Professional Solar Mounting Systems
Roof and Façade
System Overview, Roof and Façade

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General Information

The Schletter® PV mounting system is designed as a **modular unit assembly system** with quality materials (aluminum and stainless steel), that enables an installer to **install any module in almost any mounting situation or configuration**.

Schletter focuses on supporting the installer with instructions, calculation programs, system drawings and more, which help to **save valuable time and avoid mistakes**. We pride ourselves on our courteous and knowledgeable technical design support always being just a phone call away. Your Schletter representative will take a personal interest in your project from beginning to end.

**Schletter provides charts and software programs to assist with structural analysis**, provide mounting guidelines, and protect the installer from liability claims in the event of damage. Besides the main components (roof hooks, crossbeams, etc.), the system structural analysis also includes special fastening elements, which are continuously updated.

**State-of-the-art production facilities and procedures grant efficient and cost-effective manufacturing of both standard and custom components and systems**. Our welding procedures are **certified according to DIN 18.800** (welding standard for supporting structures) and we are in the process of obtaining U.S. certification.

Quality control is carried out according to DIN ISO 9001:2000. Being a founding member of RAL-Solar, we are a leader in furthering the development of quality standards. Our systems are also TÜV-Proof and VDE-GS certified and we provide a voluntary 10 year warranty on our system components.

**Please Note:**
- In this brochure, each system component is briefly described. Further information about the single components can be found in the component overview and the detailed spec-sheets on the single components available on our websites. For U.S. documentation and information visit www.schletter.us or for Canadian specific information at www.schletter.ca.
- Further information on the different types of mounting systems is summarized in product sheets.

☞ This sign refers to further relevant documents.
System Design

All mounting systems need to be attached to a roof or the ground in some way. In general, a PV mounting system simply consists of rails carrying row(s) of modules. The rails are connected to the roof and/or its substructure by means of fastening elements. The solar modules are held to the rails by middle and end clamps.

Most modules are mounted vertically or horizontally. While there are various kinds of system configurations available, always check that configurations are structurally sound and 100% code compliant.

Fastening Elements

A wide range of roof hooks and special fastening elements and systems allow for mounting on almost any roof construction. Structural Design tools indicate the number of fastening elements that must be installed in the corner and edge zones (array perimeter) of the roof as well as define the possible rail span under specific wind and snow conditions. These tools can be found on our website.

Register at www.schletter.us or www.schletter.ca for a client login to receive access to this information.

Many of our fastening elements have the option of combining the Schletter KlickTop for fast and easy installation.

KlickTop™ Design: Optimum mounting time and improved structural analysis values.

KlickTop Fastening Kit for Corrugated Roofs Product Sheet

Roof Hooks

Roof hooks are available for most types of tile and asphalt shingle roofs. The affordably priced welded hook designs are available in varying metal thicknesses, from EcoG™ up to VaMaX™ (reinforced design for especially heavy snow loads).

Optional rail mounting accessories designed to save installation time:

KlickTop™ Design
Rapid2+™ Design

All hooks are made of VA 1.4301 quality stainless steel. Our welding procedures follow standards set in the United States.

Component Overview: Roof Hooks
Corrugated Sheet Metal Roof Attachments
Since there are many different types of corrugated sheet metal roofs, different attachment methods are needed for optimal connections. Keep in mind that the professional mounting system will attach to the corrugations rather than the valleys of the sheet metal to minimize the possibility of leaks due to roof penetrations. The valleys of the corrugated sheet metal roofs are the water carrying area where water leaks would be far worse if penetration from attachments occur.

KlickTop™ Design: Optimum mounting time and improved structural analysis values.

FixVario™
The FixVario is an off-the-shelf fastening device for trapezoidal shaped corrugated sheet metal roofs, similar to the Fix2000 mentioned below. FixVario penetrates directly into the corrugation and NOT into the wooden or steel substructure of the building. A minimum metal gauge of 24 is required for this option. The FixVario has an optional EPDM insert for additional sealing and is delivered with sealing washers. Though Schletter offers components that can help to seal penetrations, responsibility for installation sealing lies with the installer. Quick rail connections are done with Klick attachment.

