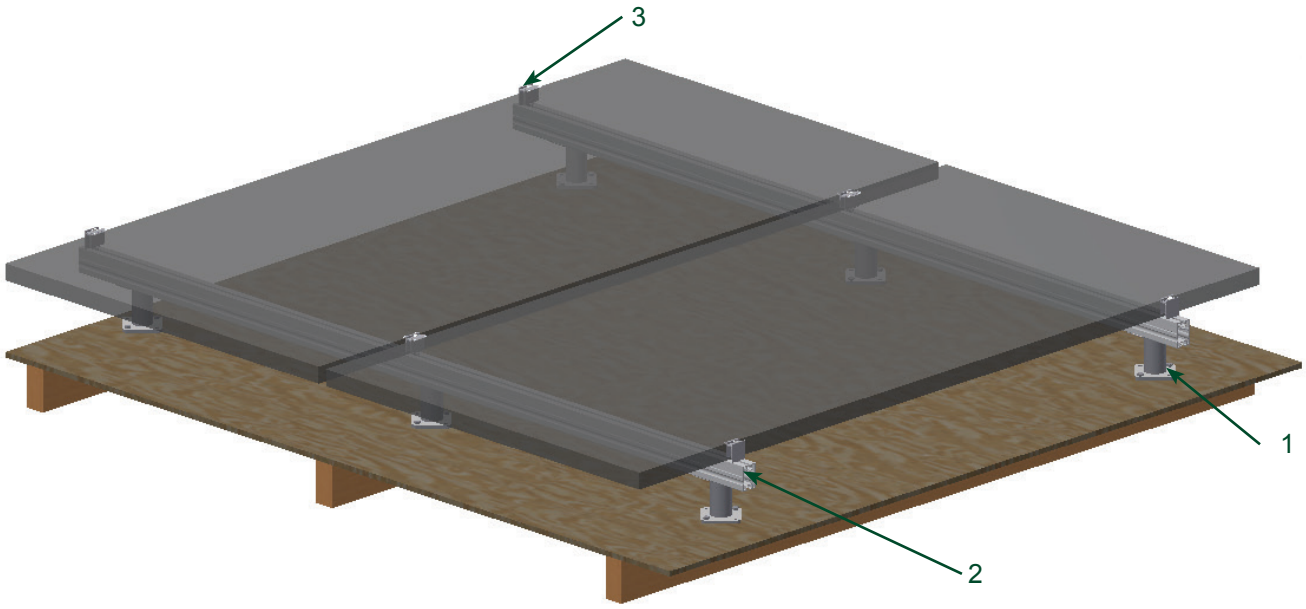
SCHLETTER
The Solar Mounting Group

Flush Mount Systems

Schletter Inc. offers a wide array of solutions for flush mount photovoltaic (PV) applications suitable for nearly any environmental condition. Every solar mounting system is designed for strength and ease-of-installation using high quality products to meet or exceed applicable IBC, ASCE, and UL standards.

Features

- Conforms to UL 2703[1]
- Certified to ULC/ORD Std C1703
- Fire class resistance rating: Class A when used with Types I and Type III photovoltaic modules only[2]
- Flexible design
- Modular components
- Industry leading installation times
- Electrically bonded unit
- Included **Rapid5K™** grounding module clamp
- Portrait and landscape module orientation[4]
- Order your system online with PV Powerhouse™



Key Components[4]

1. Roof attachment (standoff shown)
2. Rail (purlin)
3. Internal splice
4. Rapid5K™ grounding module clamp

Intertek

ETL CLASSIFIED
Intertek

Once the attachment mechanism is installed (i.e. roof hook, Fix2000, etc.), the process for installing the rails, modules[5], and clamps is essentially the same. The following will review proper installation methods for commonly used roof attachment components for Schletter Flush Mount Systems.[6]

[1] The Flush Mount System is evaluated for electrical bonding only. The Flush Mount System meets all IBC and ASCE requirements for structural loading; it was not evaluated for loading under UL 2703.
[2] Special consideration needs to be taken during design phase if system requires protective fire barrier.
[3] Maximum number of modules shall not exceed maximum system voltage.
[4] Individual parts and components will vary from system-to-system. Please reference system specific drawings.
[5] This racking system may be used to ground and/or mount a PV module complying with UL1703 only when the specific module has been evaluated for grounding and/or mounting in compliance with the included manual.
[6] Installer is responsible for verifying that photovoltaic system meets applicable NEC standards.

Installation Tool List

- Tape measure
- Chalk line
- Indelible marker
- Inclinometer
- Carpenters square
- Pliers
- Torx® bit (TX40)
  for Rapid5K™ module clamps
- Hex head wrench
  for standard 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 connection
- Rubber mallet
  for installation of end caps
- Ratchet and/or rechargeable power drill
- Chop saw

Standoff

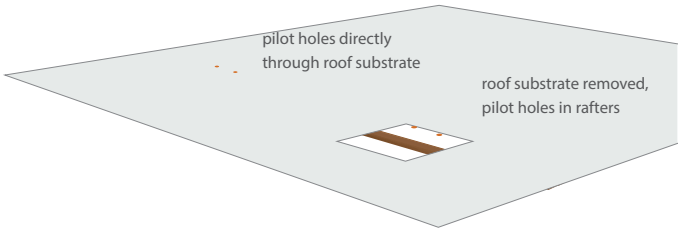
Aluminum standoffs can be used on any type of roof.

