounting system.

Mounting Method 1 (Bolted)

The P and M series of SOLON modules have four mounting holes located on the back of the two longer flanges (See Figure 1).

Attachment of the module to the module mounting system must be made at all four holes using M6 or 1/4" bolts, nuts and lock washers. Use either galvanized or stainless steel hardware to mitigate corrosion. Torque to 15-20 ft-lbs (See Figure 2 Detail A).

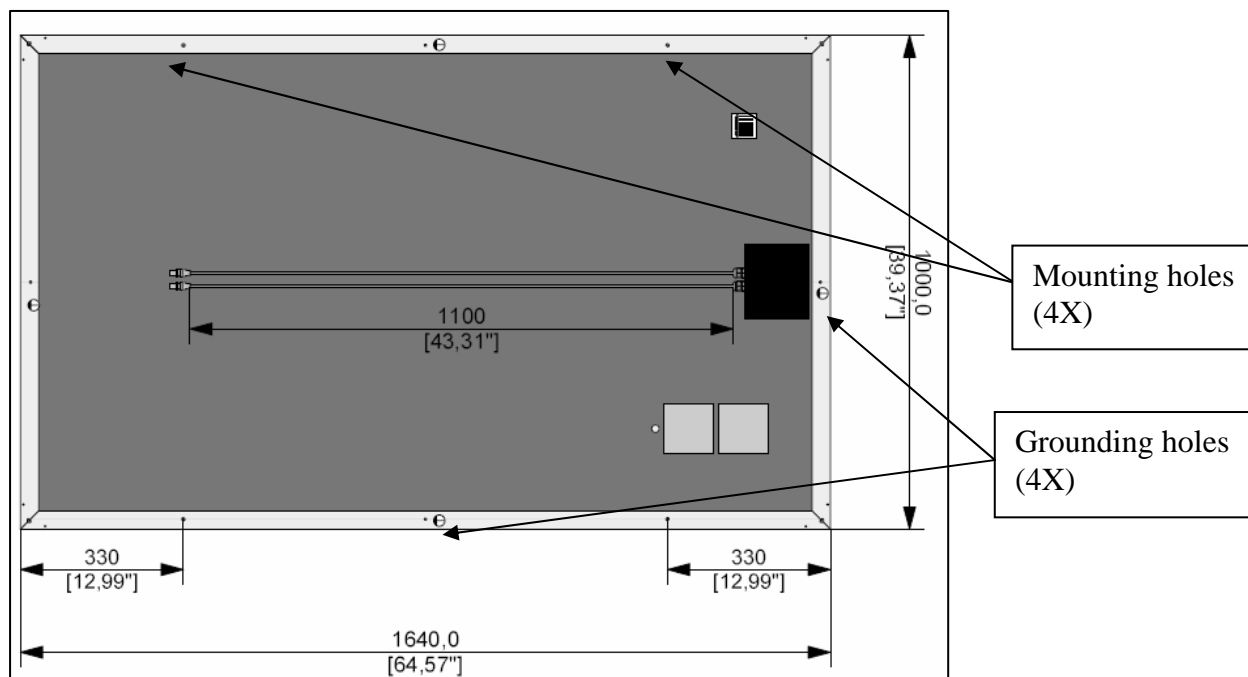


Figure 1: Mechanical Layout for P- and M- series module

NOTE

Under no circumstances may the short frame edges be used for anchoring the module.

Mounting Method 2 (Clamped)

You can ‘clamp’ the PV module frame to the module mounting system with mounting clips made by UniRac or equivalent. Attachment points of the module to the module mounting system should be made approximately at the same locations as the four mount holes in the module frame. These locations should not exceed 13” (330mm)+/-2” (51mm) from each end (See Figure 1). All hardware used should be M6 or 1/4” bolts, nuts and lock washers as required per application. Attachment must be made only at four positions. Use either galvanized or stainless steel hardware to mitigate corrosion. Torque to 12-15 ft-lbs (See Figure 2 Details B & C including mid-clip and end clip detail).

NOTE

Under no circumstances may the short frame edges be used for anchoring the module.

