

Schletter Solar Mounting Systems



AluGrid Flat roof system

- Quick, simple and, to a large extent, tool-free assembly
- Load-optimized
- Optimized number of components
- Economical solution
- Structural analysis based on the latest research on wind dynamics

 **SCHLETTER**

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AluGrid variants - Overview



AluGrid

The basic design with optimized number of components.



AluGrid100

East-west design for maximum utilization of surface area.



AluGrid+

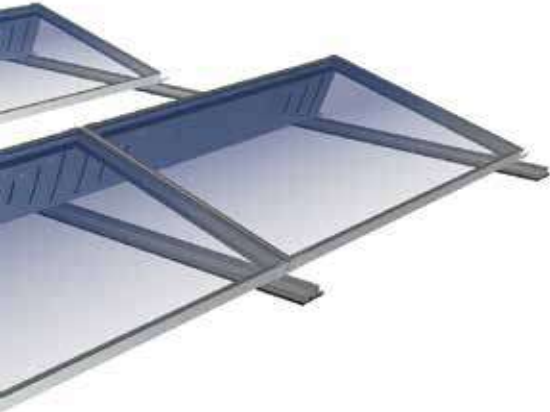
For modules that cannot be clamped at outer edges.



AluGrid100+

East-west design for maximum utilization of surface area.

For modules that cannot be clamped at outer edges.



*The terms of guarantee can be referenced at www.schletter.de/AGB_en. Subject to changes and/or technical modifications.

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Guidelines and information relating to assembly and mounting of this product can be found in our Mounting Instructions, available for reference on our website: www.schletter.eu.

The basic design



AluGrid The standard design

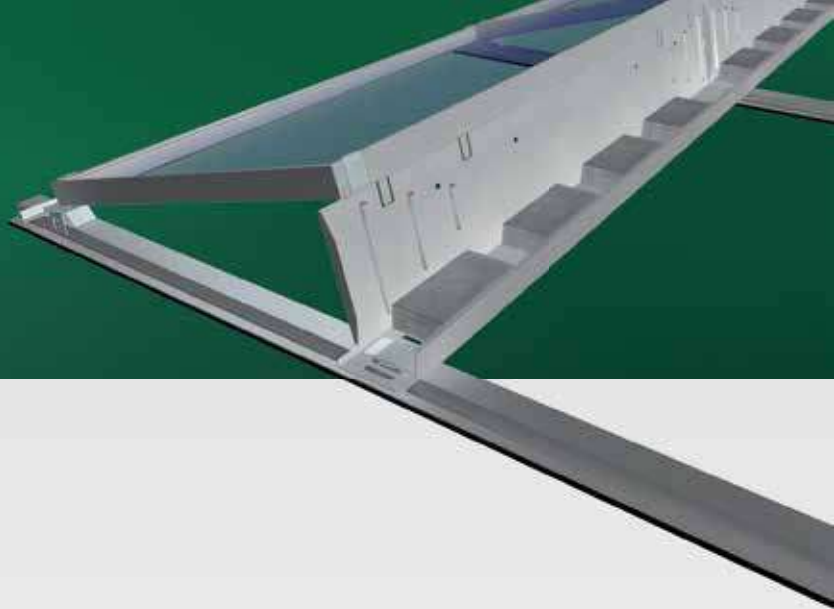
With **AluGrid** Schletter is offering a system optimized in both material and tool requirements, Modules are arranged in closed rows with a fixed tilt angle of approx. 15 or 10 degrees. Only minimal superimposed loads are required. Components are interconnected using a Klick system. The maximum permissible roof inclination for all AluGrid versions is 10°. Installation of a mechanical anti-slide mechanism is recommended for pitched roofs.

Modules are mounted and secured to the substructure using screwless clamps (spring clamps). Modules are fastened at the edges. If loads are distributed differently across the plant, one blanket approval from the manufacturer may be sufficient to cover the whole project (c.f. IEC 61215). We have posted approvals from a number of manufacturers for your reference in the Downloads area of our website www.schletter.eu under Solar Mounting \ Warranty and Certifications.

Ballast can be distributed to trays at the rear (Windsafe) plate in accordance with structural requirements. Compatible plates are available to fit the majority of module sizes currently available on the market.

Use of approved aluminium and stainless steel materials ensures an almost unlimited service life even with high UV-irradiation and gains a high level of acceptance in structural surveys.





Module clamping

Module spring clamps are available for modules with a frame thickness of 30-51mm. In the basic design the modules are clamped in the corner section of the long sides. The customer must validate that clamps are correctly positioned on the modules, in accordance with the manufacture guidelines. Custom-designed pliers must be used for the mounting of module clamps. Further information is available in the AluGrid mounting instruction.



