



Manufactured by:
Moser Baer Photo Voltaic, India

Corporate Office:
43 B, Okhla Industrial Estate,
Phase III New Delhi 110020,
India.

Re-energizing the World!



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Installation and User Manual

Moser Baer Photo Voltaic Modules

Crystalline Silicon Modules

Max/Value - Series

Re-energizing the World!





PLEASE READ THIS MANUAL CAREFULLY BEFORE INSTALLING OR USING THE MODULES

This manual contains critical safety instructions for the PV module that must be followed during the installation and maintenance of PV modules. Failure to follow these instructions may result in bodily injury or damage to property. Working on a photovoltaic system requires specialized knowledge and should only be attempted by qualified professionals.

Introduction

Moser Baer is a world leader in development and high-volume- manufacturing of technology products. Our prime commitment is to produce quality products that last for many years. Moser Baer PV modules are designed for versatility in application and suited for residential, commercial and industrial applications.

The modules use high efficiency Multi Crystalline silicon solar cells; high transmittivity, low iron content, tempered and toughened glass; and premium quality encapsulation materials having superior UV and thermal properties.

Laminates are framed in anodized aluminium frames and come along with a permanently attached junction box with a 12AWG cable terminated in connectors.

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voltage ratings, conductor ampacity, fuse sizes and size of controls connected to the module output.

- " Refer to Section 690-8 of the National Electric Code for an additional multiplying factor of 125% (80% derating) which may be applicable.
- " The electrical characteristics are within ± 10 percent of the individual values of I_{sc} , V_{oc} & P_{max} under standard test conditions (irradiance of 100 mW/cm², AM 1.5 spectrum & a cell temperature of 25°C (77°F)).

6 PRODUCT IDENTIFICATION

1. Each module has a name plate/label on its rear side detailing product type, rated power, rated voltage, open circuit voltage, short circuit current all as measured under Standard test condition (STC), weight, maximum fuse rating etc.
2. Each individual module has a unique identification vide a 15 digit alpha numeric code which is bar coded and the label is permanently affixed on the interior of the module before lamination, visible on the front side of the module.
3. The code is typically "MB XX X XXX XX XX XXX". The date of manufacture of the product can be deciphered from the 6th, 7th and 8th digit - day of the year and the 9th and 10th digit - the year code.

7 DISCLAIMER OF LIABILITY

The information in this manual is based on Moser Baer's knowledge and experience and is believed to be reliable, but does not constitute a warranty expressed or implied. Moser Baer Photo Voltaic does not assume responsibility & expressly disclaims liability for loss, damage, or expense arising out of, or in any way connected with installation, operation, use, or maintenance of PV modules as per this manual. No responsibility is assumed by Moser Baer Photo voltaic for any infringement of patents or other rights of third parties that may result from use of PV modules. No license is granted by implication or under any patent or patent rights.

Moser Baer Photo Voltaic reserves the right to change the manual, the specifications or product information sheets without prior notice.





Installation and User Manual

Moser Baer Photo Voltaic Modules

Crystalline Silicon Modules

Max Series - "CAAP"

**Value Series - "AHFP", "BAAP", "BCAP",
"BDAP", "BGFP"**



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Installation and User manual Moser Baer Max/value Series Photovoltaic Modules

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1 WARNING NOTICE

Hazardous electricity ! Can shock burn or cause death.



1.1 General Safety

1. Photovoltaic modules can generate electricity upon exposure to light. The voltage of a single module is less than 45VDC, but the shock hazard increases as modules are connected in parallel producing higher current. The shock hazard increases as modules are connected in series producing higher voltages.
2. All instructions should be read and understood before attempting to install, wire, operate, and maintain the photovoltaic module. Contact with electrically active parts of the module such as terminals can result in burns, sparks, and lethal shock whether the module is connected or disconnected.
3. Do not disconnect the connector of the modules while under load. To achieve disconnect while under load, a provision of High Voltage Slow Blow DC Fuse or High Voltage DC MCB should be provided in the Array Junction Box.



1.2 Handling Safety

1. To avoid the hazard of electric shock and injury, cover the entire front surface of the PV modules with a dense, opaque material such as a cardboard sheet, during installation and handling of the modules.
2. Do not hit or put excessive loads on the glass or back sheet or twist the frame, the glass may break, PV cells may break.
3. Do not stand or step on the PV module, the glass may be slippery and there is a risk of injury or electric shock if glass breaks.
4. PV modules are heavy , please handle with care. Do not drop or allow objects to fall on the PV module.
5. Do not twist the interconnect cable excessively
6. Unauthorized persons-except the qualified licensed professional--should not open the cover of the junction box to avoid the hazard of electric shock. Provide suitable guards to prevent yourself from direct contact with 30 VDC or greater to



avoid the hazard of electric shock or injury.