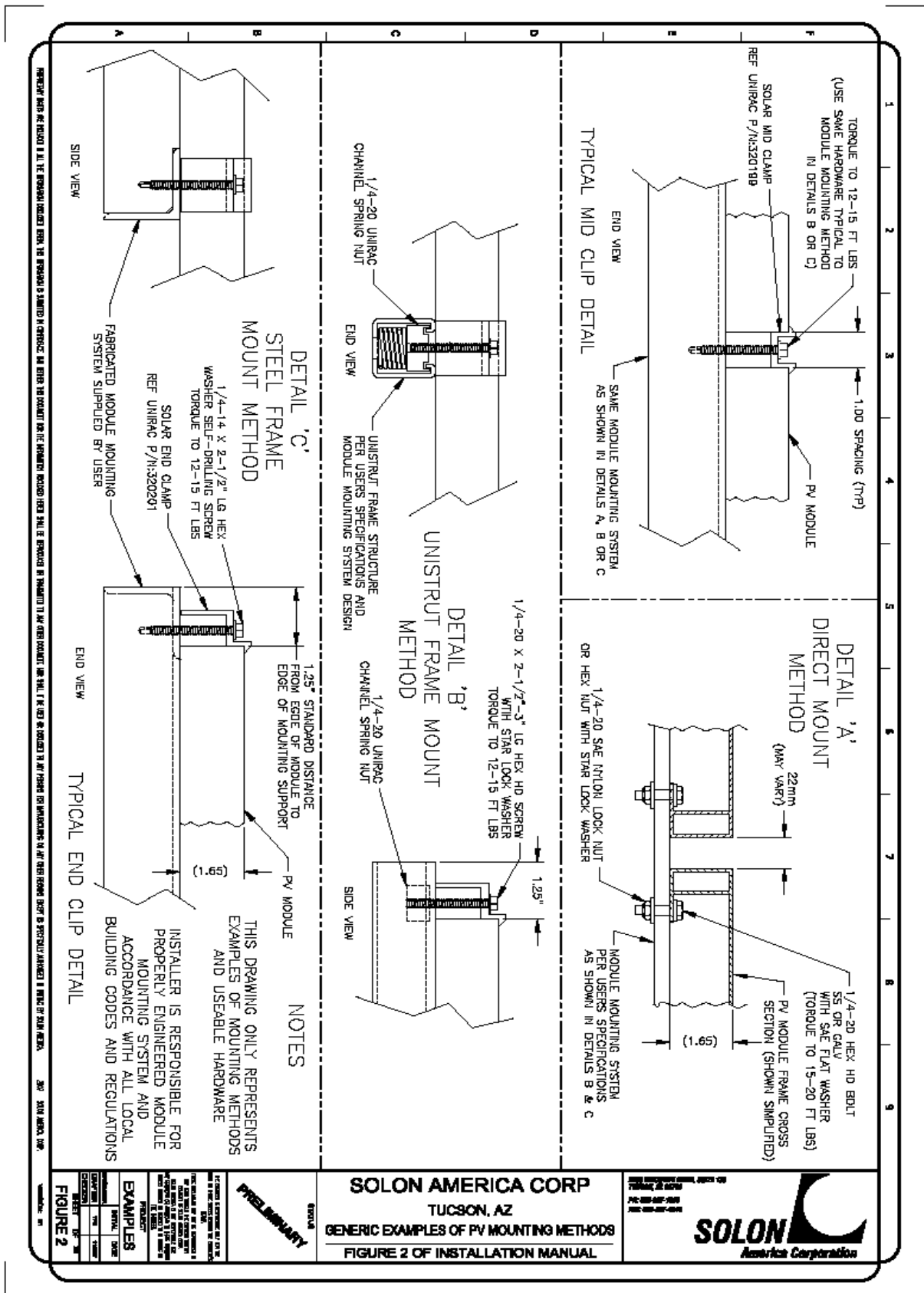


Figure 2: Examples of Attaching Modules



Module To Module Interconnection

SOLON P- and M- series modules have been designed to be easily interconnected. Each module comes with one positive (+) wire with a plug on one end and one negative (-) wire with a receptacle on one end. Both wires are connected inside of the junction box (diode housing). Modules are interconnected by inserting the plug from one module into the receptacle of the next module in the array string. Secure the mated connector pair to the inside flange of the module frame to protect it from damage.