Rubber underlay / roof surface protection

The rubber underlay is simply placed on the continuous beam from below and serves as a convenient surface protection element. Further information on design and compatibility with different roof membranes can be found on page 10.



Cable routing

The cable duct (available as an option) facilitates optimal routing of cables along the continuous beam between module rows. Simply click on the plastic clips, attach the aluminium cover and click in the grounding clip - Done! Cables can be fastened to the Windsafe plate using our Prokclip-S cable clip.



Superimposed load/ballast

Concrete stones (for example curbstones, paving stones), gravel etc. can be used for ballasting. More information on Page 13.

The basic design



Heavy snow loads

AluGrid can also be configured to withstand greater forces than 2.4 kN/m^2 in regions with higher snow loads - ie. up to 5.4 kN/m^2 . This is achieved by using an additional support with AluGrid and AluGrid+. The additional support serves to increase the load-bearing capacity of the Windsafe sheet. The calculation software automatically selects stronger lower module supports. Some existing components can be optimized in such a way as to support greater loads.



AluGrid superimposed load calculation

The convenience of AluGrid lies not only in the mounting of the system. The load calculator, available on the Schletter website, simplifies the dimensioning of plants more than ever before. Using postal codes as a basis, the program determines the regional-specific loads across the globe and for all common, tilted systems manufactured by Schletter. In the course of determining load, the program creates a specific ballasting plan.

Further designs



AluGrid+ For variable module clamping

Continuous optimization of materials means that AluGrid is a particularly economically efficient system solution. In the basic design, the modules are clamped at the short sides, in so far as a corresponding approval is available. Where this is not the case, a variant of the AluGrid system can still be deployed: the AluGrid+ design. Modules are fastened to the rails using custom-designed clamps. The rack is then secured to the continuous beam.

The rail length facilitates adjustment of module clamps up to 25% inwards - to comply with manufacturer specifications. Windsafe sheets can be fastened precisely in accordance with module manufacturer specifications. The height of the lower rail allows for a reduction in module tilt angle of approx. 1°. The exact tilt angle can be calculated using the AluGrid calculator.

An AluGrid+ system can be dimensioned at a price that is only slightly higher than that of a basic design, even if the modules deployed have no general approval for fastening.



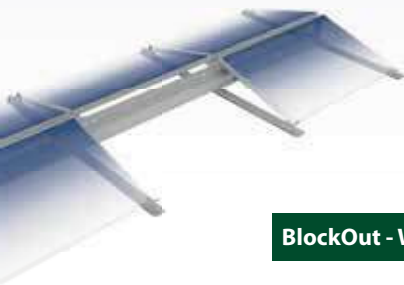
Further designs



AluGrid100 For east-west roofs

More and more investors opt for an east-west orientation of modules to achieve a proportionally higher utilization of the roof by eliminating the need for shade distances. Aerodynamic optimization of the system has also reduced the need for superimposed loading to a minimum. These superimposed loads can be structurally verified in each case. AluGrid offers an inexpensive system solution which is easy to assemble. As with the AluGrid basic variant, modules are clamped in the corner areas of the long sides. The customer must verify that clamps are correctly positioned on the modules, in accordance with the manufacture guidelines. We have posted approvals from a number of manufacturers for your reference in the Downloads area of our website www.schletter.eu under Solar Mounting \ Warranty and Certifications.

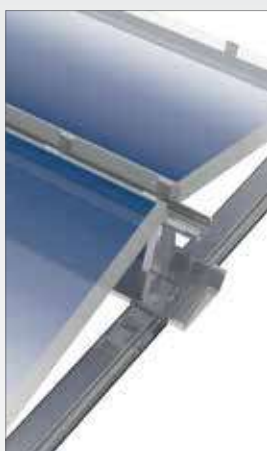
In contrast to the AluGrid basic variant, this system does not use Windsafe sheets, rather, loading trays are mounted onto continuous beams, providing a connection between rows while allowing for custom amounts of ballast, such as stone or gravel, to be added to each plant. The upper bearings constitute the "AluGrid100 module bearings" supports with an integrated bearing rail which is fitted inside the loading tray and is secured with fastening clamps of type used in the basic design.