1. Connect Standoffs to Roof

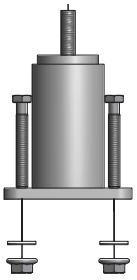
- Locate rafters and mark locations for standoff attachment points (see design drawings and/or span table).
- Depending on roof type, remove only the amount of compressible roofing material needed for standoff installation.
- Drill pilot holes as needed into rafters, keeping in mind that standoffs are positioned to allow two penetration points.
- Seal area around standoff with flashing or roofing material (consult roofing contractor for best practices).

2. Standoff to Rail Connection Options

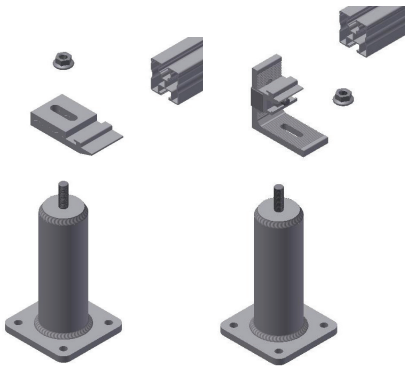
- Do not fully tighten flange nut until rail is positioned.



Remove roofing material only if necessary, standoffs may connect directly to some roof types with water seal applied to base



Secure standoff with 5/16" lag screws, self-tapping screws, or 8 mm hardware



Connect KlickTop HB or Rapid^{2+} Angle to threaded rod on standoff using M10 flange nut

Standing Seam Clamp

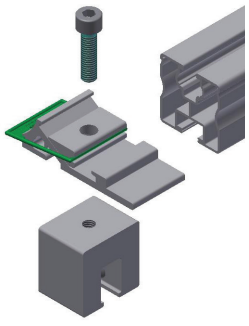
Schletter Flush Mount Systems are compatible with most S-5!® standing seam clamps.

1. Connect Standing Seam Clamp

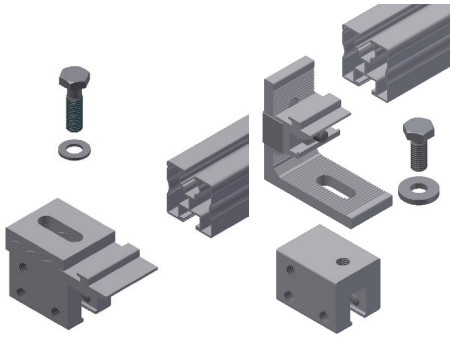
- See S-5!® website for proper installation (www.s-5.com).[7]
- Locate position of clamp on roof; arrange the clamps according to the required rail positions; attach clamps loosely to roof profile, set final torque once rail is positioned.

2. Standing Seam Clamp to Rail Connection Options

- Use KlickTop for S-5! Mini clamps and KlickTop HB or Rapid^{2+} Angle for the S-5! U.



Connect KlickTop to S-5! Mini clamps using M8 bolt



Connect KlickTop HB or Rapid^{2+} Angle to S-5! U using M10 bolt and washer

[7]S-5!® is a registered tradename of S-5! Corporation; tradename is not owned by Schletter.

Roof Hook

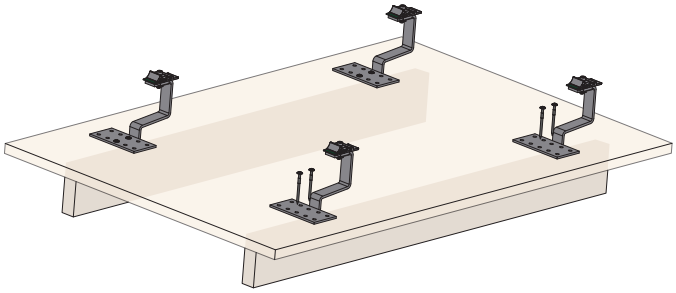
Quality stainless steel connections designed for most tile roofs.

1. Arrange and Connect Roof Hooks

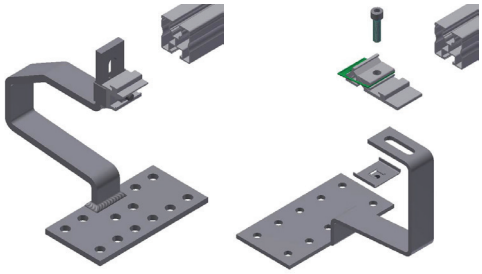
- Remove tile to allow access to roof deck, locate rafters, and mark locations for roof hook connection.
- Hole pattern in base plate allows for flexibility in placement of hook.
- Drill pilot holes as needed into rafters keeping in mind that roof hooks are positioned to allow two penetration points.
- Seal surrounding area with flashing or roofing material (consult roofing contractor for best practices).
- Re-install tile (some cutting/grinding of tile may be needed for best fit).

