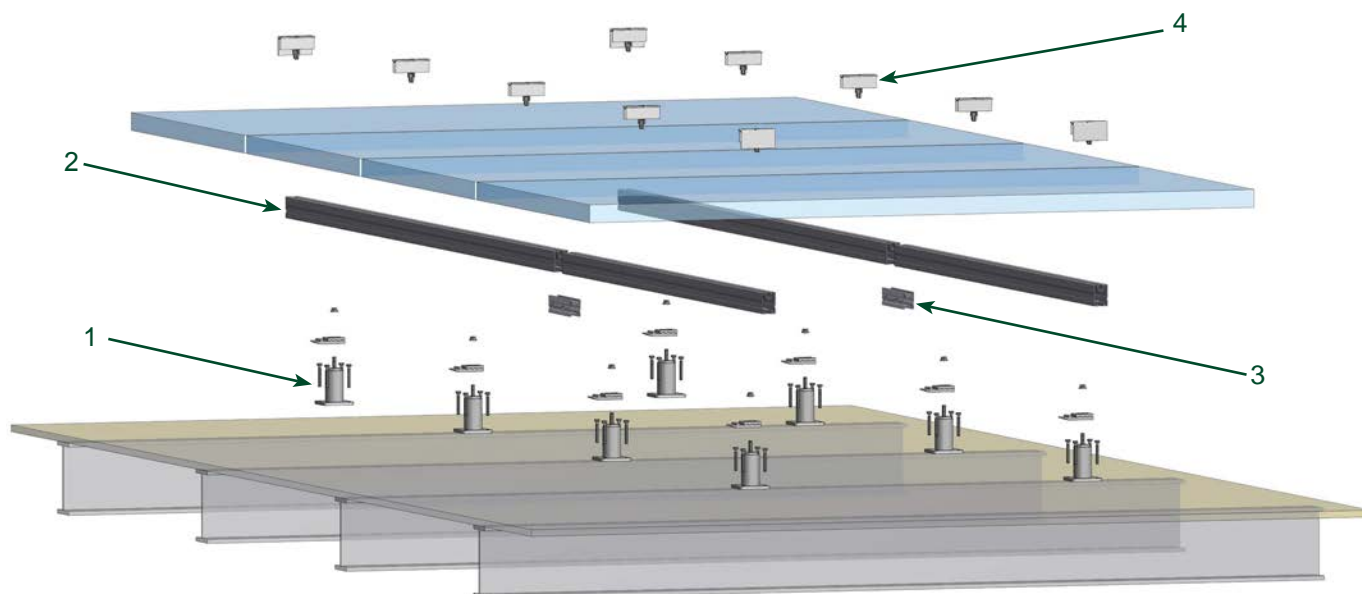


Flush Mount Systems

Schletter Inc. offers a wide array of solutions for flush mount photovoltaic (PV) applications suitable for nearly any environmental condition. Every system is designed for strength and ease-of-installation using high quality products.

Features

- Conforms to UL SUB 2703¹
- Certified to ULC/ORD Std C1703
- Fire class resistance rating: Class A when used with Types 1 and 3 photovoltaic modules only²
- Flexible design
- Modular components
- Industry leading installation times
- Electrically bonded unit³
- Included Rapid²⁺™ grounding module clamp
- Portrait and landscape module orientation⁴



Key Components

1. Roof attachment (standoff shown)
2. Rail (purlin)
3. Internal splice
4. Rapid²⁺™ grounding module clamp



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

- Standoff Page 4
- Standing Seam Clamp Page 4
- Roof Hook Page 5
- Asphalt Shingle Roof Attachments Page 5

- Fix2000™ Page 6
- SingleFix-V™ Page 6
- FixT™ Page 7
- GridNorm™ Page 7

¹The 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.

²For low slope applications, the clearance off of the roof deck has to be at least 8" for type 3 modules. For steep slope applications there are no restrictions for both types 1 and 3.