BlockOut - Windsafe

Windsafe sheets can be added to AluGrid100 and AluGrid100+ in specific areas not usable for the installation of modules (e.g. rooflight dome). Fasten to the supports with 2 self-drilling screws. Universal size, for tilt angles of 15° and for 10° respectively. Implementation options in the grey and red loading zones (see structural analysis Page 24)



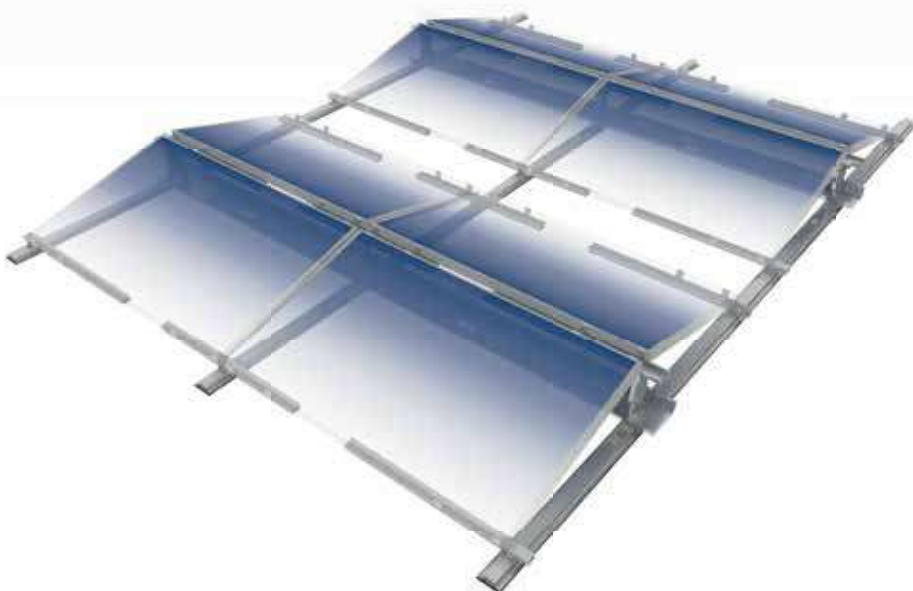


AluGrid100+

The variable east-west system

AluGrid100+ combines the advantages of AluGrid100 and AluGrid+: The cross rails included in the scope of delivery allow clamping points for the PV modules to be turned inwards up to 25 %. This makes it possible to clamp the modules according to the exact specifications set by the module manufacturer if modules cannot be fastened at the corners. The tilt angle of the panel is, however, only approx. 1 degree less than that of the basic version. The exact tilt angle can be calculated using the AluGrid calculator.

As with the AluGrid100, modules are aligned in East-West orientation thus eliminating shading distances and resulting in a greater yield per square meter. The system does not require Windsafe sheets. Modules are fastened to support rails from below and above using AluGrid spring clamps. Integrated loading trays secured to the system with AluGrid fastening clamps facilitate sufficient ballasting of the system while connecting rows of continuous beams.



Special features in detail

The AluGrid rubber underlay

We recommend using AluGrid rubber underlay (4 mm rolled material 166003-001) between the AluGrid continuous beam and the roofing membrane of the flat roof. The drainage and flow direction of rain water must be taken into account. Ideally water should flow parallel to the continuous beams.

The rubber underlay is made of high quality EPDM material and is perfectly compatible with bitumen sheeting. There is almost no risk of damage to the roof surface from use of this material. On the contrary, we have explicit approval by some manufacturers for the utilization of the underlay. Where this is not the case, the respective manufacturer must validate compatibility. It is known that some PVC materials are incompatible with certain types of roofing membrane due to plasticizer migration. There is a special surface protection mat with aluminium lamination that can be used on such roofing membranes in order to prevent any diffusion of the plasticizer into the surface protection mats.

Where run-off water flows perpendicular to the continuous beams, strips of surface protection mats with a thickness of 20 mm can be used instead of rubber underlays. The self-adhesive strips can be fastened to the continuous beams even before those continuous beams are laid to facilitate this work step. Special continuous beams have facility for fastening these strips to the sides. See both variants on Page 12.



Compatibility of the AluGrid rubber underlay with roofing membranes (Subject to change without notice)

Manufacturer	Products	Standard rubber underlay
Alwitra	Evalon white, grey, colored; Evalastic „R“ grey	approval granted; reservation*
Bauder	Bitumen roof membrane	approval granted
Bauder	Thermofol (PVC-Dachbahn)	not compatible
Bauder	Thermoplan (FPO-roofing membrane); Termofin (FPO roof membrane)	approval granted
FDT	Rhenofol, Rhepanol HG	compatible only with additional measures***
Soprema	Bitumen roof membranes	approval granted
Soprema	Flagon on the basis of FPO or PVC	compatible only with additional measures****
Hirler	VAEplan white, grey, colored	approval granted
Polyfin	Polyfin 3020, 3018, 3016 and 4230; O.C.-Plan 3020 and 4230	approval granted
Sika	Sarnafil TS, TG, TG Felt auf Basis FPO	compatible only with additional measures**
Sika	Sikaplan G/VG, SGK, SG, SGmA based on PVC-P, nb	compatible only with additional measures**
Sika	Sikaplan RV-s based on PVC-P, bv	compatible only with additional measures**
Mapei GmbH	MAPEPLAN based on FPO (...T M, ...T I, ...Af, ...T B)	approval granted Reservation*
Mapei GmbH	MAPEPLAN based on PVC (...M, ...B)	compatible only with additional measures****

* Discoloration and/or other imprinting in the membrane surface may occur over time,

however, in our many years of experience, this has never led to impairment of the roof

** Additional measures: on request and/or in consultation with the membrane manufacturer

*** Additional measure: Synthetic fleece of polyester, polypropylene or a combination of both with 180g/qm

**** Additional measure: Synthetic fleece made of polyester, polypropylene or a combination of both with 180g/qm

All data in accordance with respective responses from membrane manufacturers. Schletter GmbH accepts no liability for the accuracy of the data.