2. Roof Hook to Rail Connection Options

- KlickTop™ and Rapid5K™ Terminal Clamp come pre-assembled with roof hook.

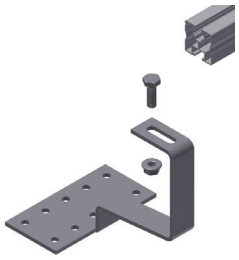


Completely secure roof hooks using two lag screws before re-installing tiles



Rapid²Terminal Clamp

KlickTop



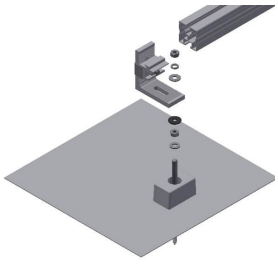
M10 hexagon-head bolt and flange nut

Asphalt Shingle Roof Attachments

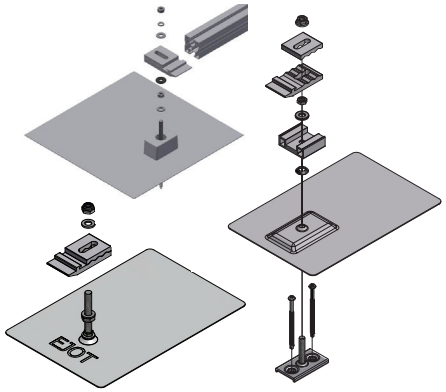
Schletter carries attachments from Quick Mount PV®, EcoFasten®, and Ejot® to offer robust solutions for asphalt shingle roofs which integrate with Schletter rails using our KlickTop HB or adjustable Rapid²⁺ Angle. Options fit standard 5" course.

1. Connect Roof Attachment

- See Quick Mount PV, EcoFasten, or Ejot installation specifications.[8]
  www.quickmountpv.com
  www.ecofastensolar.com
  www.ejot-usa.com



Connect Rapid²⁺ Angle as shown using provided hardware



Connect KlickTop HB as shown using provided hardware

[8]©Quick Mount PV is owned exclusively by Quick Mount; ©EcoFasten is a registered tradename of EcoFasten Solar; ©EJOT is a registered tradename of EJOT; neither tradename is owned by Schletter.

Fix2000™ and SingleFix-V™

Quality stainless steel roof attachments for trapezoidal sheet metal roofs 26 gauge or thicker.

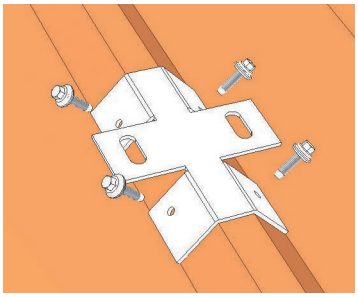
Fix2000

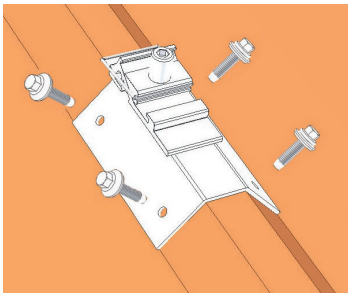
1. Connect Fix2000 to Roof

- Measure and mark distances between attachments before installing (screws should not be uninstalled and reinstalled in same location).
- Depth-stop is recommended when tightening self-drilling screws.
- Made to order.

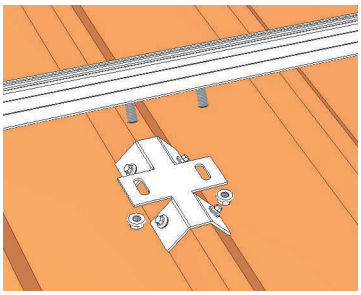
2. Fix2000 to Rail Connection

- Fix2000 with KlickTop comes pre-assembled.

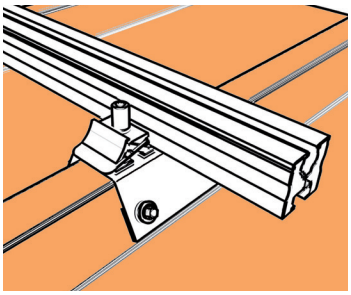




Use provided self-drilling screws to fasten until there is slight pressure on the gasket



Rails are connected using M10 hexagon-head bolts and flange nuts



Rails are quickly connected via the KlickTop

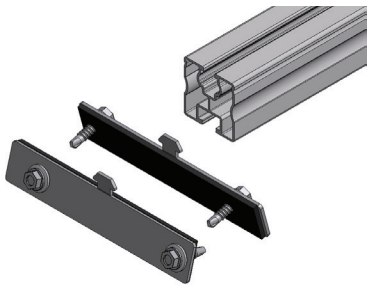
SingleFix-V

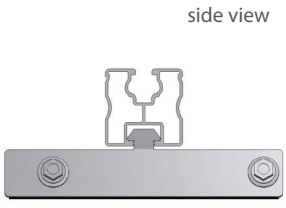
1. SingleFix-V to Rail Connection

- Connect SingleFix-V to rails before attaching to the roof.

