

# PvMax™ GROUND MOUNT INSTALLATION MANUAL

# PvMax FEATURES

The Schletter PvMax is a solar mounting system for ground mount photovoltaic (PV) installations and is designed to be a ballasted solution for soft or rocky terrain for residential or commercial-scale projects. The system can also be installed on helical piles or ground screws.

This system is specifically designed to meet or exceed applicable IBC, ASCE, and UL standards. For more information on the PvMax, please see the system brochure.

## PvMax Features

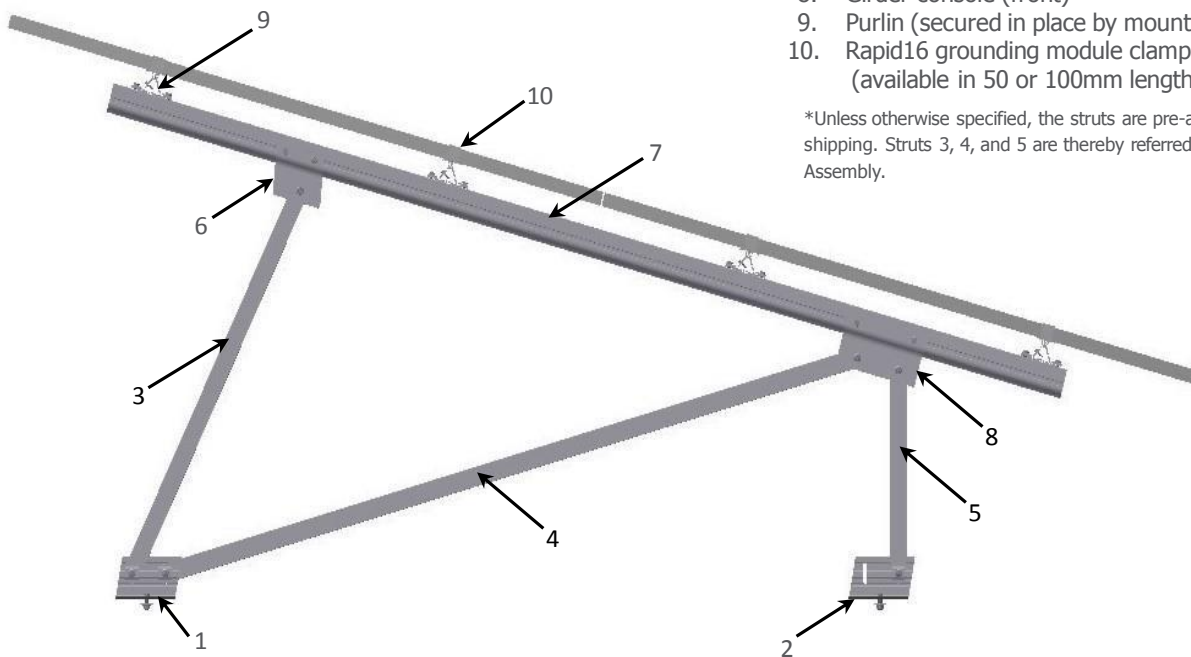
- Conforms to UL 2703<sup>1</sup> and ULC/ORD Std C1703
- Certified to LTR AE-001<sup>2</sup>
- Foundation calculation with attachment recommendation (foundation options include concrete and ground screws)
- 30 Amp fuse series rating
- Portrait and landscape module orientations available<sup>3</sup>
- Pre-assembled components for quick on-site assembly

The PvMax System is capable of accommodating nearly any framed PV module currently on the market. Each PvMax System is custom designed to meet specific structural load requirements. Included in the PvMax System are Rapid16 grounding clamps specifically designed to secure the frame of a PV module to the PvMax System. In turn, the components and assemblies that comprise a PvMax System form an electrically bonded unit. While individual components and structural sections will vary between designs, the primary assemblies and installation methods will remain the same.

## Key Components

1. Strut console (rear)
2. Strut console (front)
3. Strut (rear) — designed by job at specific length\*
4. Strut (mid)— designed by job at specific length\*
5. Strut (front) — designed by job at specific length\*
6. Girder console (rear)
7. Girder
8. Girder console (front)
9. Purlin (secured in place by mounting clamps)
10. Rapid16 grounding module clamp (available in 50 or 100mm lengths)

\*Unless otherwise specified, the struts are pre-assembled before shipping. Struts 3, 4, and 5 are thereby referred to as the Strut Assembly.