7. When carrying a module, two or more people should carry it by its frame and wear non-slip gloves (to avoid injury by a slipping module, to a foot, or cuts by the edge of a frame, and so on).
8. Do not lift the modules by grasping the module junction box or electrical cables.

1.3 Installation Safety:

1. All PV modules shall be installed in accordance with applicable codes and regulations, including but not limited in USA to National Electrical Code (NEC) and in Canada in accordance with CSA C22.1, Safety standard for electric installation, Canadian electrical Code (CEC).
2. Only PV modules with the same cell type and size should be connected in series
3. Follow all safety instructions of other components used in the system
4. Avoid uneven shade on the PV module surface .Shaded cells may become hot (hot spot phenomenon) which may result in permanent damage to the module.
5. Do not drill holes in the frame, it may compromise the frame strength and cause corrosion of the frame also void the warranty.
6. To avoid the hazard of electric shock, work only under dry conditions, with dry modules and tools.
7. Do not puncture or damage the back-sheet of a module, to avoid the hazard of electric shock and fire.
8. To avoid the hazard of electric shock and injury, be sure to completely ground all modules & do not disassemble the module, or remove any part installed by the manufacturer.
9. Since sparks may occur, do not install the module where flammable gases or vapors are present.
10. Never leave a module unsupported or unsecured.
11. Do not use mirrors or other magnification device to artificially concentrate sunlight onto the modules.

12. Do not change the connection of bypass diodes to avoid the hazard of electric shock and injury.
13. Max/Value - Series of modules qualified for Application class A

2 MECHANICAL INSTALLATION

2.1 Site Selection:

1. PV modules are intended for outdoor use only and should be installed in a location where they will receive maximum sunlight throughout the year.
2. In Northern latitudes, the modules would normally face true south & in the Southern Latitudes, the modules should face north for optimum power output
3. Avoid trees, buildings or obstructions which could cast shadows on the solar modules especially during the winter months when the arc of the sun is lowest over the horizon.
4. Solar modules produce maximum power when they are pointed directly at the sun.
5. For installations where the solar modules are mounted to a permanent structure, the solar modules should be tilted for optimum winter performance.

2.2 Tilt Angle Selection :

More sunlight per square foot falls on a perpendicular surface (90 deg to the sun's ray is optimal). Less sunlight falls on a vertical surface & horizontal surface.

The module tilt angle is measured between the solar modules and the ground

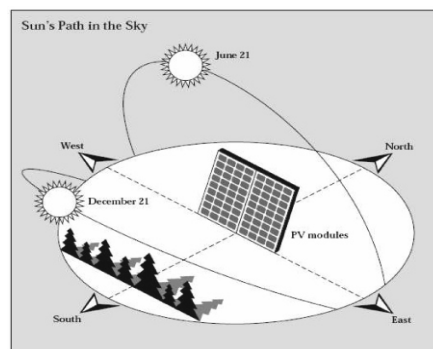
Tilt angle Table:

Site Latitude in Degrees	0° to 15°	15° to 25°	25° to 30°	30° to 35°	35° to 40°	40°
Fixed tilt angle	15°	same as latitude	latitude + 5°	latitude + 5°	latitude + 5°	latitude + 5°



Sun Arc Table:

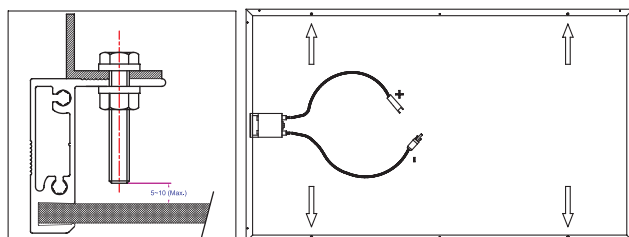
Latitude	10°	15°	20°	25°	30°	35°	40°	45°
Summer	12.71°	13.02°	13.34°	13.7°	14.08°	14.54°	15.02°	16.62°
Winter	11.54°	11.24°	10.92°	10.58°	10.21°	9.80°	9.33°	8.76°



2.3 Mounting Installation:

General Installation

1. Place the modules on top of the structure & mount it by using the pre-drilled elliptical mounting holes as shown below & fix it firmly on the structure using the mounting hardware`s (M4 nuts & Bolts).
2. Always select the length of mounting screw after considering a clearance of 5-10 mm between the module back face & screw face to avoid any breakage of module while tightening (as shown below).