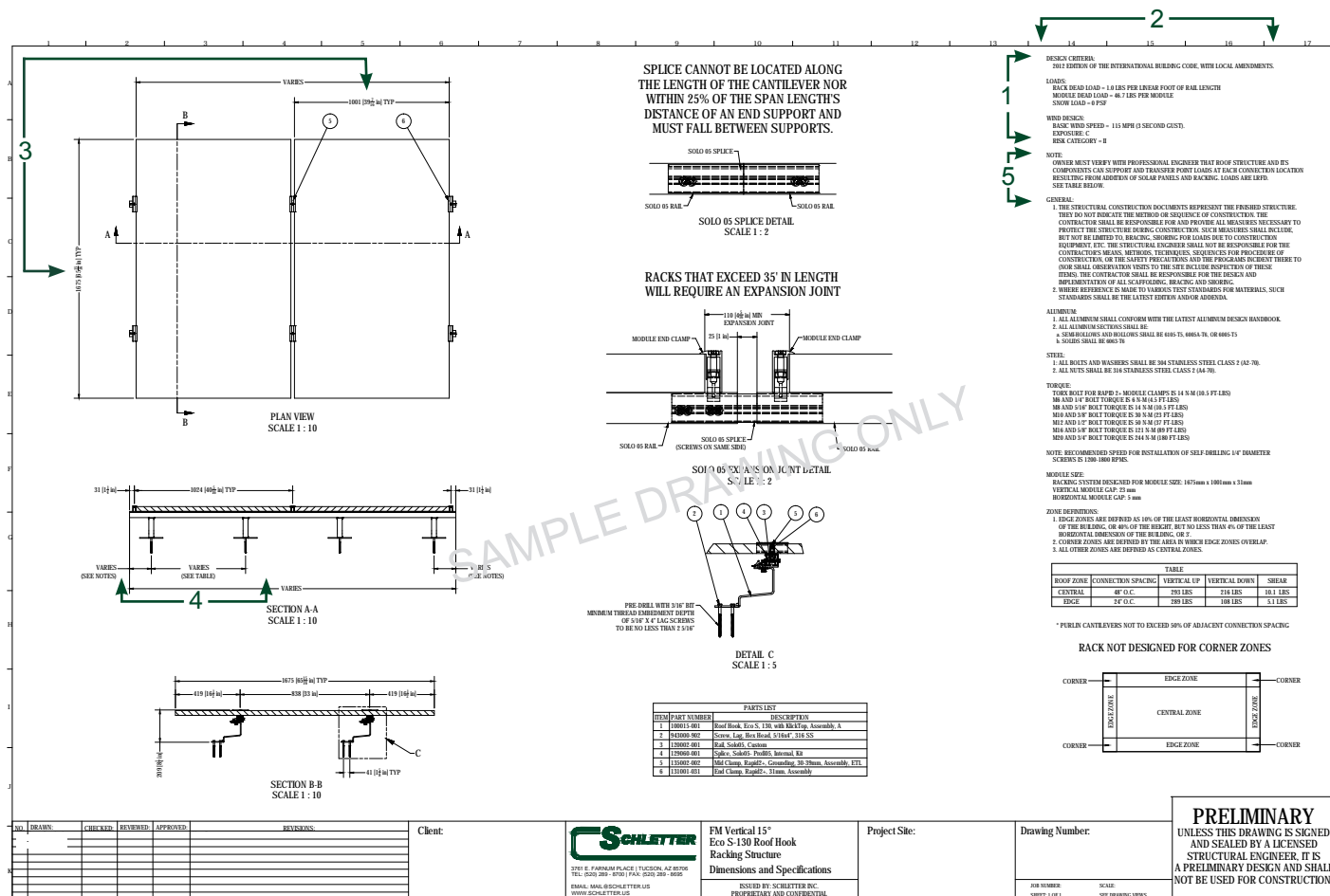
³Installer is responsible for verifying that system meets applicable NEC standards.

⁴Individual parts and components will vary from system-to-system. Please reference system specific drawings.

Sample Drawings

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

1. Design Criteria
2. Notes Section
3. Module Dimensions
4. Connection Spacing and Type
5. Connection Forces



PRELIMINARY
UNLESS THIS DRAWING IS SIGNED AND SEALED BY A LICENSED STRUCTURAL ENGINEER, IT IS A PRELIMINARY DESIGN AND SHALL NOT BE USED FOR CONSTRUCTION.