Fix2000™ and the Fix2000™ KlickTop™
Fix2000 is a proven fastening element, custom manufactured for trapezoidal-shaped corrugated sheet metal roofs. The Fix2000 clamp is custom manufactured for the individual trapezoidal sheet metal form, and is mounted with four self-drilling, self-sealing screws. The Fix2000 penetrates directly into the corrugation and NOT into the wooden or steel substructure of the building. A minimum metal gauge of 24 is required to be able to utilize this option. The Fix2000 has the option of an EPDM insert for additional sealing and is delivered with sealing washers. Please note that while Schletter offers components that can help to seal penetrations, responsibility for sealing penetration lies with the installer. The alternative to the Fix2000 standard mount includes the KlickTop connector for ease of installation.

FixT™ / FixE™
The FixT and FixE are designed for corrugated sheet metal roofs that do not allow a direct attachment to the roof support structure. With FixT, the loading is transferred into the substructure using distance pieces for steel purlins, or with hanger bolts for wood purlins. The system is also applicable to single-layer trapezoidal-shaped sheet metal roofs. Special connection components made of aluminum ensure a secure connection to the majority of roof decking.

FixE is used to attach to corrugated sheet metal roofs on steel purlins. The waterproofing is done using a special EPDM (ethylene propylene diene Monomer (M-class) rubber) formed piece which adapts perfectly to the shape of the sheet metal plate. With wooden purlins greater than 4” wide, hanger bolt combinations are possible.
Hanger Bolts
Hanger bolts are a common method of attaching to the wood substructure of the roof, similar to the FixT and FixE. The goal is to use one wood screw instead of two as on the FixT and FixE. However, the design strength of the screw is directly correlated to the pullout capacity to withstand the wind loads at the project location. Often an M12 screw is needed for this. (FixT and FixE use two M8 screws. In order to use one M12, the roof trusses need to have at least a 4” top width.)

Components Overview Brochure

Standing Seam Metal Roofs and Standing Seam Clamps
On sheet metal roofs with standing seams, standing seam clamps are used for the connection to the roof and to carry the rail. Schletter standing seam clamps pinch the seam and do not interfere or damage the integrity of the seam. The structural integrity of the roof cladding must be taken into account (e.g. adequately fastened to the substructure to withstand the wind loads).

A standing seam clamp application on titanium-zinc sheet metal roofs is not recommended, as these roofs are very brittle at subzero temperatures, which easily leads to crack formation. (An alternative for such cases is the FixPlan™ system). We offer clamps for the vast majority of sheet metal roofing types. If the sheet metal roofing material is not listed, Schletter has the ability to create custom clamps to suit the project.

Component Overview: Sheet Metal Roof Clamps

FixPlan™
The FixPlan system is for fastening on flat sheet metal roof types and on standing seam roofs with wood substructures greater than 4” wide. This system provides a safe anchoring in the substructure and helps alleviate damage from thermal length changes of the sheet metal roofing.

FixPlan KlickTop Product Sheet

Support Components

Standoff
Standoffs are an alternative for a penetrating attachment method on various types of roofs. They can be used on asphalt shingle, concrete tile and on flat roof applications where a tilt up system is being installed. We suggest that standoffs are sealed for watertightness by a licensed roofer.

SolTub™
Often a PV system can be held on a roof or on the ground by being ballasted using concrete blocks or pavers, such as with the Windsafe System. Commonly this method is used on tilted systems on flat roof surfaces. There are several options for ballast holding devices that can be adapted to the rack design. SolTub aluminum trays simplify installation and reduce cost. Depending on wind loads, the height of building, tilt of the racking system, and the location of the racking system on the roof, different ballast requirements in terms of weight are needed. There are several sizes and dimensions of SolTubs offered in the Schletter line:

<table>
<thead>
<tr>
<th>SolTub #1</th>
<th>Top width / Bottom width / Height</th>
</tr>
</thead>
<tbody>
<tr>
<td>312 mm / 12 in</td>
<td>105 mm / 4 in</td>
</tr>
<tr>
<td>SolTub #2</td>
<td>452 mm / 18 in</td>
</tr>
<tr>
<td>SolTub #3</td>
<td>386 mm / 15 in</td>
</tr>
<tr>
<td>SolTub #4</td>
<td>596 mm / 23 in</td>
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</tbody>
</table>