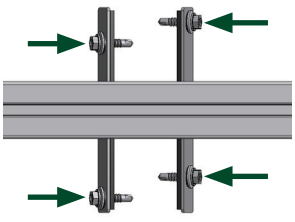
2. Connect SingleFix-V to Roof

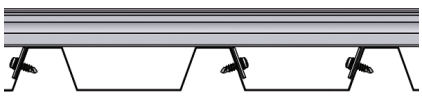
- Measure and mark distances between attachments before installing (screws should not be uninstalled and reinstalled in same location).





Slide hook into bottom channel of rail





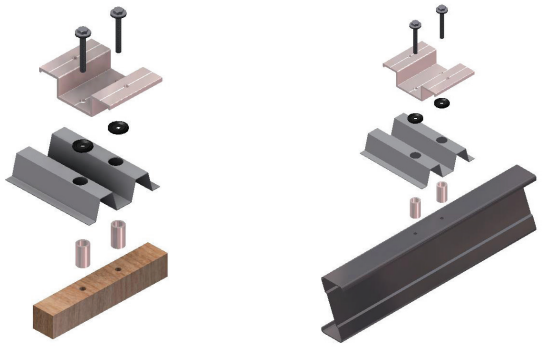
Tighten self-drilling screws until there is slight pressure on the gasket

FixT™

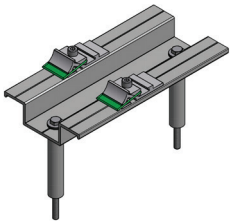
Aluminum roof attachments for corrugated sheet metal roofs 26 gauge or thinner and where roof deck cannot support installation.

1. Connect FixT to Roof

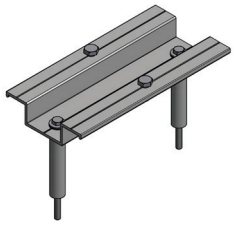
- Locate rafters and mark attachment points (see design drawings and/or span table).
- Drill pilot holes on designated attachment points.
- 5/16" lag screw or M10 and M8 hex head screw can be used to secure FixT on roof.
- Depth-stop is recommended when tightening self-tapping screws.
- Spacers transfer load directly to roof structure.



If installing on corrugated roof, insert spacer before securing FixT with provided hardware



Connect KlickTop to FixT using M8 bolt



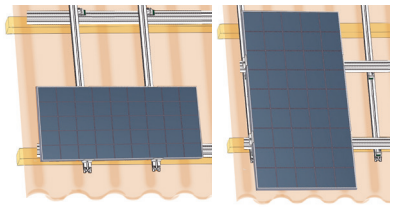
M10 hexagon-head bolts and M10 flange nuts

GridNorm™ System

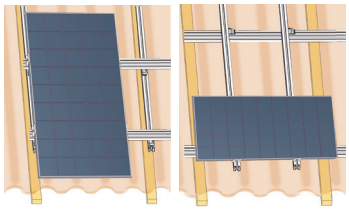
If roof structure does not meet the span requirements of the roof attachment, a GridNorm is the ideal solution.

1. Rail Installation

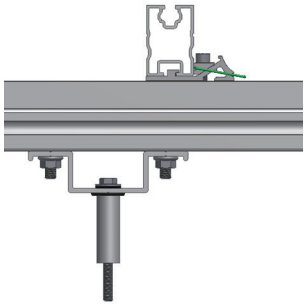
- Allows for flexible placement of roof connections.
- Locate rafters and mark attachment points (see design drawings and/or span table).
- Install roof attachment and base rail.
- Install module rail perpendicular to base rail.



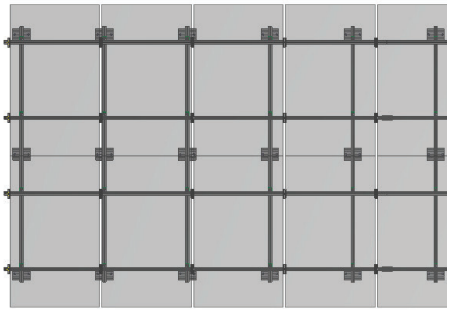
Strapping running E-W, uneven spacing



N-S running rafters, uneven spacing



KlickTop can be used to attach module rail to base rail



GridNorm (top view)

Rail Installation

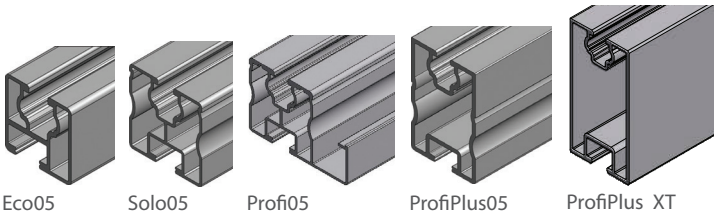
1. Rail Options for Flush Mount Application