Installation with Long side frame		
Bolting		
Clamping		



3. The support module mounting structure must be made of durable , corrosion resistant and UV resistant material.
4. Modules should be firmly fixed in place in a manner suitable to withstand all expected loads, including wind & snow loads. Determine wind loads for the installation site & consult it from safety departments for the specific requirements.
5. All hardware like bolts, nuts & washers should be of stainless steel so as to eliminate the possibility of rust.
6. The Open circuit Voltage exceeds the rated voltage. Take care that the open circuit voltage multiplied by the number of modules in series is not higher than the Max. system voltage (IEC-1000V/ UL 600V)
7. Module mounting must use the pre-drilled mounting holes in the frame.
8. Do not drill additional mounting holes on the frame & glass surface of the module. Doing so will void the warranty

Ground Mount



1. Select the lowest height of the structure to prevent the lowest height of the module from being covered by snow for a long time in winter.

2. In addition ensure that the lowest portion of the module is placed high enough so that it is not shaded by trees or plants and not damaged by sand or stone driven by wind.
3. The supporting frame/structure is used to mount modules at correct tilt angles.
4. Clearance between the modules frame & the mounting surface is required to prevent the junction box from touching the surface & to allow cooling air to circulate around the back of the module. This also allows any condensation or moisture to dissipate.

Roof Mount(Tilt Roof/Wall Installation)



1. Roof mounted PV modules should be mounted on a fire resistant roof.
2. Installation should be carried out in calm winds to prevent accident due to fall.
3. Special construction or structures may be required to help provide proper installation.
4. Both roof construction and module installation design have an effect on the fire resistance of a building. Improper installation may contribute to fire hazards.



Additional devices such as ground fault, fuses, and disconnects may be required.

5. Make sure that roof structure can support the installation load and might require service of professional installers.
6. The modules should never be sealed to the mounting surface with sealant that prevents the junction box from touching the surface & air from circulating under the module. Leave atleast 4 inches of clearance between the roof & the module frame.
7. Module need to be securely mounted on fire resistant roof & slope less than 5 in/ft. (127mm/305mm) required to maintain a fire class C.

Pole Mount



Choose a pole and module mounting structure that will withstand the expected snow and wind Loads

3 ELECTRICAL INSTALLATION

Several modules are connected in series and then in parallel to form a PV array, especially for application with a high operating voltage.

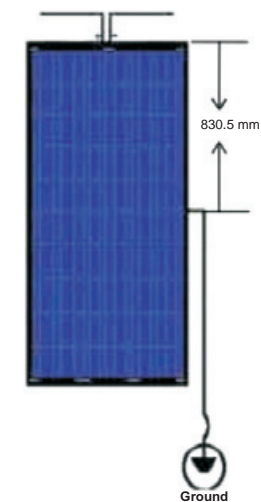
The DC electrical energy from a PV module may be also be converted to AC and connected to a utility grid system. As local policies on connecting renewable energy systems to a grid may vary from region to region, please consult a qualified system designer or integrator to design such a system. Permits are normally required to install such a system and the utility must formally inspect and approve such a system before it is connected to the grid.

3.1 Grounding

The module frame must be properly grounded to avoid the hazards of electric shock or fire.

Grounding Systems for MBPV Modules

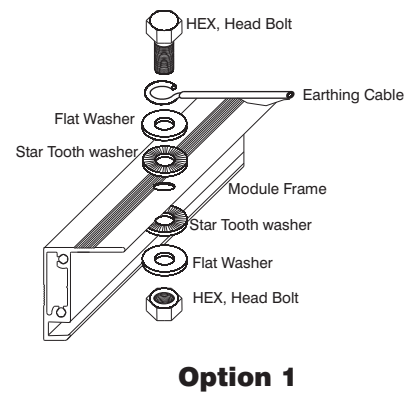
- MBPV array frame is ground in accordance with NEC Article 250 (USA) or CEC (Canada)
- Each framed module has two grounding holes in the longer side frame rail, to connect a grounding conductor to the module metal frame





► Option 1

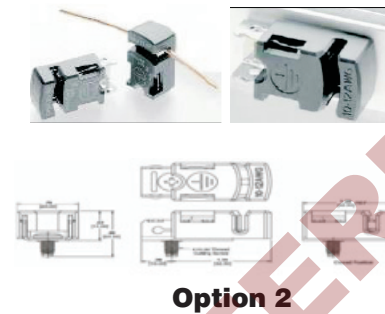
The grounding will be provided by fixing earthing cable with Hex Nut, Star Tooth Washer, Flat Washer and Hex Head Bolt as shown in the below picture. All the above mentioned grounding hardware should be of stainless steel to prevent the corrosion