SolRack™
The SolRack plate is mainly used as the ballast holding option on existing gravel roofs. The existing gravel can be used as a ballast in many cases. The SolRack utilizes this ballast method. The main application for SolRack is on a tilted Windsafe System.
Cross Beam Profiles, Aluminum Profiles

**Profile Series 05**
The cross-beam or module carrying aluminum profiles Eco05™, Solo05™, Profi05™ and ProfiPlus™ are the most commonly used module carrying components of several different Schletter systems, especially in roof top applications. Each of the above mentioned rails has different characteristics with regard to its structural capabilities, such as span or load carrying ability. Please use the calculators provided in your client login at www.schletter.us or www.schletter.ca to determine which rail will fit your specific application.

**Profile Series “S”**
The Profiles in the S Series are named S0, S1, S1.5, S1.8, S2, S3 and S4. These rails are commonly used as cross beams for module carrying purposes and are found mostly in the Schletter ground mounted systems (FS System, PVMax, Park@Sol) and the IsoTop penetrating roof top system. Often these rails are combined with existing structures, such as carports, to accomplish large spans and integrate rail layers. Please ask a Schletter representative for specifics on structural aspects of the rails, such as span capabilities and load carrying capabilities.

**Profile Series “DN”**
The DN rail series is mostly used in roof top applications as an additional load distributing beam running below the “main” racking system, resulting in a layer system or cross-rail system. DN rails are categorized from DN0, DN1, DN2, DN2.5 and DN3. Each of the rails has a different span capability and load-bearing capability. Structural characteristics are available upon request. A large variety of other profile shapes are available to cover various spans, systems and loading conditions. Please ask your Schletter representative about structural characteristics and further information.

Module Clamping Systems

Schletter mostly uses what is referred to as “top down” clamps. The clamps hold the modules to the rack by applying pressure to the module frame in a material-friendly manner. At the same time, the clamps distribute the loads evenly and avoid tensions on the module glass and the module cells. Schletter carries mid- and end-clamps for nearly all sizes of module frames. Please see our detailed Components Overview for the various sizes of module clamps, including ETL listed grounding clamps listed on the following page.

Laminate Eco-Series

The Laminate Eco-Series is used for frameless solar modules. There are different clamps for different module thicknesses. Please note that safety hooks are required for portrait (vertical) installation of modules on tilted systems. On frameless modules there cannot be too much pressure applied to hold the module to the rack. Otherwise the glass modules would break. Therefore, the Laminate Eco-clamps are more of a “place holder”. In a portrait orientation (vertical) there is the danger of the module sliding out of the clamps due to the earth’s downward force.

Laminate Safety Hooks

The laminate safety hook prevents gravity from pulling the module out of place. Safety hooks available in 0.26” / 6.8 mm and 0.31” / 8 mm sizes.
Klick System

The Klick system describes the method used to mount the module clamps to the module carrying rail (cross-beam). Module clamps are usually bolted down, so a nut is needed to make the connection. The bolt channels of the Schletter rails are designed to hold that required nut. To eliminate sliding the nuts down the rail channel, we offer the Klick System — a small green plastic click component that snaps into the rail channel and allows the square nut to be slid into the rail at the location needed while still being able to move along the rail channel afterwards. The result is time saved during installation.

Rapid2+™ Clamp

The Rapid2+, considered a top-down module clamp, quickly clamps the modules to the cross beams (see above) by using pressure to hold the module down. The Rapid2+ eliminates the use of nuts and bolts, resulting in shorter mounting times and fewer parts.

• Quick and simple installation
• Secured with quality stainless steel bolts

Integrated grounding pin eliminates the use of extra material to bond modules to the rack = huge cost savings (please consult with your module supplier to find out if they approve this bonding method)
• Completely pre-assembled. The clamps snap into the Schletter rail channel and only needs to be tightened down.