- Eco05, Solo05, Profi05, ProfiPlus05, ProfiPlus XT

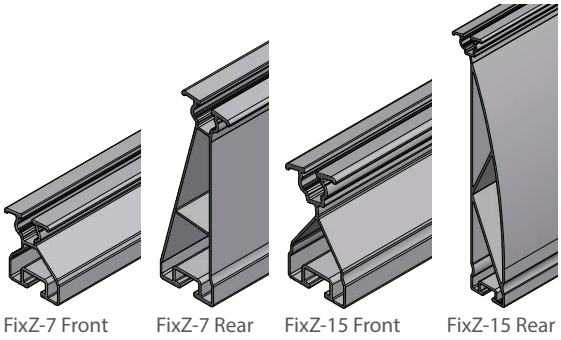
  Top channel: M8
  Bottom channel: M10

- FixZ series

  Top channel: M8
  Bottom channel: M10



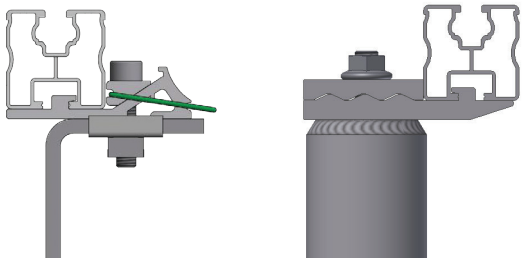
Eco05 Solo05 Profi05 ProfiPlus05 ProfiPlus XT



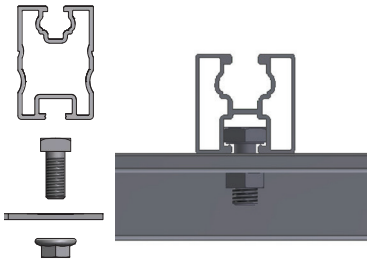
FixZ-7 Front FixZ-7 Rear FixZ-15 Front FixZ-15 Rear

2. Install Rail

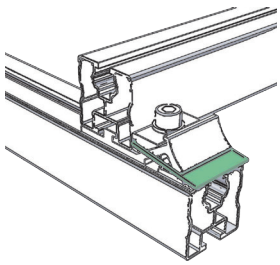
- Installation method varies depending on the type of roof attachment-to-rail connector being used; follow appropriate instructions shown to the right.



KlickTop and KlickTop HB: press rail channel into 'hook', secure by tightening bolt/nut



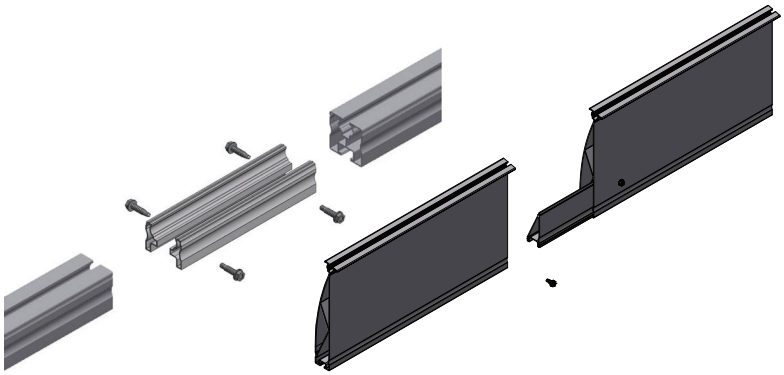
Slide M10 hexagon-head screw into rail channel, secure with M10 flange nut from underside of roof attachment



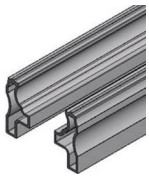
Rail-to-rail connection

3. Add Rail Splice

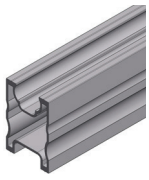
- Insert half of internal splice into first rail, secure with provided self-drilling screw; insert exposed end of splice into second rail, secure with self-drilling screw.



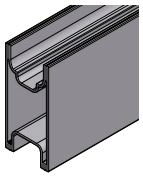
Install splice as shown in project specific drawing