► Option 2

Attach all module to an earth ground using the 'Solkclip' ground clip (manufactured by TYCO). Attach the 'Solkclip' ground clip to one of the grounding holes on the module frame with a screw and bonding or external tooth washer"

If functional grounding is used (i.e. grounding plus of minus), such grounding means should be isolated from live parts by reinforced insulation

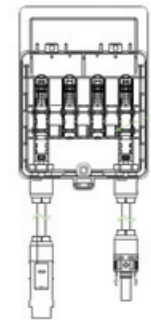


Cable

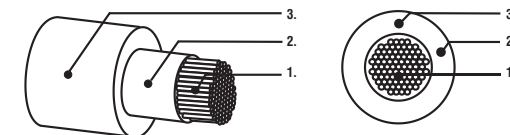
Use uncoated, stranded copper in the 10, 12 and 14 AWG wire sizes

3.3 General Installation

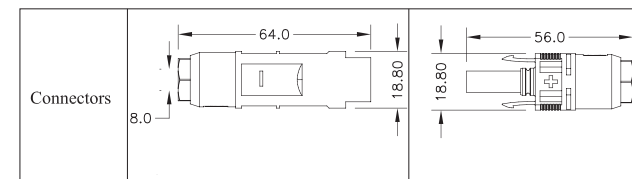
1. The facility electrical ground system must efficiently dissipates lightning surge energy that may arrive via down conductors of the lightning protection system and be electrically and mechanically robust to assure performance over the "life" off the facility.



(Type USE-2, rated 90°C wet or dry, 1000V 12AWG 4mm² double insulated, halogen free UV resistant solar cables Resistance to UV, water, ozone, fluids, salt and against general weathering, Resistance to abrasion.



1. Conductor: Standard tin plated copper No./Dia 56x0.30mm Dia. of conductor: ϕ 2.56mm
2. Insulation: Electron beam cross-linked polyolefin, colour: Natural
3. Sheath: Electron beam cross-linked polyolefin, halogen: free, Outer Dia ϕ 6.2 \pm 0.3 mm color: Black
4. Temperature Rating: -40°C to +125°C
5. Following Sunlight resistant connectors should be used for field wiring.



2. All wiring should be done in accordance with applicable electrical codes.



3. Wiring methods should be in accordance with the electrical standards & norms of the country in which the modules are being installed.
4. Wiring should be done only by a qualified & certified professional.
5. Do not cut the connectors or crimp any other thimble on module wiring (Doing so will void the warranty).
6. The junction box, present on the back side of the module is designed to be used with standard wiring or conduit connections.
7. The junction box has a breather port and the breather port must not be exposed to direct rain/water. Hence the Junction box should be mounted on the higher side of the module when mounted with the cable outlet pointing downward, preferably.
8. The maximum electrical rating of an acceptable series fuse is 7.5 A (modules with 5" cell) & 10 A (for module with 6" cell).
9. Keep in mind to follow the applicable codes for outdoor installation of wires in conduits. Verify that all fittings are properly installed to protect wire against damage & prevent moisture intrusion.
10. Number of module in series connection should not increase such that voltage generated is beyond system voltage.
11. Blocking Diodes ;Blocking diodes can prevent night time battery discharging and also prevent modules from loss of array output and damage by reverse current flow. Moser Baer PV modules do not contain blocking diodes when shipped from the factory however most battery charge regulators do have this feature.
12. By Pass Diodes ; In systems with modules in series strings, high reverse current can flow through cells that are shaded partially or when part of a module is shaded and rest is exposed to the sun. These currents can cause affected cells to heat up (hot spot phenomenon) and even damage the module.To protect modules from high reverse currents bypass diodes are provided in the junction box (factory fitted). Diode rating -12A,200V

4 MAINTENANCE

Moser Baer Photovoltaic modules require very little maintenance, following is recommended to ensure optimum performance.

1. In view of the tilt angle of the PV modules , normal rainfall is sufficient to keep the module glass surface clean in most weather conditions. However, if dirt build up becomes excessive, clean the glass surface only with a soft cloth or sponge using water.
2. A mild non abrasive cleaning agent can be used for stubborn dirt. Do not use high pressure water spray or chemicals to clean the module.
3. In order to ensure proper operation, please check all wiring connections, condition of the insulation and mechanical connections every six months.
4. Observe the maintenance instructions of all components used in the systems such as support frames, inverters, battery and charge controller etc