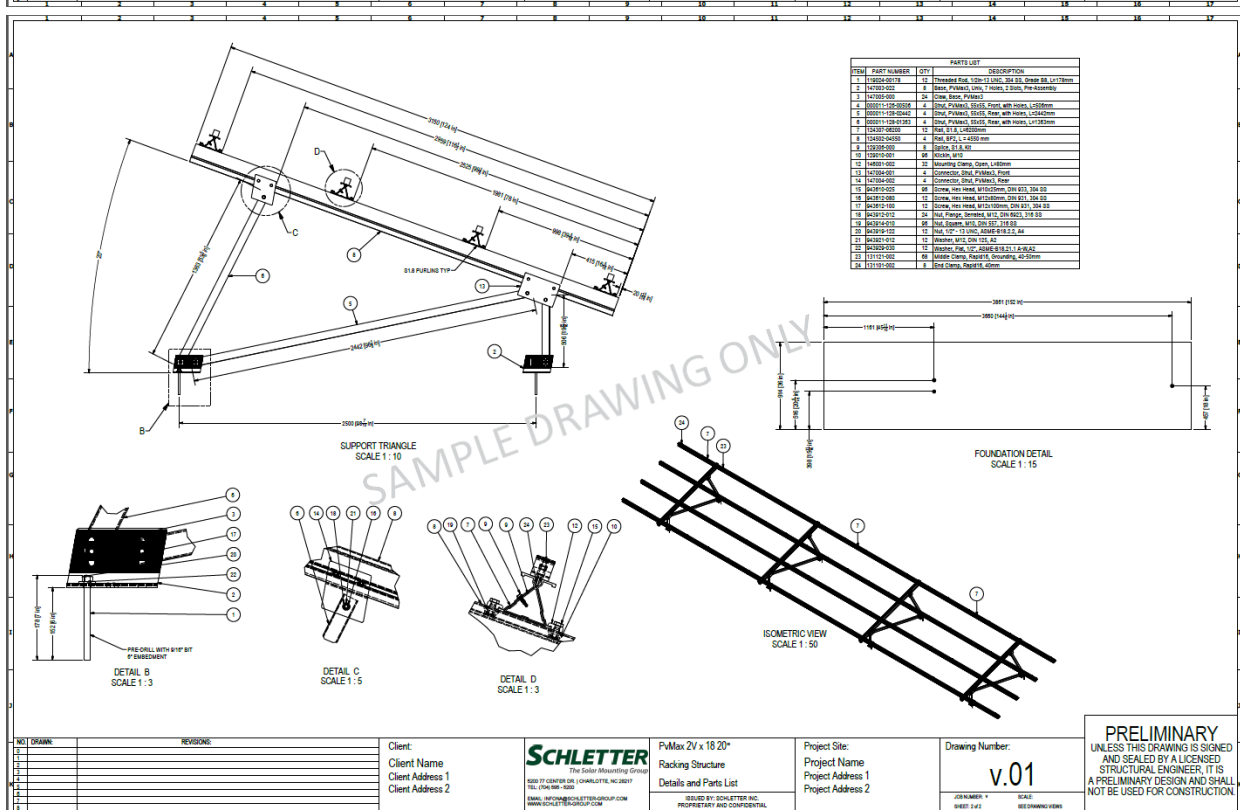
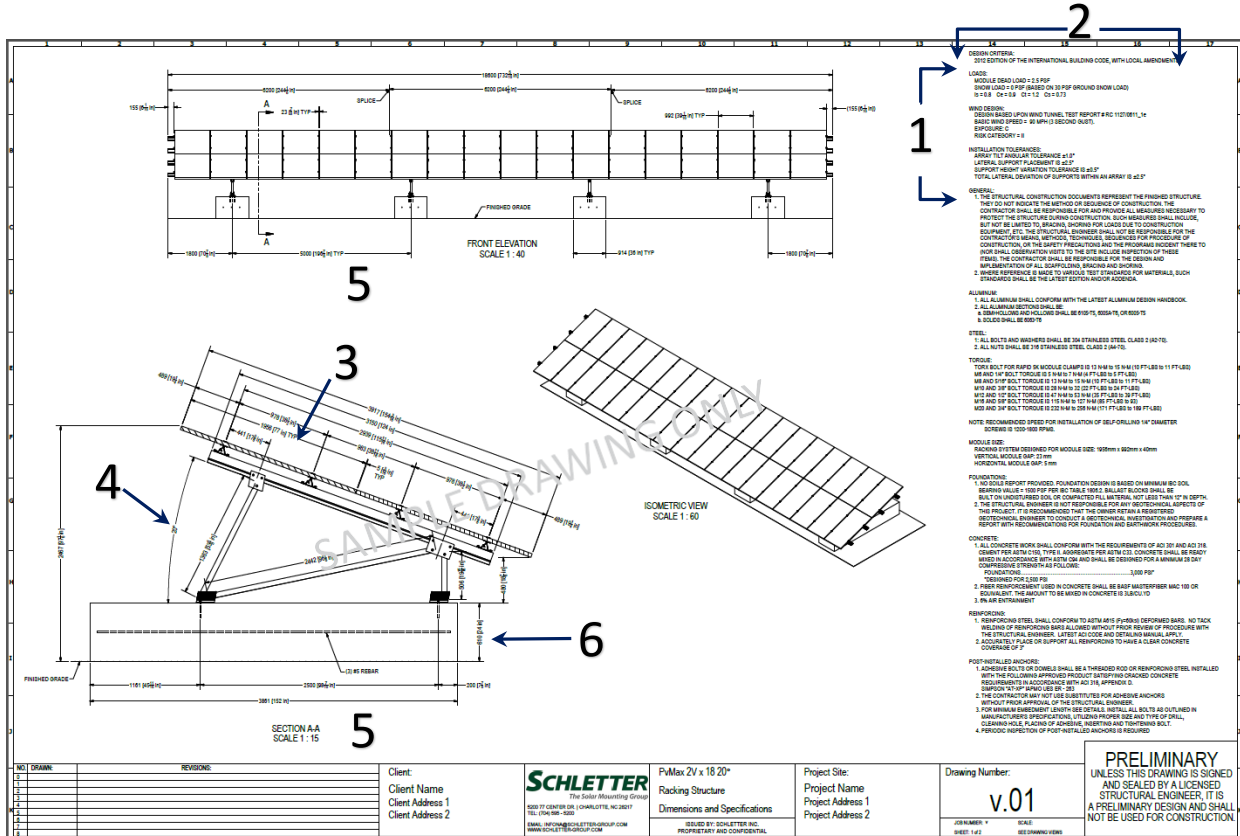