Solo05/Profi05 internal splice

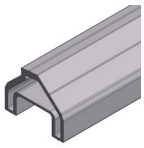


ProfiPlus internal splice

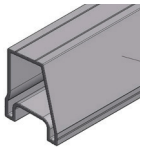


ProfiPlus XT internal splice

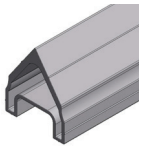
Eco05 Connector Plate



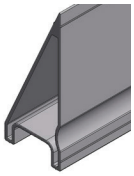
FixZ-7 front internal splice



FixZ-7 Rear internal splice



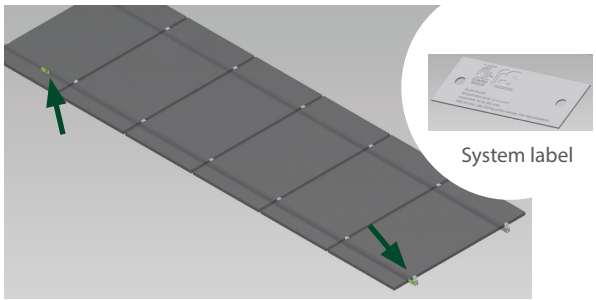
FixZ-7 Rear internal splice



FixZ-7 Rear internal splice

4. Listing Requirement

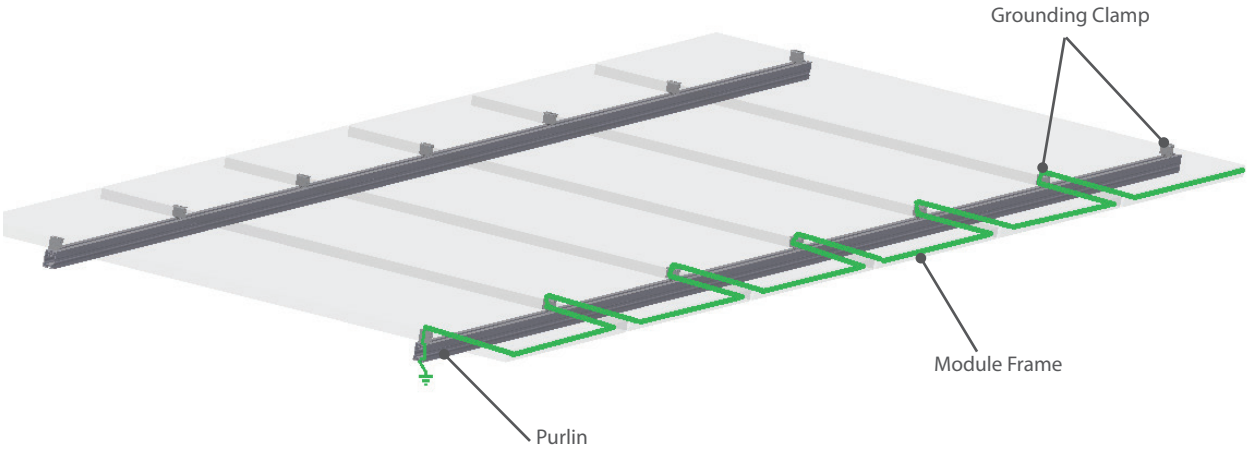
- **IMPORTANT!** Listing requires one system label be placed on all rear rails.



System label

Secure system labels on rail with self-drilling screws

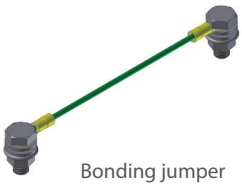
5. Grounding Path Diagram



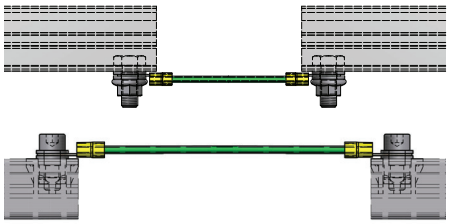
Optional Accessories

1. Bonding Jumper

- Electrically bonds adjacent systems, forming a continuous ground path.
- Available in 6-inch to 48-inch lengths.
- Required at expansion joints/ physical breaks.



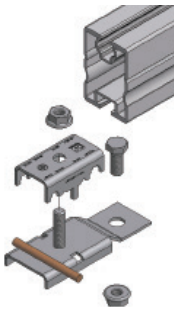
Bonding jumper

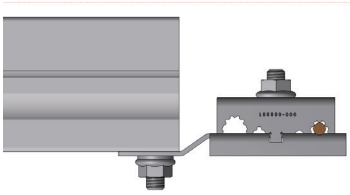


Bonding jumper connects directly to the top channel of rail using M8 or M10 hardware or bottom channel using M10 hardware

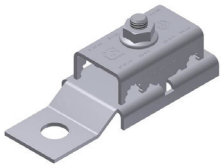
2. Overcurrent Protection Device (grounding)

- Accommodates strandard or solid copper wire (2 gauge to 14 gauge).
- Must use bare copper wire to make connection. Remove at least 2 inches of insulation to expose copper wire.
- Connects to bottom M10 rail channel.





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



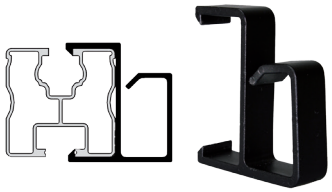
Grounding lug
(Part #135003-003)

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

3. Cable Management

- If cable management was ordered with the system, install before modules are in place.
- Keep in mind: ProKlips will be positioned in the space between rail and back of module, which is created by module frame.

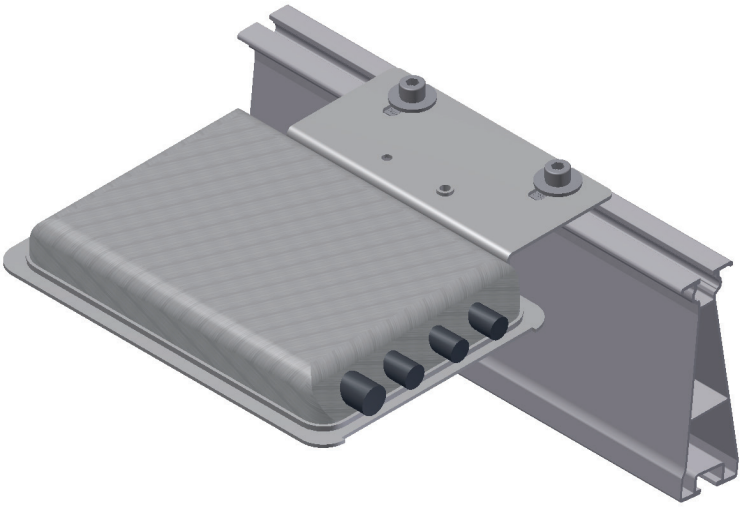
ProKlip-Multi 8 (129065-008); gently press clip into top channel of front or rear rail, use caution as clip may break