NO.	DRAWN	CHECKED	INVENTED	APPROVED	REVISIONS
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Client:



FM Vertical 15" Eco S-130 Roof Hook Racking Structure
Dimensions and Specifications

ISSUED BY: SCHLETTER INC.
PROPRIETARY AND CONFIDENTIAL

Project Site:

Drawing Number:

JOB NUMBER: SHEET 1 OF 1
SCALE: SEE DRAWING NOTES

Installation Tool List

- Tape measure
- Chalk line
- Indelible marker
- Inclinometer
- Carpenters square
- Pliers
- Torx bit (TX40)
for Rapid²⁺™ 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

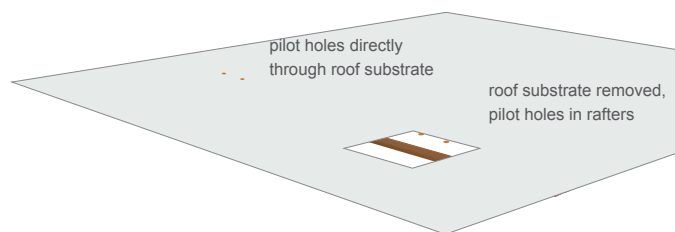


Standoff

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).



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

2. Standoff to Rail Connection Options

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



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

Connect KlickTop HB or Rapid2+ Angle to threaded rod on standoff using M10 flange nut

Standing Seam Clamp

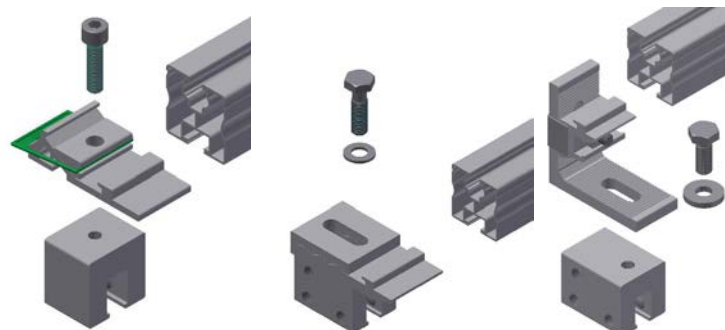
Schletter Flush Mount Systems are compatible with most S-5!® standing seam clamps.

1. Connect Standing Seam Clamp

- See S-5!® website for proper installation (www.s-5.com).⁵
- 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 Rapid2+ Angle for the S-5! U.



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

Connect KlickTop HB or Rapid2+ Angle to S-5! U using M10 bolt and washer

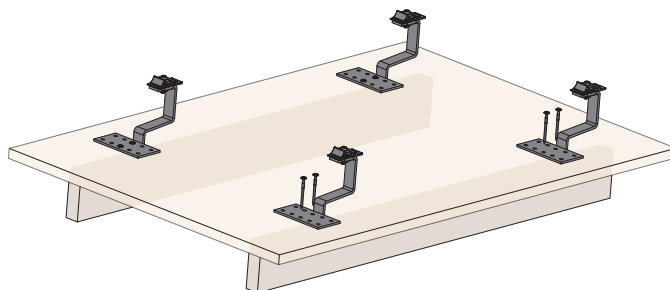
- ➡ See page 8 for rail installation
- ➡ See page 12 for module installation

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 area around 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).



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

2. Roof Hook to Rail Connection Options

- KlickTop™ and Rapid2+™ Terminal Clamp come pre-assembled with roof hook.



Rapid2+



KlickTop



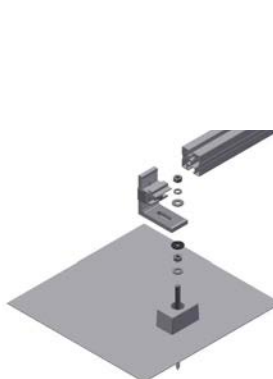
M10 hexagon-head bolt and flange nut

Asphalt Shingle Roof Attachments

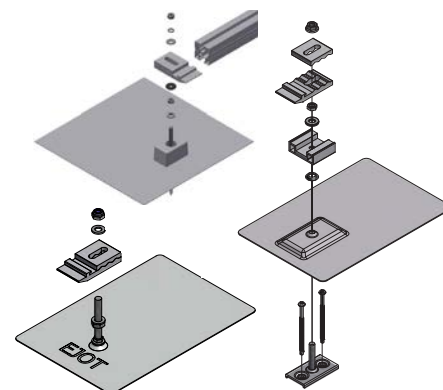
Schletter carries attachments from Quick Mount PV®, EcoFasten®, and Ejot® to offer robust solutions for asphalt shingle roofs which integrate with Schletter rails using our KlickTop HB or adjustable Rapid2+ Angle. Options fit standard 5" course.