1. The PvMax is evaluated for electrical bonding only. The PvMax meets all IBX and ASCE requirements for structural loading; it was not evaluated for loading under UL 2703.
2. Maximum table size 2 panels in portrait x 10 or 3 panels in portrait x 8.
3. Maximum number of modules shall not exceed maximum system voltage.
4. This racking system may be used to ground and/or mount a PV module complying with UL 1703 only when the specific module has been evaluated for grounding and/or mounting in compliance with the included instructions.
5. Individual parts and components may vary from system-to-system. Please reference system specific drawings.
6. Installer is responsible for verifying that photovoltaic system meets applicable NEC standards.

# SAMPLE DRAWINGS

Specific drawings are provided for each custom project. Key information included on these drawings is as follows:

1. Design Criteria
2. Notes Section
3. Module Dimensions
4. Array Tilt
5. Array Dimensions
6. Footing Size



# INSTALLATION TOOL LIST

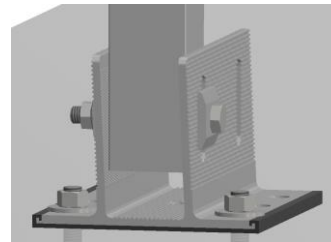
- Tape measure
- Chalk line
- Indelible marker
- Inclinator
- Carpenters square
- Pliers
- Torx® bit (TX40) for Rapid16™ module clamps
- 3/8" drive socket for self-drilling screws
- Drill bit — check hardware to determine drill bit size
- Torque wrench
- Wrench and/or socket for all bolted connections
- Rubber mallet for installation of end caps
- Ratchet and/or rechargeable power drill



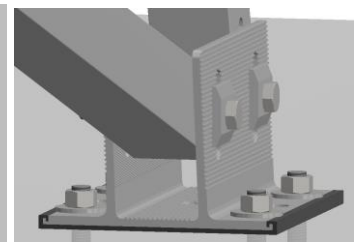
# MOUNTING THE INDIVIDUAL ASSMEBLY GROUPS

## Install Foundation and Strut Base:

- The typical foundation options include cast- in-place concrete\* and ground screws. See project-specific drawings for foundation specifications and spacing. Please check the ground screw installation guide for instruction of subterranean screw insertion.
- Connection of all strut bases; front and rear strut base has optional 7 bolt connection points.



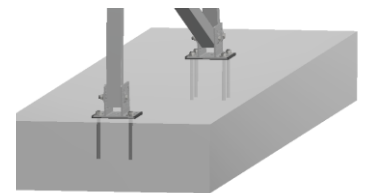
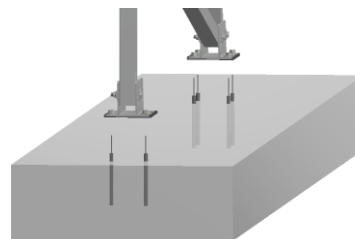
Front Strut Console



Rear Strut Console

## Connections on concrete foundations:

- Connect strut consoles (bases) to rods previously set in concrete (all-thread embedment depth is specified on drawing detail).
- Repeat until all strut consoles are installed.