Special features in detail



EPDM rubber underlay

Prerequisite: Roofing membrane and the EPDM rubber underlay are compatible and the water run-off flows parallel to the continuous beams.

- 166501-006 AluGrid continuous beam 6m, and/or -004 (4m) or -001 (custom cut)
- 166003-001 AluGrid rubber underlay continuous beam

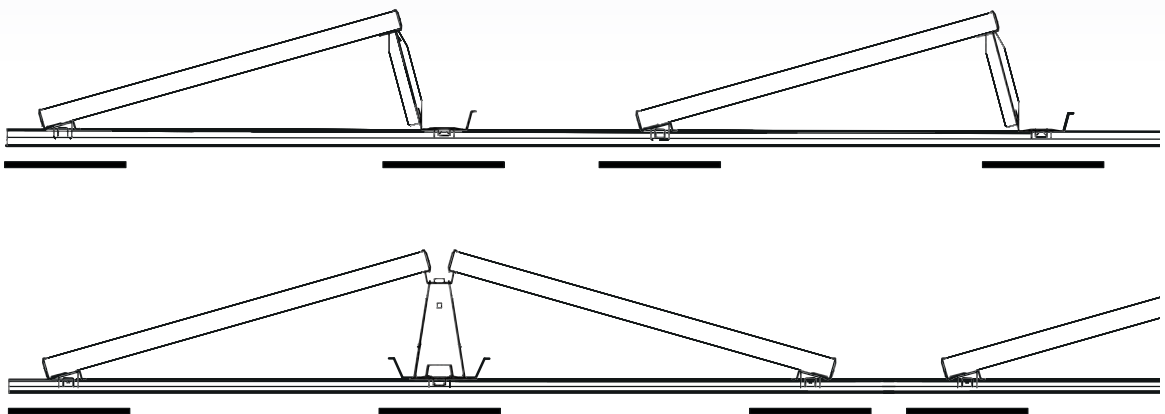


Surface protection mat with aluminium lamination (water runs off perpendicularly to the continuous beam)

Prerequisite: Run-off water flow is perpendicular to continuous beam; no proof of compatibility required (due to aluminium lamination = separation layer),

- 166505-006 AluGrid continuous beam for protection mat 6m and / or -004 (4 m) or -001 (custom cut)
- 169004-003 Protection mat strips 300x110x 20mm with aluminium lamination, self-adhesive on one side to facilitate mounting onto continuous beam

The strips are put centrally under each bearing point/fastening point (see assembly diagram below). The amount and the distance and between strips can be adjusted depending on the volume of rainfall and the partial loading capacity of the flat roof.



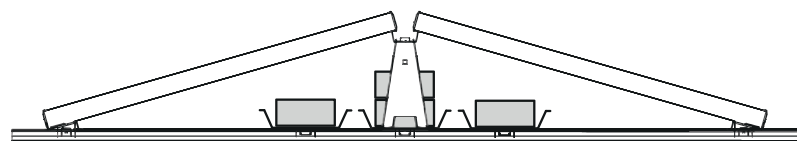
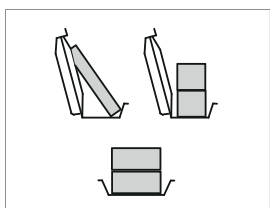
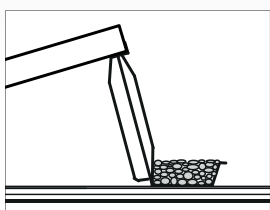


Ballasting

Ballast trays fitted to the Windsafe sheets of system variants AluGrid and AluGrid+ as well as those from AlGrid100 and AluGrid100+ are configured to hold a maximum load of 100 kg/module. The load should be distributed as evenly as possible. Where this is not possible, ballast should be contained in areas close to the continuous beams. If greater loads are required e.g. in corner areas, further ballast trays can be added. Ballast trays from the system variant AluGrid100 can be used to this purpose. These can be installed beneath the modules or in an area of shading clearance, for example. However, it has to be made sure that no further shading distances are created.