1. Connect Roof Attachment

- See Quick Mount PV, EcoFasten, or Ejot installation specifications.⁵
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

- See page 8 for rail installation
- See page 12 for module installation

⁵Quick Mount PV is owned exclusively by Quick Mount; EcoFasten is a registered trademark of EcoFasten Solar; EJOT is a registered trademark of EJOT; S-5! is a registered trademark of S-5! Corporation; neither trademark is owned by Schletter.

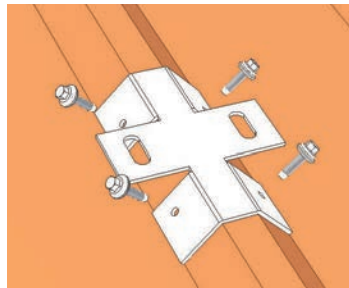
Fix2000™ and SingleFix-V™

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

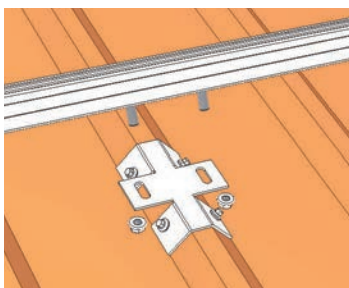
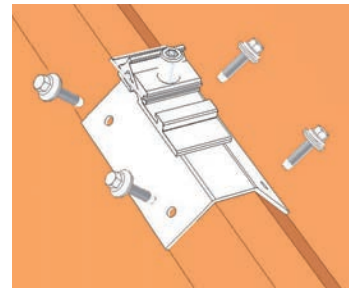
Fix2000

1. Connect Fix2000 to Roof

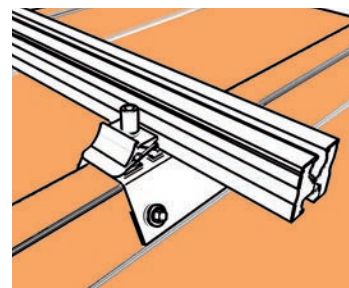
- Measure and mark distances between attachments before installing (screws should not be uninstalled and reinstalled in same location).
- Depth-stop is recommended when tightening self-drilling screws.
- Made to order.
- Please note: while Schletter offers components that can help to seal penetrations, responsibility for sealing penetrations lies with the installer.



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



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



Rails are quickly connected via the KlickTop

2. Fix2000 to Rail Connection

- Fix2000 with KlickTop comes pre-assembled.

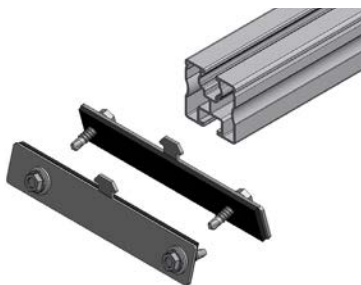
SingleFix-V

1. SingleFix-V to Rail Connection

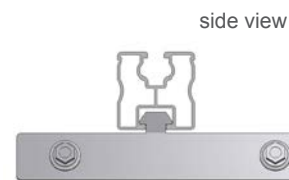
- Connect SingleFix-V to rails before attaching to the roof.

2. Connect SingleFix-V to Roof

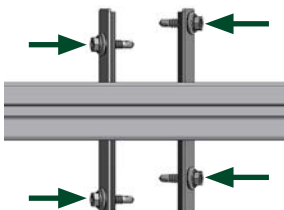
- Measure and mark distances between attachments before installing (screws should not be uninstalled and reinstalled in same location).
- Please note: while Schletter offers components that can help to seal penetrations, responsibility for sealing penetrations lies with the installer.



Slide hook into bottom channel of rail



side view



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

- See page 8 for rail installation
- See page 12 for module installation

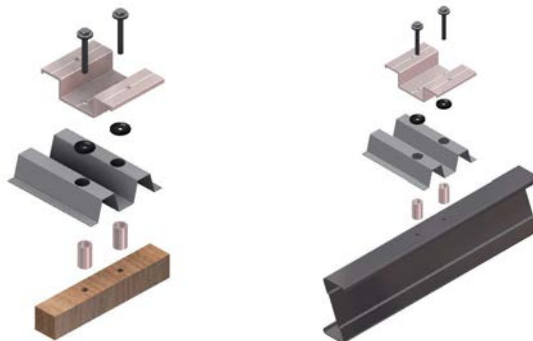
FixT™

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

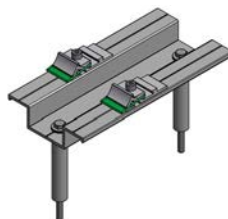
1. Connect FixT to Roof

- 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.