Connections on Concrete Foundations

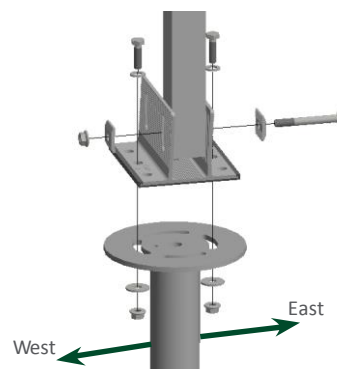
**Note:** Both front and rear strut consoles have optional 7 bolt connection points. One in center and three per side as shown.

## Connections on ground screw foundations:

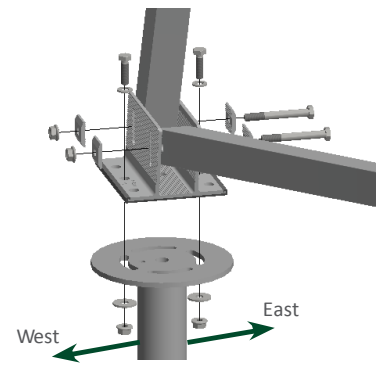
- Install ground screws as specified by manufacturer. When installing ground screws, make sure that screw headpiece connection hardware is oriented east-west.
- Front and rear strut consoles are attached with hex-head screws, washers, and nuts. Repeat until all strut consoles are connected to ground screw plate.

### Note:

- Both front and rear strut consoles have optional 7 bolt connection points. One in center and three per side as shown
- Concrete anchors & ground screw hardware is not included.
- All holes are 16mm diameter punched holes



Front Strut Console



Rear Strut Console

\*All concrete works shall conform with the requirements of ACI 301 and ACI 318. Cement per ASTM C150, Type II and aggregate per ASTM C33. Concrete should be ready mixed in accordance with ASTM C94 and designed for a minimum 28 day compressive strength of 3,000 PSI. See order-specific drawing package for more details.

# MOUNTING THE INDIVIDUAL ASSEMBLY GROUPS

## 2. Girder/Strut Assembly:

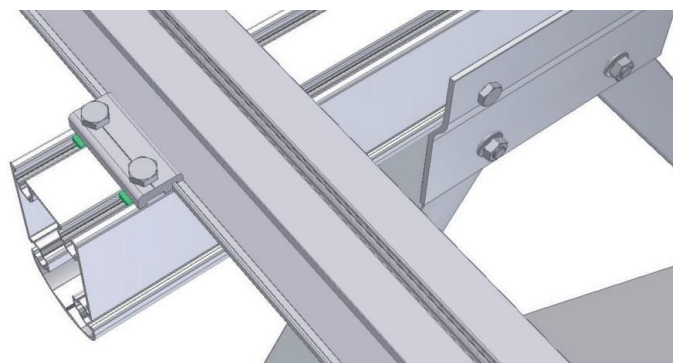
- Regardless of foundation type, struts are connected to the strut consoles following the same process.
- Begin by securing the front, short strut to the single attachment point on the front strut base.
- Then attach the middle strut to the first position on the rear strut base.
- Finish by attaching the long rear strut to the second position on the rear strut base.



Remove pre-assembled M12 bolts, align holes through end of struts with strut base bolt slot, then reinsert M12 bolt and fix with M12 washers and locking nut

## 3. Mount Purlins:

- Refer to job-specific drawings for dimensions and details.
- Purlin connections and mounting claws are drawings pre-assembled/ positioned at Schletter according to project or quick on-site installation.
- Position bottom channel of purlin in lower mounting claw. Upper claw may need to be adjusted in order to secure purlin. When each purlin is in place, secure bolts.
- Repeat for each purlin position.



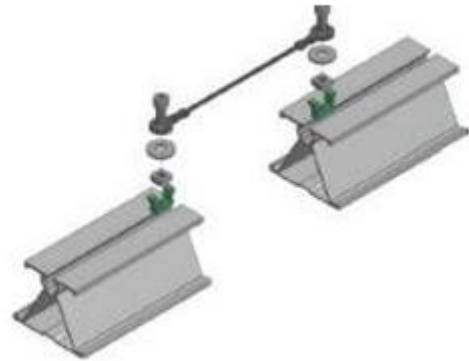
Lower mounting claw with module purlin in place



# MOUNTING THE INDIVIDUAL ASSMEBLY GROUPS

## 4. Bonding Jumper:

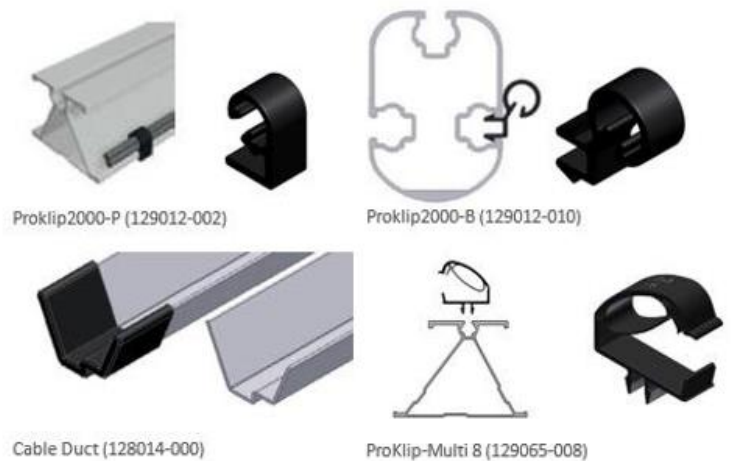
- Electrically bonds adjacent systems forming a continuous ground path.
- Connects directly to purlin.
- Available in 6-inch to 48-inch lengths.
- Used for expansion joints or other breaks in racking system