By evenly filling ballast trays with gravel of grain size 16/32 or 8/16 a load of 10kg/lfm can be achieved with the AluGrid and AluGrid+ systems. The even loading of AluGrid100 and AluGrid100+ trays achieves a load of 16kg/lfm.

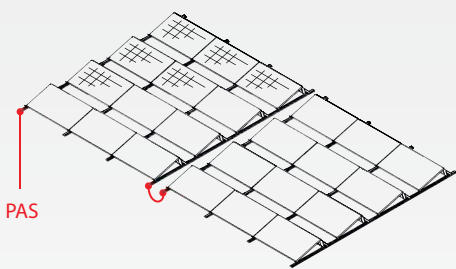
Further options are available by using standard concrete blocks as ballast. The maximum breadth is 11.5 cm with AluGrid and AluGrid+ and 18cm with AluGrid and AluGrid100+.



Lightning protection and potential equalization

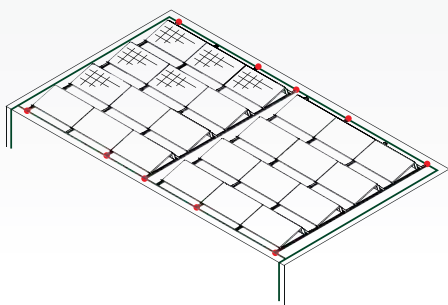
Integration of the system

AluGrid is a safe system, optimized in wind dynamics and competitive in price. The potential equalization and lightning protection are also fully integrated to 100%. There are **4 possible levels of integration** into existing system designs:



Level 1: Potential equalization

In principle all components of a PV plant must be integrated into the potential equalization of the building. This requires a low-impedance connection between all components of the load-bearing system. Depending on the specifications provided by the module manufacturer, it may be necessary to integrate the module frames into the potential equalization. AluGrid fulfils all these requirements. Please note that the various units of the load-bearing system must be interconnected using the appropriate terminal clamps. Special module clamps also facilitate the integration of module frames into the potential equalization. The relevant contact is achieved, despite the anodized coating, between a small metal pin protruding from the clamp and the module frame.

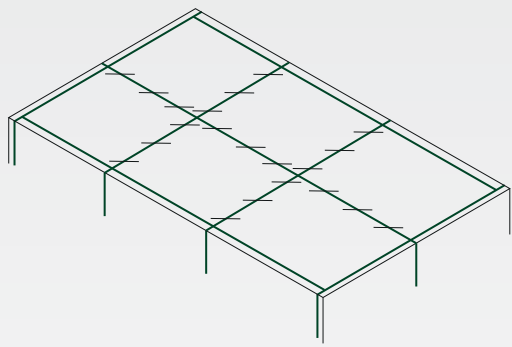


Level 2: Connections capable of carrying lightning current

When installing a PV plant on a flat roof, care must be taken not to compromise the effect of an external lightning protection system already present on the building. Ideally the installation concept allows for subsequent integration of the plant into the building lightning protection. The separation distance between PV plant and lightning protection system must comply with regulations outlined in VDE 0185-305-3 Addendum 5. Should this not be possible, e.g. on a metal roof, then pertinent alternative standards apply for the integration of the PV plant with the lightning protection system. In such cases, separation distances do not need to be maintained. Mounting points and internal connections of the load-bearing system must be able to carry current. AluGrid fulfils these prerequisites.

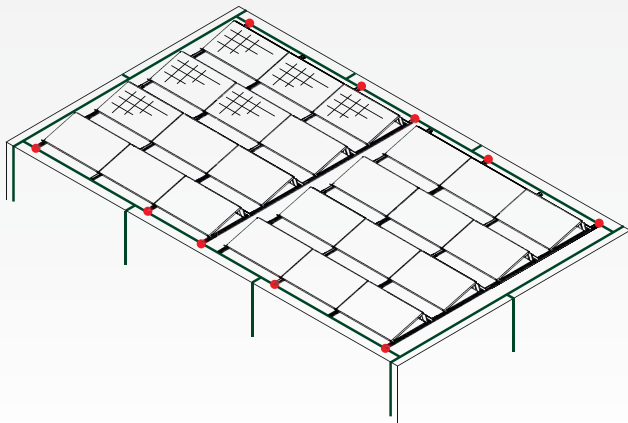
Guidelines for DC cabling and switching:

Where separation distances are not maintained and the load-bearing system is integrated, instead, into the lightning protection system, the entire cabling network of the plant is exposed to partial lightning current. Type 1 lightning arresters must be incorporated into the DC circuit in such cases to protect against overvoltage. Detailed specifications relating to lightning current carrying capability and the dimensioning of arresters are outlined in the corresponding standards. In each case the entire wiring concept must be approved by a lightning protection planning office.