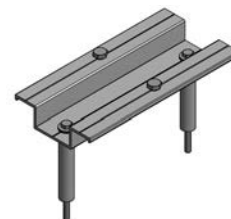
- See page 8 for rail installation
- See page 12 for module installation



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

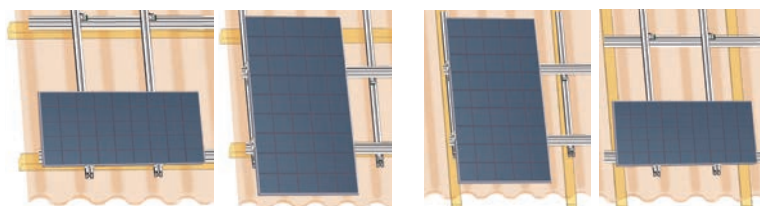
GridNorm™ System

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

1. Rail Installation

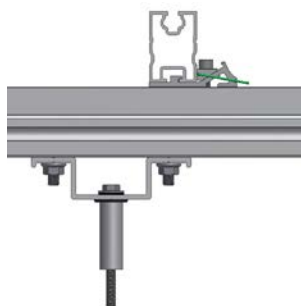
- Allows for flexible placement of roof connections.
- Locate rafters and mark attachment points (see design drawings and/or span table).
- Install roof attachment and base rail.
- Install module rail perpendicular to base rail.

- See page 12 for module installation

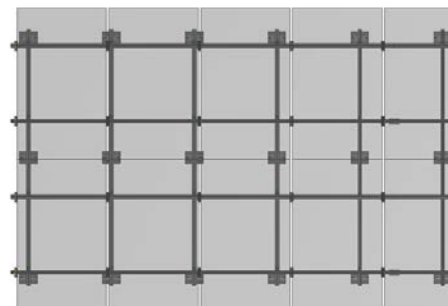


Strapping running E-W, uneven spacing

N-S running rafters, uneven spacing



KlickTop can be used to attach module rail to base rail



GridNorm (top view)