Bonding jumper connects directly to top channel of purlin using M8 hardware.

## 5. Cable Management:

- If cable management was ordered with the system, install before modules are in place.
- ProKlips will be positioned in the space between purlin and back of module, which is created by module frame.
- If using cable duct, secure trays on outer portion of rear purlins for convenient placing of cables.



# MOUNTING THE INDIVIDUAL ASSEMBLY GROUPS

## 6. Overcurrent Protection Device (grounding):

- Accommodates stranded or solid copper wire (2 gauge to 14 gauge).
- Must use bare copper wire to connect to the grounding wire, remove at least two inches of insulation to expose copper wire.
- Connects to strut using M12 hardware.



Loosen or remove top portion of grounding lug and insert grounding wire into appropriate groove



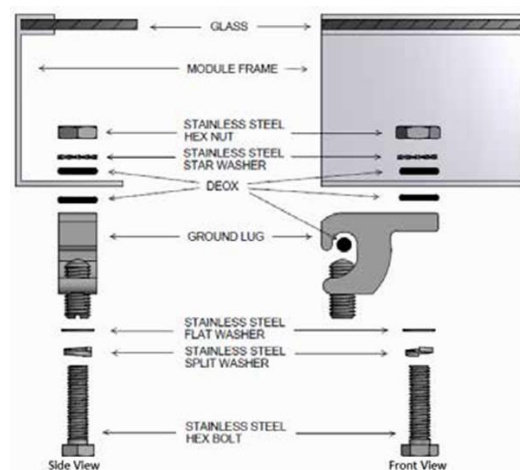
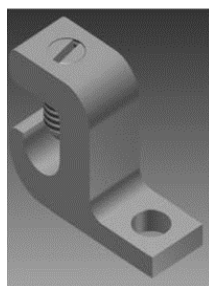
Grounding lug  
(Part #135003-003)



Grounding wire must extend through grounding lug by at least 1/4 inch

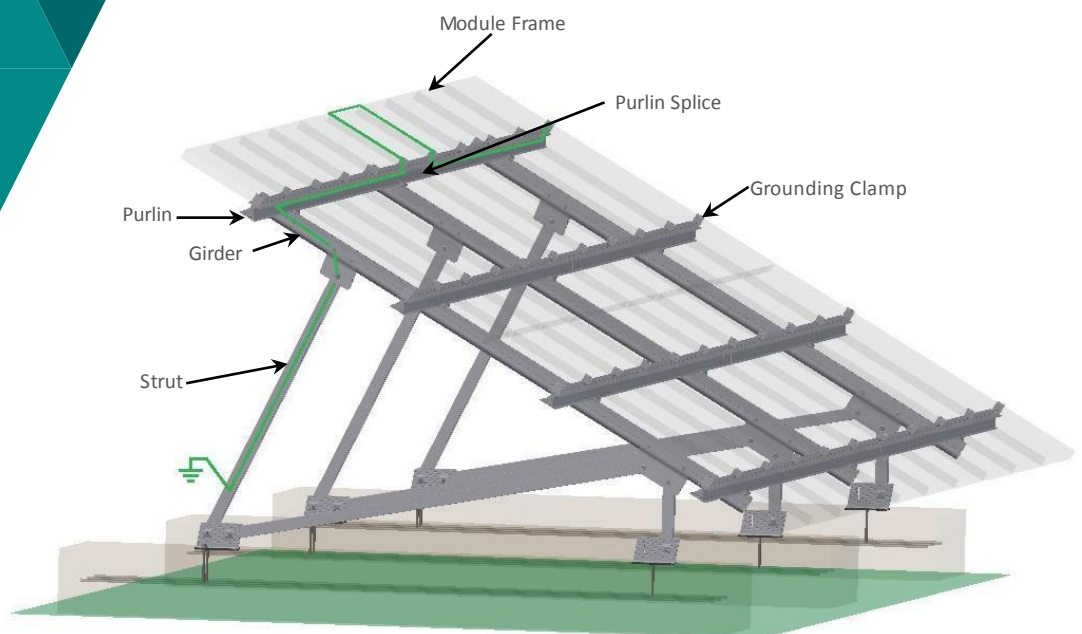
## ILSCO GROUNDING PATH INSTALLATION INSTRUCTION