♫ Component Overview: Module Clamps
♫ Potential Equalization Product Sheet
♫ Laminate Mounting
Schletter Systems

Schletter Standard Flush Mount

The easiest option for a flush mounted roof top system (also called roof parallel) is made up of the following components:

• Roof attachment
• Cross-beams (module carrying rails) — connect directly to the roof attachment
• Module clamps and hardware needed to attach clamps

Generally, two horizontal running rails (usually East-West running) (05 Series) carry one row of vertical (portrait) oriented modules. The rails are connected to the roof by the proper attachment methods. The modules are held using module clamps.

Modules can also be used in a landscape (horizontal) orientation and be mounted directly to the cross beams. A Schletter system shares a middle rail in landscape scenarios. (Please see picture to the right).

To chose the correct rail for the right span and to determine the correct spacing of the roof attachments, please see the Schletter flush mount calculator on the Client Login portion of our website.

Please see examples of application on the back of this page

➤ Product Sheet Schletter Standard

GridNorm™ System: Layer Design with Cross Rails

GridNorm is the solution when a racking system needs to be configured as a layer system. A layer system adds an additional load distributing rail to the Standard Flush Mount (see above). It is needed when the roof substructure does not meet with the span requirements of the roof attachments, or when a special module orientation is needed in relation to the direction the trusses run to the module carrying rails. A load distributing rail should always cross the load carrying trusses of the roof in a 90° angle. If the cross beams cannot achieve that directly due to the module orientation, a second rail layer is needed. Rails in a layer system are connected using the KlickTop-Cross Connector.

Please see examples of this application on the side of this page.

➤ GridNorm Product Sheet
➤ KlickTop Product Sheet
Different Types of Module Mounting

**Single Layered**
In most cases, it is recommended to mount the rails vertically to the substructure.

![Vertical to the Substructure — Rafter](image1)

![Vertical to the Substructure — Purlin](image2)

**Cross Rail**
Cross rail mounting is highly recommended if the substructure does not feature suitable mounting locations.

![Cross Rail 1 — Rafter](image3)

![Cross Rail 1 — Purlin](image4)

![Cross Rail 2 — Rafter](image5)

![Cross Rail 2 — Purlin](image6)

**Linear Support**
Designed specifically for horizontal (landscape) mounting.

![Linear Support](image7)
Overview of Tilted Mounting Systems

With a wide variety of system components to choose from, and considering the wide variety of roof orientations, analyzing the specific needs of each mounting project is necessary.

The following describes different types of flat roof systems and system components that may be used in tilted mounting systems.

Generally, two types of tilted mounting systems are available:

a) Roof penetrating systems

b) Ballasted solutions (non-penetrating)

Ballasted solutions should not be chosen or offered without thorough examinations performed on the basis of turbulent wind flow conditions and extensive wind-tunnel testing results. Schletter offers extensive design analysis using software adhering to the latest IBC code standards. It is not recommended to install a ballasted solution without verifying the structure’s ability to support the loading conditions imparted by the system. Additionally, PE stamped loading calculations will normally be required by building authorities.

Mounting on Flat Roofs
Structure of Tilted Systems

A tilted system is in general built up of the following components:

- Ballast tub (ballast holding device) or roof attachment for applications with penetrating systems
- Support triangle manufactured to the desired tilt of the system
- Cross beams to hold the modules
- Module clamps
- Windshield to reduce wind loads on rack

Cross beams are mounted to the support triangles by KlickTops.

In the case of a penetrating system a distribution rail between the roof attachment and the support triangle may be needed in addition to meet spans for tie in points.

Tilted systems are usually designed by a Schletter professional to the specifications of the customer (tilt, lengths, modules staked on top of each other, landscape or portrait orientation, wind and snow loads etc.). Please call us for more information or a design.

Smaller systems can also be designed by the customers themselves using standard support triangles and standardized ballast tubs of the Schletter line.

Single Supports

With systems on single supports, usually one module row is fastening to rails which rest on single supports. The individual supports may be fastened to the roof or loaded individually.