Rail Installation

1. Most Commonly Used Rails for Flush Mount Application

- Eco05, Solo05, Profi05, ProfiPlus05, ProfiPlus XT

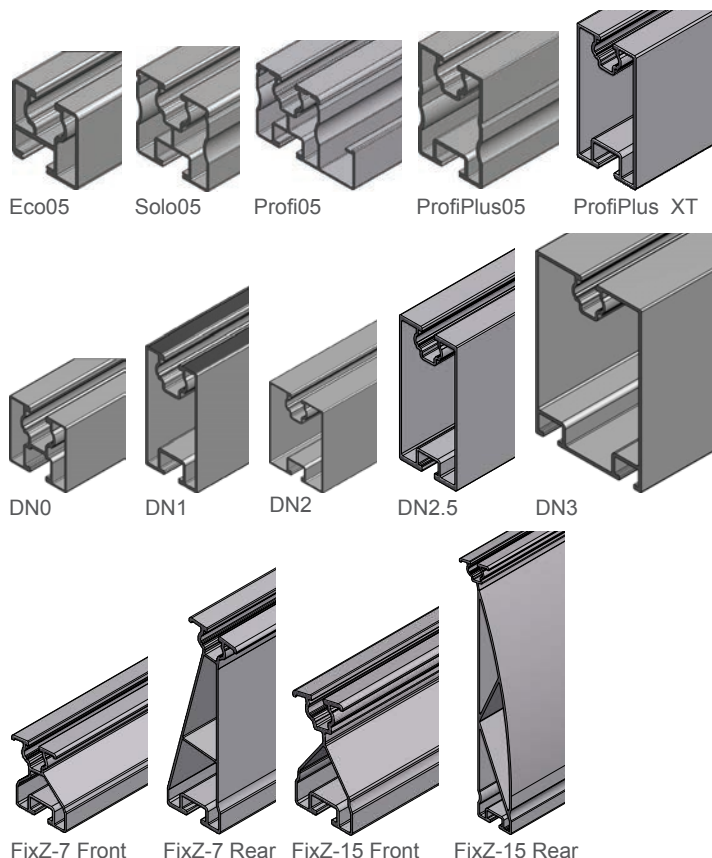
Top channel: M8
Bottom channel: M10

- DN rail series

Top channel: M10
Bottom channel: M10

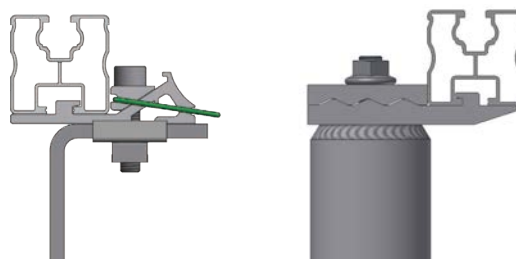
- FixZ series

Top channel: M8
Bottom channel: M10

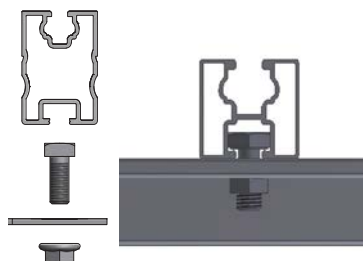


2. Install Rail

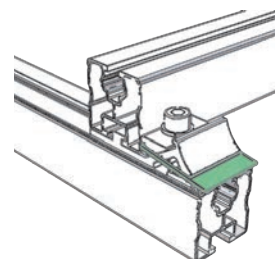
- Installation method varies depending on the type of roof attachment-to-rail connector being used; follow appropriate instructions shown to the right.



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



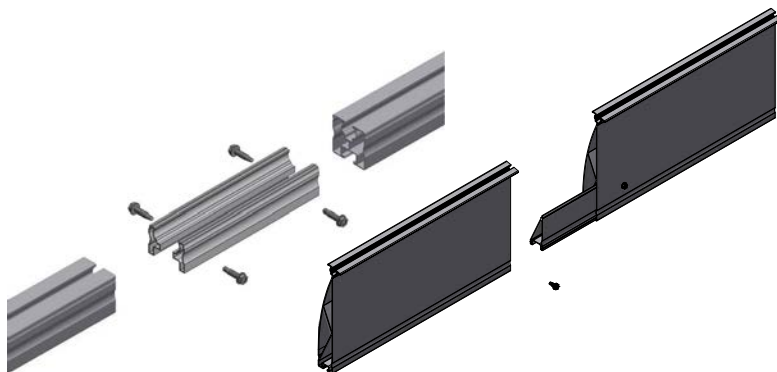
Slide M10 hexagon-head screw into rail channel, secure with M10 flange nut from underside of roof attachment



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.



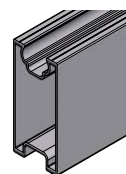
Install splice as shown in project specific drawing