Building Source Circuit and Configuring Modules

PV arrays are comprised of source circuits. A source circuit is a series of modules connected together to reach the desired power. The number of modules in a source circuit can vary depending on the module voltage and desired system voltage, provided the max system voltage does not exceed that allowed by NEC Section 690-7 (600 volts).

When calculating the system operational voltages use the module V_p . However, for NEC compliance, the maximum system voltage is calculated using V_{oc} .

When determining component voltage ratings, conductor ampacities, fuse sizes, and size of controls connected to PV output, use the values of I_{sc} and V_{oc} marked on the module or found in this instruction manual.

NOTE

Under normal conditions, a photovoltaic module is likely to experience conditions that produce more current and/or voltage than reported at standard test conditions. Accordingly, the values of I_{sc} and V_{oc} marked on this module must be multiplied by a factor of 1.25 when determining component voltage ratings, conductor ampacities, fuse sizes, and size of controls connected to PV output.

Refer to Section 690-8 of the National Electrical Code for an additional multiplying fraction of 125 percent (80 percent derating) which may be applicable.

CAUTION

DO NOT connect or disconnect a P- or M- series SOLON AG module unless the array string is open-circuited or all of the modules in the string are covered. The connectors are not designed to make or break the full system current.

CAUTION

Be aware that the artificially concentration sunlight shall not be directed on the modules or panels.

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)).

Module Grounding

The module frame must be properly grounded. The installer shall ground the frame using the grounding method described in NEC Article 250.

All USL/CNL installations shall be in accordance with CSA C22.1, Safety Standard for Electrical Installations, Canadian Electrical Code, Part 1.

The grounding wire must be properly fastened to the module using a ground bonding lug suitable for outdoor use such as GBL-4DBT tin coated copper lug. Company: ILSCO: UL number is E34440. An uncoated copper lug is not acceptable substitute.

Four grounding holes are provided on the inside of the module frame located in the middle of each of the four frame flanges. See Figure 3 for location of module grounding holes.

Grounding wire

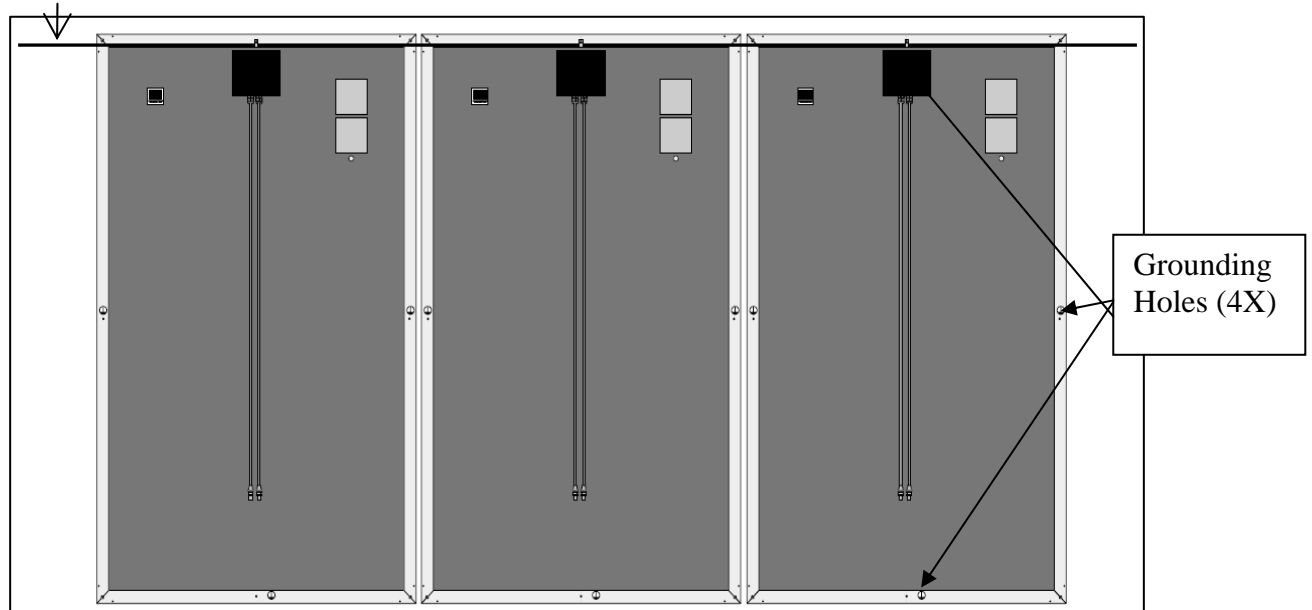


Figure 3: Grounding Hole Locations

See Figure 4 for installation of lug. Note that the star washers are required for making a reliable electrical earth connection with the anodized aluminium frame as well as to prevent losing of the screw over time.