ProKlip-C (129005-000): connect clip to side of rail inserting hooks in top and bottom channels

4. Micro-Inverters

- Mark approximate centers of each module on the rack assembly for micro-inverter placement
- Mount one micro-inverter at each marked location using the provided hardware mounting kits
- Allow a minimum of 20mm between roof and bottom of inverter. Allow a distance of 25mm between back of module and top of inverter
- Torque to the appropriate value
  Enphase: 9 N-m (80-85 in-lbs)
  Darfon: 9 N-m (80 in-lbs)
  AEconversion: 15 N-m

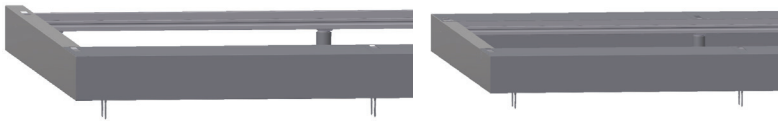


Attach micro-inverter to top channel of rail using provided hardware kits

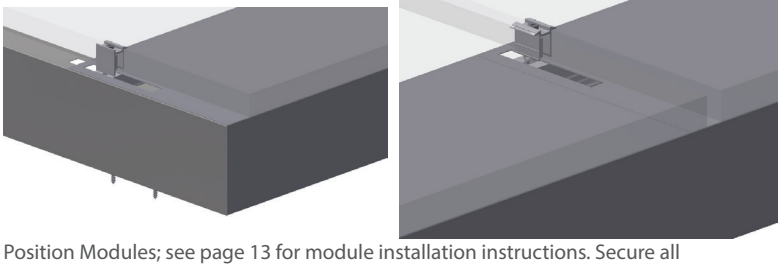
Fire Barrier

- Required in systems installed on roofs with slopes less than 9.5 degrees (not for use on roofs with slopes greater than 9.5 degrees).
- Fire barrier should be installed after modules are properly installed.
- Start at one corner of the system and place the horizontal and vertical fire barrier pieces between the module frame and rail.
- Ensure correct dimension of the side alignment of module and rail.
- Maximum opening between fire barrier and roof deck is one inch.
- Provides for a Class A fire rating when used with Type I modules.
- For Type III modules, a minimum of 8" clearance between module and roof deck must be maintained, but no fire barrier is required for a Class A rating.
- Only required on perimeter of array.

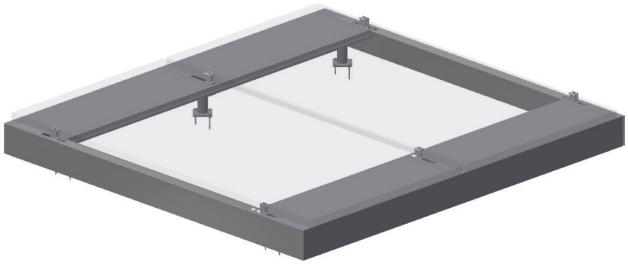
Position side fire flashings



Position front and back fire flashings



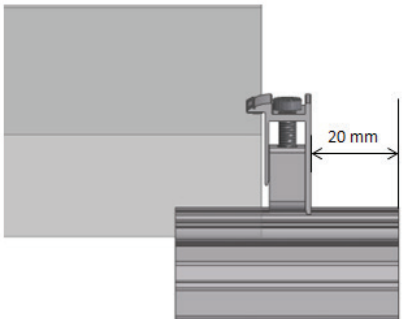
Position Modules; see page 13 for module installation instructions. Secure all connections using module clamps



Modules and Module Clamps

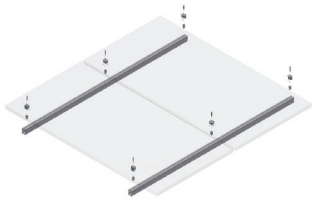
1. Position Modules

- Position end clamps on rail approximately 20 mm from end of rail, do not tighten.
- Position first module and secure using pre-positioned end clamps, do not tighten.
- Attach middle clamps to rail on the exposed side of first module.
- Place second module next to first module and secure using middle clamp, do not tighten.
- Repeat until end of row.
- Modules installed in landscape require Module Support Plate (Part #139004-005) installed between module and rail.