Light™ Support Series
Designed specifically for cross mounting and vertical mounting with narrow spans. The standard angle is 30 degrees, and customized angles are also available on demand.

Profi™ Support Series
Economically priced angle support, structurally suitable for upright mounting and wider spans. The standard angle is 30 degrees, and customized angles are available request.
**Windsafe™**
The term Windsafe is applied to all Schletter tilted roof racks (penetrating or ballasted) that use a windshield in the back to reduce the effect of wind loads attacking the PV structure. This reduction leads to less ballast needed to secure the system to the roof.

The wind shield is an aluminum sheet metal mounted to the back of the rack spanning from one triangular support to the next. It is available in standard lengths for standard applications and profiles.

- Windsafe Product Sheet
- Components Overview Brochure

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**AluLight™**
Adding to a history of proven ballasted system designs, AluLight offers quick and easy installation for flat roof systems. AluLight accommodates most photovoltaic modules, offering a fixed 12 degree tilt angle and a landscape (horizontal) oriented module. Concrete ballast ensures the AluLight base remains in place, making the system ideal for exacting high-wind conditions where roof dead load weight is a concern. The AluLight is Windtunnel tested and can achieve overall spread-loads below 5 psf in the right applications. Please contact your trusted Schletter representative for further information.

- AluLight Product Sheet

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![AluLight, ballasted system](image) ![Windsafe, penetrating system](image)
CompactVario™

CompactVario is a tilted mounting system for flat and pitched roofs, designed specifically for spanning large distances between purlins. The DN rail series is used as a distribution rail below the triangular supports. The distribution rail usually runs in a North-South direction crossing East-West running trusses or purlins of the roof.

Combining the different attachment elements (FixT, FixE, etc.) with CompactVario creates a universal system, mountable to almost every purlin roof.

The CompactVario™ — can also be used in ballasted racking environments. In this case, connecting the single Windsafe racks in a North-South direction will tie the single racks together to one large grid and therefore offer more wind resistance.

CompactGrid™

When the necessary number of fastening points on the roof cannot be obtained, or when a better distribution of the connection points is necessary because of a limited firmness of the roof (e.g., on sheet metal roofs), CompactGrid is an excellent option.

⇒ CompactGrid Product Sheet
Flat roof mounts that are designed without penetrations of the roof cladding have to be secured against wind suction, tilting, and sliding by means of sufficient superimposed loads. The CompactVario system offers advantages in this respect, as considerably lower superimposed loads are required due to its design.

- CompactVario Product Sheet

**Special Systems**

**CompactDirect™**

Under certain conditions it is possible to mount the flat roof support to the substructure of the building by means of a suitable connector (e.g., hanger bolt kit).

- CompactDirect Product Sheet

**FixZ-7™**

The flush-mounting or a roof-parallel mounting is not optimal on flat sheet metal roofs with less than a 10 degree inclination due to the low module output yields and the insufficient self-cleaning of the modules found with higher tilts. The Schletter FixZ-7 offers the perfect solution for these problematic cases by offering an additional 5 to 7 degrees of tilt.

- FixZ-7 Product Sheet
**IsoTop™**

Membrane roofs of industrial buildings are often constructed of a substructure with large girder or joist spans and a relatively soft roof covering (foam or EPDM). The dimensioning of the structural supports and the allowed pressure load of the insulation are often so small that loading from ballasted solutions are ruled out immediately.

IsoTop is the perfect solution for supporting PV plants with membrane roofs of industrial buildings. In the project planning stage, Schletter provides rigorous consulting services for planning the PV supporting structure in order to find the most economic solution for the respective substructure. The design will be optimized to reduce penetrations even when large span distances are required. Often support brackets can be welded at a low cost. The system support brackets to the substructure can also be designed with a thermal separation barrier.

- IsoTop Product Sheet
- IsoTop Check List
Façade and Awning Systems

Mounting to a façade involves fastening panels to vertical walls. If the mounts are in visible locations, attachments with optional colored designs (e.g., anodized or powder-coated) can be delivered.

**Awning System**

The awning system is a specially designed façade mount. Awning supports (also called façade supports) are mounted to vertical walls or façades, and bear the rails for the module rows.