GBL-4SS, Ground Lug Installation Instructions for Photo Voltaic Applications





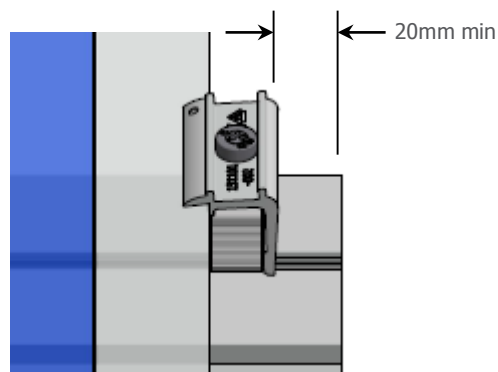
# GROUNDING PATH DIAGRAM



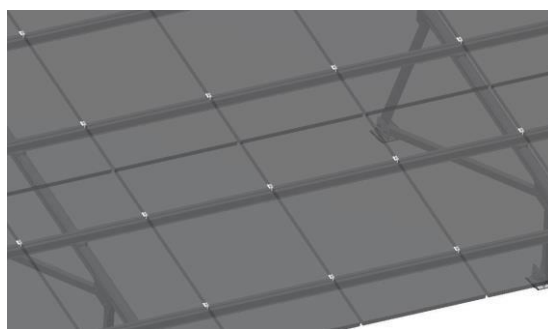
# MODULE MOUNTING

## 1. Position Modules

- Position end clamps approximately 20mm from end of purlin.
- Position first module and secure using pre-positioned end clamps; do not tighten.
- Attach middle clamps to the purlin on the exposed side of the first module
- Place second module and secure using the middle clamp; do not tighten.
- Repeat until end of row.
- Modules are installed according to module manufacturers' recommendations as well as provided engineering specifications.



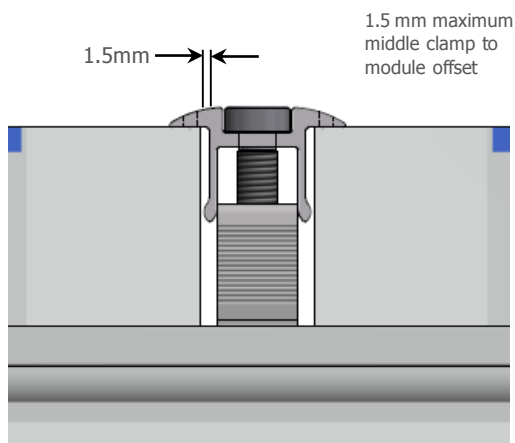
Position end clamps approximately 20mm from end of purlin



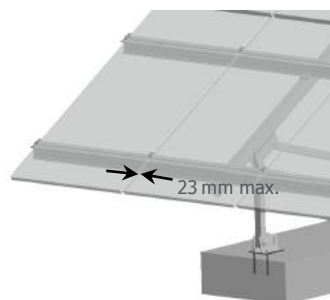
Modules are positioned on the purlins according to specified dimensions

## 2. Secure Modules

- Verify that the module clamp is fully engaged on the purlin and that the module clamp is aligned with the module frame.
- Secure all clamps to specified torque.
- When mounting modules, please observe the clamping points specified by the module manufacturer.
- Use of impact driver is not recommended



Tighten module clamp screw to secure modules to the purlins



Allowable gaps between modules

# EQUIPMENT GROUNDING

- Many PV installations contain more than one mounting system. Such cases call for electrically bonding each of the different mounting systems. Since individual racks are fully bonded units it is only necessary to connect individual racks together from one single point to another single point.<sup>6</sup> Only use stainless steel hardware when connecting harnesses or jumpers to the mounting system. Take care to prevent copper wires from directly contacting aluminum surfaces as this will cause corrosion. For this purpose, Schletter supplies a bonding jumper (see page 6).
- The PV INSTALLER of Schletter's electrically bonded PvMax system must provide the components necessary for the final connections to the grounding electrode system. Typically the installation will incorporate a grounding electrode (ground rod), appropriately sized copper wire, rated wire connectors, and grounding lugs which are rated for this purpose. The PV INSTALLER must follow all manufacturers' installation literature. Installation must comply with all applicable NEC/CSA sections including but not limited to; NEC 250 (Grounding and Bonding), NEC 690 (Solar Photovoltaic Systems), CSA 22.1 (Safety Standard for Electrical Installations), and all other applicable state and local electrical code requirements.
- PV INSTALLER shall be fully responsible for all connections between Schletter's bonded PvMax system and PV grounding electrode system.
- Equipment grounding conductors shall be no less than 14AWG (copper) or 12AWG (aluminum).
- Equipment grounding conductors can be connected to any exposed metallic portion of rack system provided that that:
  - a. connection area is sufficiently sized
  - b. dissimilar metals are not in direct contact
  - c. connection does not interfere with other components
  - d. connection is protected from damage

# TORQUE SPECIFICATIONS AND TOLERANCES

Systems are specifically designed for each project. Please reference the specific project drawing for allowable tolerances and recommended torque for each size of bolt used in the system.