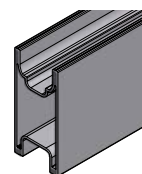
Solo05/Profi05
internal splice



ProfiPlus
internal splice



DN2.5
internal splice



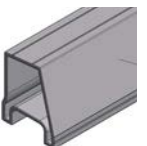
DN1
internal splice



Eco05
Connector Plate



FixZ-7 front
internal splice



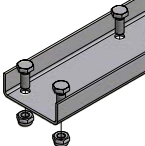
FixZ-7 Rear
internal splice



FixZ-7 Rear
internal splice



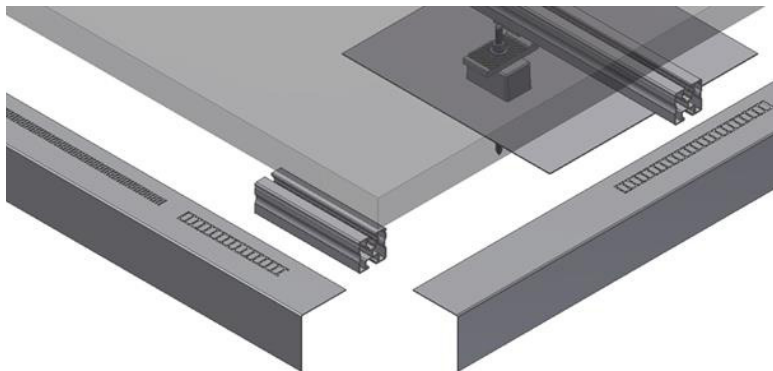
FixZ-7 Rear
internal splice



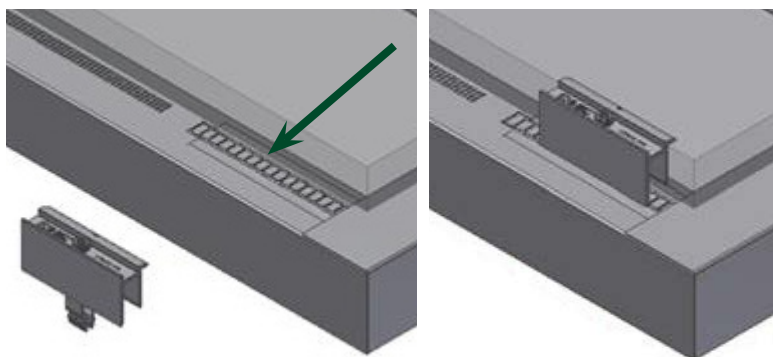
DN3 external
Splice

4. Listing Requirement

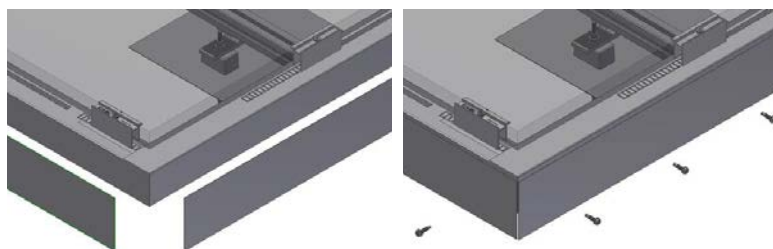
- Required in systems installed on roof slopes less than 9.5 degrees (not for use on roofs with slopes greater than 9.5 degrees).
- Fire barrier should be installed after modules are properly installed.
- Start at one corner of the system and place the horizontal and vertical fire barrier pieces between 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 1 modules.
- Only required on perimeter of array.



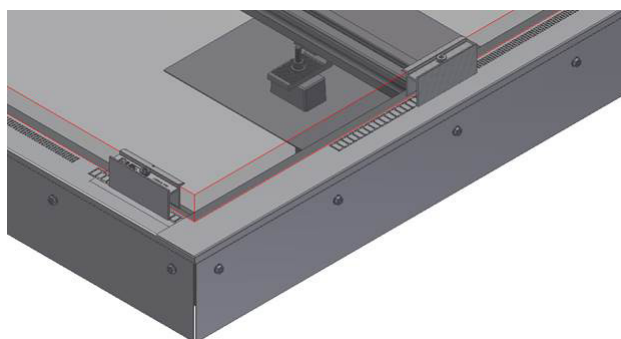
Use a short section of rail to attach the angle piece, secure with end clamps



Use a flathead screwdriver to break away tabs in order to install module clamp



Attach trim (if needed) onto angle piece with self-drilling screws

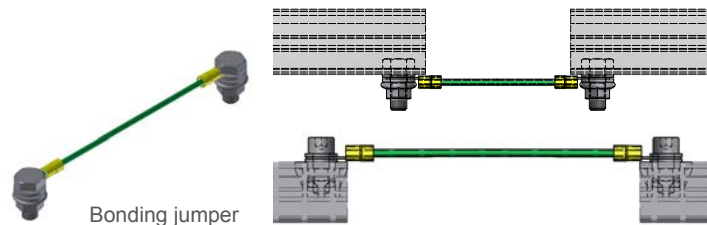


Secure all connections

Optional Accessories

1. Bonding Jumper

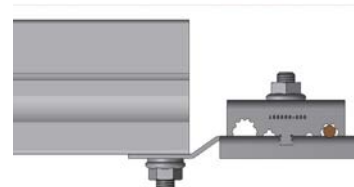
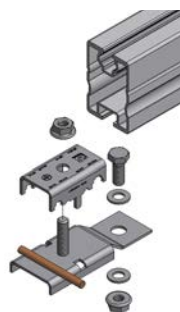
- Electrically bonds adjacent systems forming a continuous ground path.
- Available in 6-inch to 48-inch lengths.
- Required at expansion joints/ physical breaks.