To attach grounding lugs, use #8-32 (4mm) bolts and nuts, star washers, and lock washers are provided for use with module ground points. The ground lug shall be installed from the bottom side of the frame using the paint cutting star washers, lock washer and bolt. Torque hex bolt to 50-70 in-lbs. This ground hardware can accommodate a 14AWG through 4AWG bare (stranded or solid) wire.

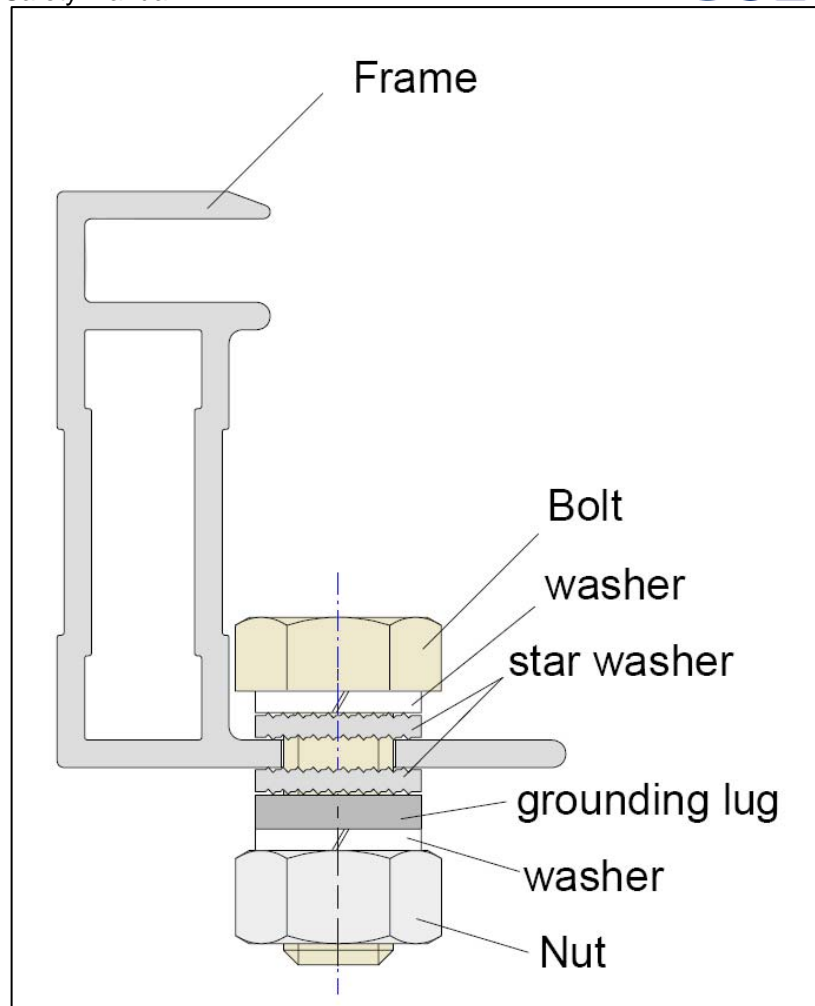


Figure 4:
Installation of the grounding lug

Use grounding lug GBL-4DBT (tin coated copper lug) from ILSCO Corp. (UL File # E34440, CCN - KDER). Attach this lug to module frame with a nut and bolt as shown in Figure 4.

For additional information, and for a list of local dealers and distributors, visit our website at www.solon.com or contact our factory at:

SOLON Corporation
6850 S. Country Club Road
Tucson, AZ. 85706
Phone: +1 (520) 807 1300
Fax: +1 (520) 807 4046

Mail: info@solonamerica.com



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SOLON AG für Solartechnik
Phone: 0049 (0) 818 79 100
Phone: +1 (520) 807 1300 (USA only)
Fax: +1 (520) 807 4046

Mail: info@solon.com