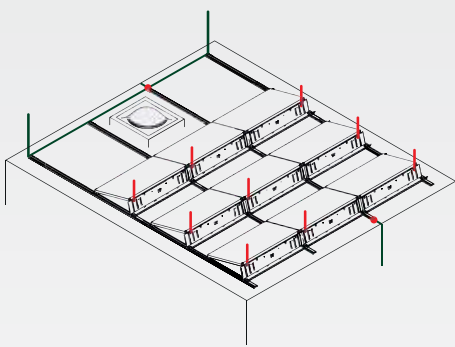


Level 3: Replacement of parts from an external lightning protection system.

In some cases there may already be an enhanced and appropriately integrated lightning protection system available on the flat roof. If, in such cases, there is a physical encroachment of systems (even if only by the galvanized rack connection) this can lead to mounting problems. To counteract this issue, the arresting device can be removed from the external lightning protection system and replaced by AluGrid. Please ensure, when connecting components, that the designated current-carrying clamps are used and that the maximum mesh width is maintained when installing lightning rods. Lightning rods are arranged in such a way as to protect modules from a direct strike. Information from level 2 must be taken into account.



Lightning protection and potential equalization



Level 4: AluGrid as an arresting device to an external lightning protection system

The tested lightning current carrying capability of the entire AluGrid system allows for AluGrid to be utilized as an arresting device in the event that separation distances cannot be maintained. The following pre-conditions apply:

1. *The entire system must be equipped with AluGridProtect lightning rods*

Lightning protection rods must be connected at roof edges at the very least, but ideally also within module rows, at appropriate transverse distances (generally 6 m). A geometric test, carried out in compliance with the known rolling sphere method, may reveal the potential for omitting rods (e.g. in every other row).

Please note that either a minimal reduction of yield must be tolerated due to the core shadow cast by the lightning rods, or, the distance between module rows must be increased to compensate.

2. *Additional lightning rods in edge zones*

Tests must be carried out, using the rolling sphere method, to establish if additional lightning rods are required in the edge zones of the PV plant and/or of the building in order to integrate the plant or the entire building into the protection area.

3. *Arrester and grounding system*

The individual sub-fields of the PV mounting system AluGrid must be connected such that the mesh installation on the roof is compliant with legal standards. Additional rods must be added if required. For partial lightning currents, arresters must be installed at appropriate distances and connected to a grounding system that complies with official standards.

4. *Wiring of the DC-cables*

Information given in level 2 must be taken into account.

5. *Verification and Certification*

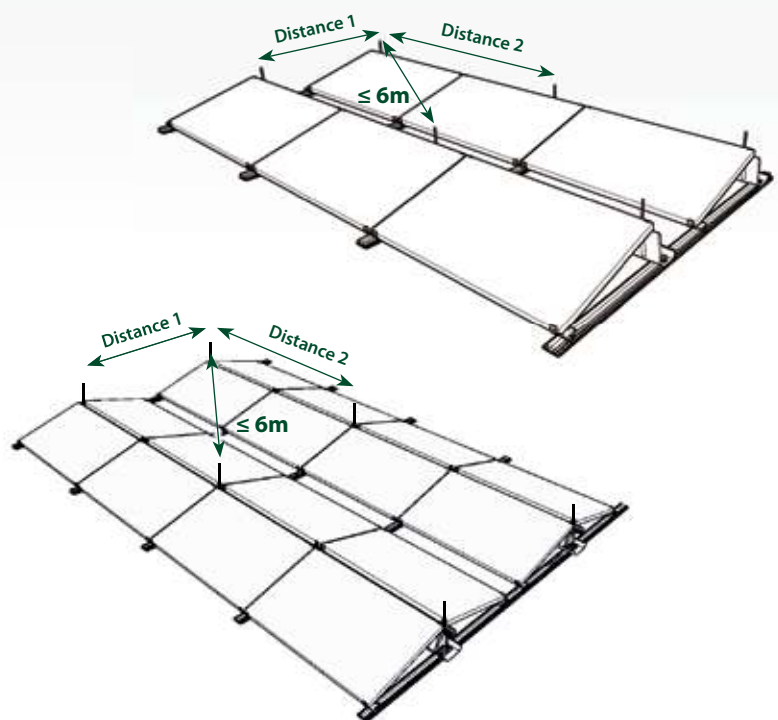
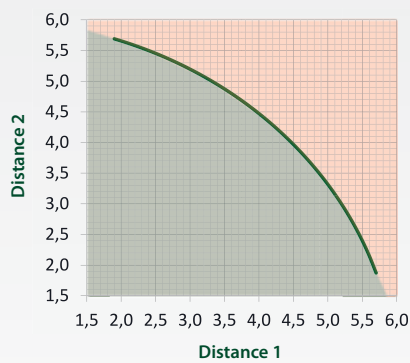
A test was carried out to verify the compatibility of the system for integration into lightning protection systems, whereby lightning current carrying capability of all connections was checked in accordance with the standards. These tests were carried out subsequent to mandatory pre-aging of all components using salt-spray.