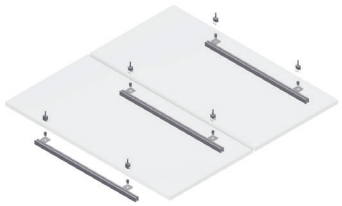


Position end clamps approximately 20 mm from end of purlin

Portrait

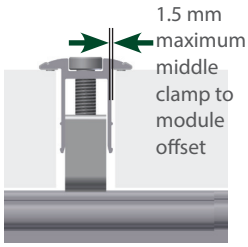


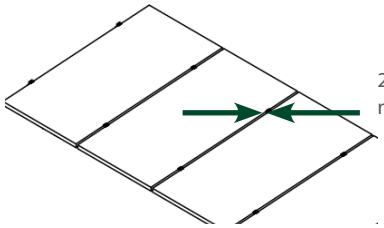
Landscape



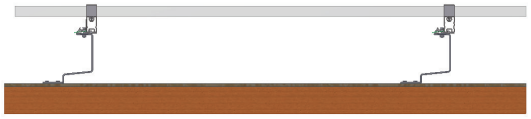
2. Secure Modules

- Verify that the module clamp is fully engaged on the rail and 1.5 mm maximum middle clamp to module offset is aligned with the module frame.
- Secure all clamps to specified torque values.
- When mounting modules, please observe the clamping points specified by the module manufacturer.

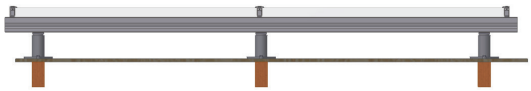




Allowable gaps between modules

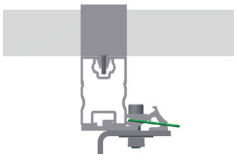


Completed installation with module (Roof Hook)

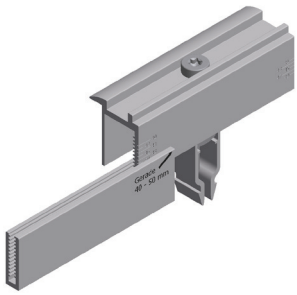


Completed installation with module (Standoff)

Completed installation with module (Fix2000)



Rapid5K™ clamp connected to purlin (side view)



If adjustable end clamps are provided, slide attachment on to desired height

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 Rapid5K Module Clamps	14 N-M	10.5 FT-LBS
M6 and 1/4" Bolt	6 N-M	4.5 FT-LBS
M8 and 5/16" Bolt	14 N-M	10.5 FT-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.		

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 much 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.

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

Safety Precautions

Follow proper installation and safety procedures at all times. Edges of parts may be sharp. Follow proper lifting procedures.

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.[9] 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 offers a bonding jumper (see Page 11).

- The PV INSTALLER of Schletter's electrically bonded Flush Mount 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 should be fully responsible for all connections between Schletter's bonded Flush Mount system and PV grounding electrode system.

- Equipment grounding conductors should be no less than 14 AWG (copper) or 12 AWG (aluminum).

- Equipment grounding conductors can be connected to any exposed metallic portion of rack system provided 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

For more information on Flush Mount Systems, please contact us at:

Schletter Inc.
1001 Commerce Center Drive
Shelby, NC 28150
Call: (888) 608 - 0234
Fax: (704) 595 - 4210
info.us@schletter-group.com

Schletter Canada
3181 Devon Drive
Windsor, ON N8X 4L3
Call: (519) 946 - 3800
Fax: (519) 946 - 3805
mail.canada@schletter-group.com

[9]Schletter recommends two bonding jumpers to connect separate systems for redundancy.

Approved Module Manufacturers

Bonding and Grounding

Canadian Solar
- CS6X-310|315|320P
- CS6X-P-FG
- CS6K-P-FG
- CS6K-M
- CS6K-M AB
- CS6P-P
- CS6P-P-SD
- CS6V-M

ET Solar
- 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

Hanwha Q Cells
- Q.PRO BFR G4|G4.1|G4.3
- Q.PLUS BFR G4.1
- Q.PRO G4
- Q.PLUS G4
- Q.PRO L G4.1
- Q.PLUS L G4.1|G4.2
- Q.PEAK-G4.1|G4.1/MAX
- Q.PEAK BLK G4.1
- Q.PEAK L G4.2

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

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

Jinko Solar
- JKM275P-60
- JKM330P-72
- Eagle 60|72
- Eagle PERC
- Eagle Black 60|72
- JKM275PP-60-V
- JKM330PP-72-V
- JKM270P-60-V
- JKM320P-72-V
- Eagle MX JK07A|JK07B
- JKM265PP-60

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

LG
- LGxxxN1C-G4
- LGxxxN1W-G4
- LGxxxS1C-G4
- LGxxxS1W-G4
- LGxxxN1K-G4
- LGxxxN2C-B3
- LGxxxN2W-B3
- LGXXXN1C-A5
- LGXXXS1C-A5
- LGXXXN2W-A5
- LGXXXS2W-A5

REC Solar
- REC245|250|255|260|265|270PE
- REC245|250|255|260PE BLK2
- REC300|305|310|315|320PE72
- REC265|270|275|280|285TP
- REC330|335|340TP72

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

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

Approved Module Manufacturers (continued)

Trina

TSM-PD14
TSM-PD05
TSM-PD05.08
TSM-PD05.05
TSM-PEG5
TSM-PEG5.07
TSM-PEG14
TSM-PEG40.07
TSM-DD14A(II)

Yingli Green Energy

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

Approved Micro-Inverters

Enphase

M215
M250

Darfon

G320

AEconversion

INV500-90