5 MODULE SPECIFICATIONS

(Typical Electrical Parameters)	Unit	AHFP	BAAP	BCAP	BDAP	BGFP
Nominal Power at STC, Pmax	[W]	75	100	120	130	170
Power tolerance at STC (min / max)	%			±3%		
Voltage at Pmax, Vmp	[V]	17.2	22.93	17.4	28.5	36.5
Current at Pmax, Imp	[A]	4.51	4.51	7.12	4.64	4.7
Open circuit voltage, Voc	[V]	21.78	29.04	21.5	36.05	43.26
Short Circuit Current, Isc	[A]	4.8	4.8	7.6	5.05	5.1
NOCT	(±2)°C	47	47	47	47	47
Maximum System Voltage (IEC/UL)	V DC	1000/600				
Temperature Coefficient of Pmax	%/K	-0.43				
Temperature Coefficient of Voc	%/K	-0.344				
Temperature Coefficient of Isc	%/K	0.11				
IP Protection Level		IP 65				
Absolute Maximum Rating						
Operating Temperature	°C	-40 to +85				
Mechanical Parameters						
Cell Type	mm	Multi Crystalline Cells				
Cell Size	Inch	5	5	6	5	5
No. of Cells (Matrix)	nos	36	48	36	60	72
Module Overall Dimensions (A)	mm	839	1095	1027	1353	1606
Module Overall Dimensions (B)	mm	810	813	999	813	806
Module Overall Dimensions (C)	mm	40	40	40	40	40
Weight (Approx)	kg	7.5	10	11.5	13.3	15
Maximum Wind Load (Static load front & back {e.g. wind})	Pa	2400 (50 lbs/ft²)				
Resistance against Hail (Hailstone Impact)		25 mm ice ball at 23 m/s at 11 impact location				
Max series Fuse	Amp	7.5	7.5	10	7.5	7.5

Note: STC : Irradiance 1000 W/m² , cell Temperature at 25°C & AM 1.5 spectrum

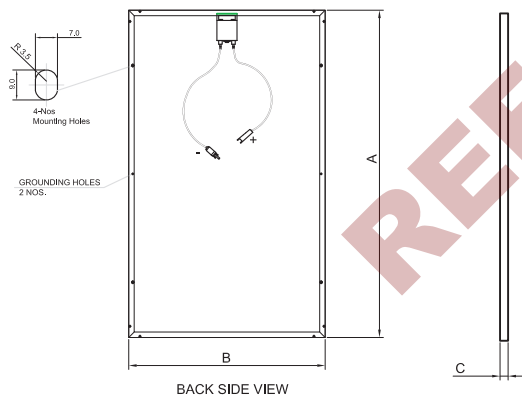
- Module available in each category are within ± 10% power range.

- Refer product data sheet of particular category of module on Moser Baer web site for detailed information.

(Typical Electrical Parameters)	Unit	CAAP					
Nominal Power at STC, Pmax	[W]	180	190	200	210	220	230
Power tolerance at STC (min / max)	%			±3%			
Voltage at Pmax, Vmp	[V]	26.95	27.94	28.78	29.37	30.35	30.91
Current at Pmax, Imp	[A]	6.68	6.8	6.95	7.15	7.25	7.44
Open circuit voltage, Voc	[V]	36.1	36.18	36.25	36.36	36.52	36.83
Short Circuit Current, Isc	[A]	7.55	7.65	7.7	7.74	7.84	7.95
NOCT	(±2)°C	47±2					
Maximum System Voltage (IEC/UL)	V DC	1000/600					
Temperature Coefficient of Pmax	%/K	-0.43					
Temperature Coefficient of Voc	%/K	-0.344					
Temperature Coefficient of Isc	%/K	0.11					
IP Protection Level		IP 65					
Absolute Maximum Rating							
Operating Temperature	°C	-40 to +85					
Mechanical Parameters							
Cell Type	mm	Multi Crystalline Cells					
Cell Size	Inch	156 x 156					
No. of Cells (Matrix)	nos	60 (10 x 6)					
Module Overall Dimensions (AxBxC)	mm	1661 x 991 x 40					
Weight (Approx)	kg	19.5					
Maximum Wind Load (Static load front & back {e.g. wind})	Pa	2400 (50 lbs/ft²)					
Resistance against Hail (Hailstone Impact)		25 mm ice ball at 23 m/s at 11 impact location					
Max series Fuse	Amp	10					

Note: STC : Irradiance 1000 W/m² , cell Temperature at 25°C & AM 1.5 spectrum

Note: STC : Irradiance 1000 W/m² , cell Temperature at 25°C & AM 1.5 spectrum



" Under normal conditions, a photovoltaic module may produce current and/or voltage that are different than those listed in the datasheet.at Standard Test Conditions. Accordingly, during system design the values of ISC and VOC marked on modules should be multiplied by a factor of 1.25 when determining component