- Façade Support Product Sheet
- Façade Mounting

**Façade System**

In certain cases, standard components can be used for mounting unframed or laminated modules to vertical walls or façades (bearing rails, module clamps, and screw anchor brackets for wall mounting).

- Façade Mounting
Accessories

Lightning Protection and System Grounding

For the grounding of anodized module frames, it is recommended to use special grounding shims or plates in combination with the middle and end clamps to break the anodized layer of the panel frame. The module is connected in a conductive manner to the mounting rack at several spots. An alternative grounding middle clamp (with grounding pins) provides a grounding solution integrated into the middle clamp, installed directly from above.

- Grounding Product Sheet
- Rapid+ Grounding Middle Clamp: Product Sheet (ETL Listed)
- Grounding Conductor Plate: Product Sheet (ETL Listed)

Cable Duct Systems

A clean and professional cable routing can have an influence on the end-user’s overall impression of the mounting quality. The standard profiles (Profi 05™) of the Schletter system offer the possibility of attractive cable routing by use of a duct that can be supplemented with a lid. The rectangular cable duct can be fastened to the rails at a right angle and then fastened from below.

If extensive wiring is required, we offer the cable duct system MaxK™. Different system components and even an extendable universal duct are available. In cases in which a cable duct would be too much of an effort or when additional cables have to be fixed, ProKlips™ can be inserted in the Klick™ grooves of the rails.

- Component Overview MaxK
- Cable Clips Product Sheet

SecuFix™/SecuFix2™

SecuFix is a simple anti-theft device that can be combined with all new Schletter systems or retrofitted to an existing Schletter system. The socket head screws of the module clamps are secured against any unauthorized loosening by a high-grade stainless steel ball which is punched into the screw head.

SecuFix2 represents further development of the SecuFix system. An additional “lateral protection” at the ends of the module rows acts as an increased theft deterrent. SecuFix2 can be combined with additional security equipment (electronic plant surveillance, etc.) to further protect your project.

- SecuFix/SecuFix2 Product Sheet
**System Overview, Roof and Façade**

**Service**

**Sending of Delivery Notes**

E-mail updates are sent regularly, containing important shipping and product specific information.

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**Calculation of Superimposed Load**

Roof height, basis width, terrain category, and wind load, are all required parameters for the calculation of a superimposed load for flat roofs. Upon request, Schletter can perform these calculations for customers using our proprietary system software.

☞ Mounting on Flat Roofs

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**System Structural Analysis**

The system structural analysis provides exact guidelines for the application and installation of all system components and for different module configurations. Each analysis addresses both safety and economic efficiency. Coupling the system structural analysis and building construction documents with the mounting documentation protects the installer from subsequent warranty claims.

General guidelines, load calculation, and project planning charts are available at no charge to our valued clients. Complex software programs for all components and systems enable us to create complete 100% code compliant structural analyses in-house.

☞ System Structural Analysis
☞ Individual Structural Analysis Charts
Mounting Instructions

The mounting instructions contain important information for the installer. Simply arranged and well-illustrated descriptions provide a quick overview, even to inexperienced users.

- Mounting and Project Planning
- System-Specific Instructions

Sample Case and Module Rack

The new sample case by Schletter demonstrates the fine quality of Schletter products and components.

* Please note that there is a small investment required for this sample case.

- Sample Case Product Sheet

Module Holder

The Module Holder is specially designed for trade shows and other professional presentations. Version 400650 features one rack with two wooden beams which represent the rafters of a pitched roof. Roof hooks, mounting rails, and the module are fixed to these rafters. The 400650-Alu design is a module stand with anodized aluminium bearing rails.

Delivery complete with fastening kit for one module including roof hooks, screws, etc. Please specify the module type when placing an order.

- Module Stand Product Sheet

Roll-Up Banners & Printed Literature

As our valued partner, our goal is to make your next trade show or client meeting a success! We are happy to provide Schletter printed literature and other promotional pieces to you.
For complete project planning and questions concerning logistics and order processing, we are available from Monday to Friday from 7 am to 5 pm.

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