Bonding jumper 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 standard 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



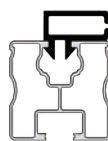
Grounding lug
(Part #135003-003)



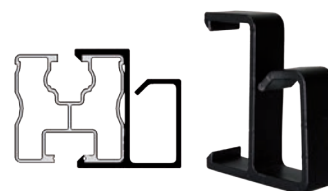
Grounding wire must extend through grounding lug by at least 1/4 inch

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-S (129012-008): gently press clip into top channel of front or rear rail, use caution as clip may break

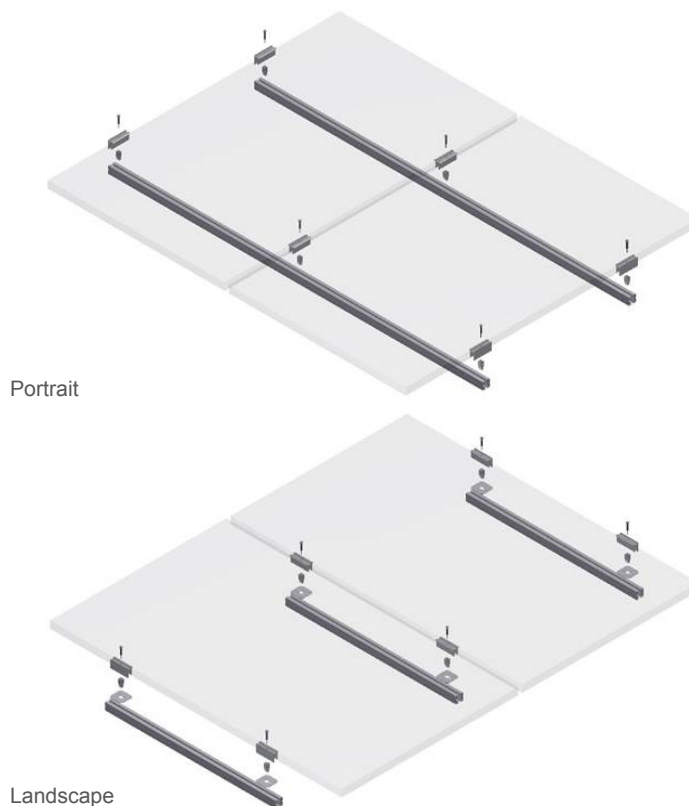


ProKlip-C (129005-000): connect clip to side of rail inserting hooks in top and bottom channels

Modules and Module Clamps

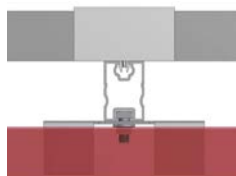
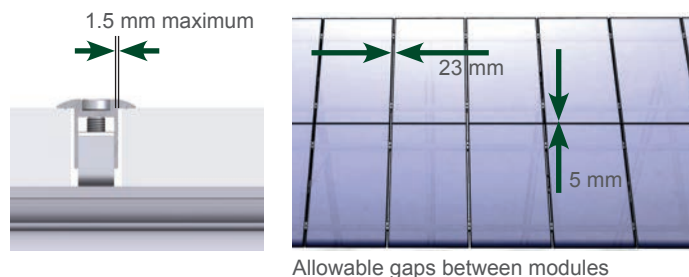
1. Position Modules

- 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.
- Schletter's Rapid²⁺™ module clamps are ETL Listed.



2. Secure Modules

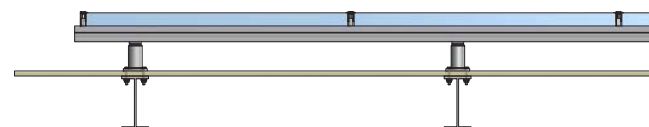
- Verify that the module clamp is fully engaged on the rail and that the module clamp is aligned with the module frame.
- Secure all clamps to specified torque values.
- When mounting modules, please observe the clamping points specified by the module manufacturer.



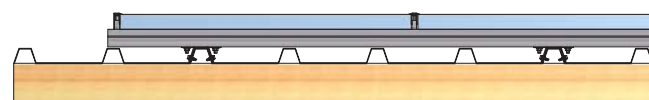
Rapid²⁺ clamp connected to purlin (side view)



Completed installation with module (Roof Hook)



Completed installation with module (Standoff)



Completed installation with module (Fix2000)

Torque Specifications and Tolerances

Systems are specifically designed for each project. Please reference your 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.

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. 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 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:

- | | |
|---------------------------------------|----------------------------------|
| ➤ Sample Drawings | ➤ Roof Attachment Product Sheets |
| ➤ Roof Mount System Overview Brochure | ➤ Installation Video |