In the event of deviation from approved drawings, contact Schletter immediately.

Torx Bolt for Rapid16 Module Clamps	15 N-M	11 FT-LBS
M6 and 1/4" Bolt	6 N-M	5 FT-LBS
M8 and 5/16" Bolt	14 N-M	11FT-LBS
M10 and 3/8" Bolt	30 N-M	23 FT-LBS
M12 and 1/2" Bolt	50 N-M	37 FT-LBS
M16 and 5/8" Bolt	121 N-M	89 FT-LBS
M20 and 3/4" Bolt	244 N-M	180 FT-LBS
Note: Recommended speed for installation of self-drilling 1/4" diameter is 1200-1800 RPMS.		

<sup>6</sup>Schletter recommends two bonding jumpers to connect separate systems for redundancy.

# MAINTENANCE

- Yearly inspection of system should be conducted to maintain optimal performance.
- Visually inspect for signs of damage, wear, corrosion, or movement. Replace any affected components immediately.
- Check for loose wiring
- Check mechanical details of the structure:
  - At least 2% of bolted connections must be checked using a calibrated torque wrench. The torque wrench must have a display or be a click type torque wrench.
  - Torque wrench should be set at 50% of the intended tightening torque. Check is successful if the bolt cannot be loosened.
  - If >10% of the checked bolted connections are loose, the check has to be increased by a factor of five.
  - If more than 10% of connections are still loose, all bolted connections must be checked.
  - Tighten to specified torques
  - Requirements per ASME B107 and AISC
  - WARNING:** Risk of death by electric shock
  - Maintenance should only be performed by qualified personnel.

# FOR MORE INFORMATION

For more information on the PvMax please see:

 **PvMax Product Sheet**

Torx® is a registered trademark of the Camcar Corp. division of Textron Industries.

# APPROVED MODULE LIST

MANUFACTURER	MODEL NUMBERS
<b>Boviet Solar</b>	BVM6612
<b>Canadian Solar</b>	CS1K-MS CS3K CS3K-MB-AG CS3K-MS CS3K-P CS3L CS3U CS3U-MB-AG CS3U-MS CS3U-P CS3W CS5A-xxxM CS6K CS6K-M CS6K-M AB CS6K-P CS6K-P-FG CS6K-xxxMS CS6P-M CS6P-P CS6P-P-SD CS6U CS6U-M CS6U-P CS6V-M CS6X-310 315 320P CS6X-P-FG
<b>ET Solar</b>	ET-M660 285 280 275 270 265 BB ET-M660 290 285 280 275 270 WW WB ET-M672 340 335 330 325 320 BB ET-M672 345 340 335 330 325 WW WB ET-P660 265 260 255 250 BB ET-P660 270 265 260 255 WW WB ET-P672 315 310 305 300 BB ET-P672 320 315 310 305 WW WB
<b>Hanwha Q Cells</b>	L-G3 L-G2 L-G4 Q.PEAK DUO BLK-G5-xxx Q.Peak DUO BLK-G6 xxx Q.Peak DUO G6 xxx Q.Peak DUO LG6 xxx Q.PEAK DUO-G5.X-xxx Q.PEAK DUO-G5-xxx Q.PEAK DUO L-G5.2 Q.PEAK DUO L-G5.3 (380-395) Q.Peak DUO L-G6.2 xxx Q.Peak DUO L-G6.3 xxx

# APPROVED MODULE LIST

## Hanwha Q Cells (continued)

B.LINE PRO L G4.1 - 35mm  
 B.LINE PLUS L G4.2 - 35mm  
 B.LINE PRO L G4.2 - 35mm  
 B.LINE PLUS BFR G4.1 xxx  
 B.LINE PRO BFR G4.1 xxx  
 Q.PEAK BLK G4.1/TAA xxx  
 Q.PEAK L G4.2 / 4.5  
 Q.PEAK-G4.1 | G4.1/MAX  
 Q.PLUS BFR G4.1/TAA xxx or MAX xxx  
 Q.PLUS G4  
 Q.PLUS L G4.1 | G4.2  
 Q.PRO BFR G4 | G4.1 | G4.3 | G4.4  
 Q.PRO G4  
 Q.PRO L G4.1  
 Q.PRO L G4.2  
 Q.PRO L G4.5

## Heliene

Heliene 36 | 60 | 72 | 96M  
 Heliene 36 | 60 | 72 | 96P

## Hyundai Solar

HiS-M250 | 255 | 260 | 265RG  
 HiS-M310 | 315 | 320 | 325TI  
 HiS-S265 | 270 | 275RG  
 HiS-S330 | 335 | 340 | 345 | 350TI