Distance 1 (m)	Distance 2 (m)
1,80	5,73
2,00	5,66
2,20	5,58
2,40	5,50
2,60	5,41
2,80	5,31
3,00	5,20
3,20	5,08
3,40	4,94
3,60	4,80
3,80	4,64
4,00	4,47
4,10	4,38
4,20	4,28
4,30	4,18
4,40	4,08
4,50	3,97
4,60	3,85
4,70	3,73
4,80	3,60
4,90	3,46
5,00	3,32
5,10	3,16
5,20	2,99
5,30	2,81
5,40	2,62
5,50	2,40
5,60	2,15
5,70	1,87

6. Instructions for use

The spacing and the arrangement of the lightning rods must be determined geometrically, for example using the so-called rolling sphere method. The following guideline can be used when planning:

The lightning spikes must be arranged to a maximum of 6 meters apart in accordance with the chart below.



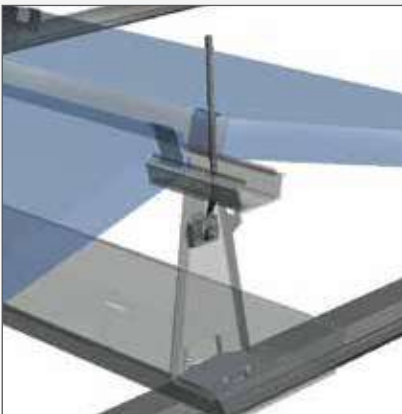
Lightning protection and potential equalization



Summary

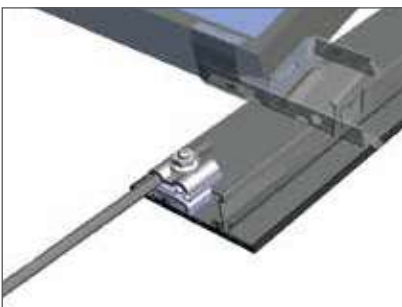
AluGrid allows for all methods of integration into existing lightning protection systems. Compatibility has been proven by testing against current, valid standards. AluGrid can also be used as an arresting device for the external lightning protection system in cases where separation distances cannot be maintained.

A specialist company or a lightning protection planning office must be consulted for the dimensioning and design of the system, particularly as a concept for circuitry through "inner lightning protection" components must be generated and documented. Both a risk analysis and a zone analysis must also be carried out. The design of the lightning protection system must be drawn up by specialists.

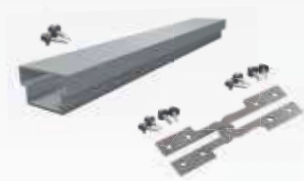
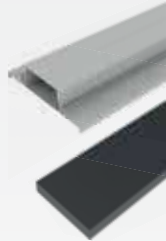
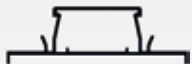
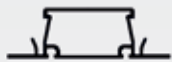


Important information:

In manufacturing AluGrid, we have laid the foundations for a cost-efficient integration into the external lightning protection. Please note, we cannot provide detailed advice relating to your lightning protection system. The current documentation should be made available to both the planning engineer and to the installer of the lightning system respectively.



Component overview



Continuous beam for EPDM rubber underlay

166501-006	Continuous beam 6 m
166501-004	Continuous beam 4 m
166501-001	Continuous beam custom cut
166003-001	Rubber underlay 4 mm on rolls

Continuous beam for surface protection mat strips

166505-006	Continuous beam 6 m
166505-004	Continuous beam 4 m
166505-001	Continuous beam custom cut
169004-003	Surface protection mat custom cut 300x110x20 mm, Alu lamination
169004-004	Surface protection mat strips 10 m 110/8 mm, Alu lamination Discontinued – only remainders!

Rail connector

169005-002	Insertion connector kit
129062-000	Tension connector

Cable duct

166502-006	Cable covering 6 m
166004-001	Cable covering clip
169010-004	Earthing lug for cable covering

Module bearing 15°

166002-002	Lower module bearing 15°
166002-007	Lower module bearing 15°, for heavy snow loads

Module bearing 10°

166002-003	Lower module bearing 10°
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Component overview



Windsafe sheets (Rear plate), In-stock items= bold

for module tilt angle of approx. 15°

Module length	Module width (dimensions in mm)		
	780-859	940-1019	1020-1100
1300-1360	169007-114	169007-116	169007-117
1381-1439	169007-134		169007-137
1440-1500		169007-146	169007-147
1501-1559		169007-156	
1560-1620	169007-164	169007-166	169007-167
1621-1680	169007-174	169007-176	169007-177
1681-1740		169007-186	
1940-2000		169007-236	

for module tilt angle of approx. 10°, installation height approx. 290 mm (e.g. for Italy)