## Jinko Solar

Eagle 60 | 72 Eagle  
 Black 60 | 72  
 Eagle MX JK07A | JK07B  
 Eagle PERC  
 JKM265PP-60  
 JKM270P-60-V  
 JKM275P-60  
 JKM275PP-60-V  
 JKM320P-72-V  
 JKM330P-72  
 JKM330PP-72-V  
 JKM390/395/400/405/410M-72HL-V

## Kyocera

KD260 | 265GX-LFB2  
 KU260 | 265 | 270-6MCA  
 KU260-6MCA  
 KU315 | 320-7ZPA

## LG

LGxxxN1C-A5  
 LGxxxN1C-G4  
 LGxxxN1K-G4  
 LGxxxN1W-G4  
 LGxxxN2C-B3  
 LGxxxN2W-A5  
 LGxxxN2W-B3  
 LGxxxS1C-A5  
 LGxxxS1C-G4  
 LGxxxS1W-G4  
 LGxxxS2W-A5



# APPROVED MODULE LIST

## LG (continued)

LG390N2T-A5  
LGxxxQ1C-V5  
LGxxxQ1K-V5  
LGxxxA1C-V5  
LGxxxN2T-J5  
LGxxxN1C-V5  
LGxxxN1K-V5

## Longi

LR4-72HBD 415-435M  
LR4-72HBH 420-440M  
LR4-60HPB  
LR6-60PE 300-320M  
LR6-60HPH 300-320M  
LR6-72BP 355-375M  
LR6-72HPH 370-390M  
LR6-72PH 350-370M  
LR6-72PH 360-380M

## Phono Solar

PS270P-20/U  
PS275P-20/U  
PS280P-20/U  
PS270PH-20/U  
PS275PH-20/U  
PS280PH-20/U  
PS305M-20/UH  
PS310M-20/UH  
PS315M-20/UH  
PS320M-20/UH  
PS305MH-20/UH  
PS310MH-20/UH  
PS315MH-20/UH  
PS320MH-20/UH

## REC Solar

PEAK Energy Series REC245|250|255|260|265|270PE  
PEAK Energy BLK2 Series REC245|250|255|260PE BLK2  
TWINPEAK SERIES REC265|270|275|280|285TP  
PEAK Energy 72 Series REC300|295-315PE  
TWINPEAK REC330|335|340TP72  
TWINPEAK 2 BLK2 SERIES RECxxxTP2 BLK2  
TWINPEAK 2 SERIES  
TWINPEAK 2S 72 Series RECxxxTP2S 72

## Risen

RSM60-6-270M-290M/5BB

## SolarWorld

Sunmodule Plus SW 275-290 MONO BLACK  
Sunmodule Plus SW 280-290 MONO BLACK (5-busbar)  
Sunmodule Plus SW 280-295 MONO  
Sunmodule Plus SW 285-300 MONO (5-busbar)  
Sunmodule Pro-Series SW 260 POLY WOB  
Sunmodule Protect SW 275-280 MONO BLACK  
Sunmodule SW 100 POLY RGP  
Sunmodule SW 150 MONO R6A  
Sunmodule SW 150 POLY R6A  
Sunmodule SW 320-325|340-350XL MONO  
Sunmodule SW 80 MONO RHA

# APPROVED MODULE LIST

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## Talesun

FEATHER 2.0 TP660P  
Hipro M295+ TP660M  
Hipro M350+ TP672M  
PID ZERO TP672M  
TD660M  
TD660P  
TP660|672M  
TP660|672P  
TP660|672P(H)

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## Trina

TSM-xxx PA05.08  
TSM-DE14A  
TSM-DD14A  
TSM-PD05  
TSM-PD05.05  
TSM-PD05.08  
TSM-xxx DD05A.05(II)  
TSM-xxx PD05.08  
TSM-xxx PD05.10  
TSM-PD14  
TSM-PE14  
TSM-PEG14  
TSM-PEG40.07  
TSM-PEG5  
TSM-PEG5.07

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## WattPower

Glacier Series G3  
WP-xxxM/G3-60H-V (325|330|335|340PC)

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## Yingli Green Energy

YL260P|255P|250P|245P|240P-29b  
YL275P|270P|265P|260P|255P|250P-29b  
YL290D|285D|280D|275D|270D-30b  
YL300C|295C|290C|285C|280C|275C-30b  
YL325P|320P|315P|310P|305P|300P-35b  
YL340D|335D|330D|325D|320D|315D-36b

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For competent and comprehensive advice in planning your system, and for questions about logistics and order processing, our employees are gladly available to you.

For more information, please visit our website:  
<https://schletter-group.com/>

## **SCHLETTER**

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