Module length	Module width (dimensions in mm)		
	780-859	940-1019	1020-1100
1300-1360	169009-114	169009-116	169009-117
1381-1439	169009-134		169009-137
1440-1500		169009-146	169009-147
1501-1559		169009-156	
1560-1620	169009-164	169009-166	169009-167
1621-1680	169009-174	169009-176	169009-177
1681-1740		169009-186	
1940-2000		169009-236	



Fastening clamp

166002-001 Fastening clamp



Additional support for high snow loads (HighSnowLoad - HSL)

169006-154	AluGrid HSL additional support 15° B780-859
169006-156	AluGrid HSL additional support 15° B940-1019
169006-157	AluGrid HSL additional support 15° B1020-1100
169006-104	AluGrid HSL additional support 10° B780-859
169006-106	AluGrid HSL additional support 10° B940-1019
169006-107	AluGrid HSL additional support 10° B1020-1100



AluGrid module clamps

166001-050	Module clamp for module thickness 50/51 mm
166001-048	Module clamp for module thickness 48/49 mm
166001-046	Module clamp for module thickness 46/47 mm
166001-044	Module clamp for module thickness 44/45 mm
166001-042	Module clamp for module thickness 42/43 mm
166001-040	Module clamp for module thickness 40/41 mm
166001-039	Module clamp for module thickness 39 mm
166001-038	Module clamp for module thickness 38 mm
166001-037	Module clamp for module thickness 37 mm
166001-036	Module clamp for module thickness 36 mm
166001-035	Module clamp for module thickness 35 mm
166001-034	Module clamp for module thickness 34 mm
166001-033	Module clamp for module thickness 33 mm
166001-032	Module clamp for module thickness 32 mm
166001-031	Module clamp for module thickness 31 mm
166001-030	Module clamp for module thickness 30 mm



AluGrid+ lower module-bearing rail

166503-00950	14° 950 mm for module lengths from 1300-1740 mm
166503-01100	14° 1100 mm for module lengths from 1741-2000 mm
166504-00950	9° 950 mm for module lengths from 1300-1740 mm
166504-01100	9° 1100 mm for module lengths from 1741-2000 mm

AluGrid+: The rails are available in two different lengths. It is therefore possible to fasten any module of length 1300mm-2000mm up to 25% distance from the edge. Depending on the system, the tilt of the module is approx. 1° less than that of the basic design.



AluGrid+ fastening clamp

166002-004	AluGrid fastening clamp module-bearing profile
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Component overview



AluGrid100 load retainer

166006-110	AluGrid100 load retainer L1300-1361
166006-130	AluGrid100 load retainer L1381-1439
166006-140	AluGrid100 load retainer L1440-1500
166006-150	AluGrid100 load retainer L1501-1559
166006-160	AluGrid100 load retainer L1560-1620
166006-170	AluGrid100 load retainer L1621-1680
166006-180	AluGrid100 load retainer L1681-1740
166006-230	AluGrid100 load retainer L1940-2000



AluGrid100 load retainer end plate

166006-000	AluGrid100 load retainer end covering
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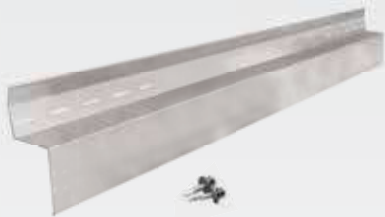
AluGrid100 module bearing

166005-154	Upper module bearing 15° B780-859
166005-156	Upper module bearing 15° B940-1019
166005-157	Upper module bearing 15° B1020-1100
166005-104	Upper module bearing 10° B780-859
166005-106	Upper module bearing 10° B940-1019
166005-107	Upper module bearing 10° B1020-1100



AluGrid100+ module bearing

166007-154	Upper module bearing 950 15° B780-859
166007-156	Upper module bearing 950 15° B940-1019
166007-157	Upper module bearing 950 15° B1020-1100
166008-154	Upper module bearing 110015° B780-859
166008-156	Upper module bearing 110015° B940-1019
166008-157	Upper module bearing 110015° B1020-1100
166007-104	Upper module bearing 950 10° B780-859
166007-106	Upper module bearing 950 10° B940-1019
166007-107	Upper module bearing 950 10° B1020-1100
166008-104	Upper module bearing 110010° B780-859
166008-106	Upper module bearing 110010° B940-1019
166008-107	Upper module bearing 110010° B1020-1100



AluGrid100 Blockout-Windsafe

169006-007	AluGrid100 Blockout-Windsafe 15° kit
169006-008	AluGrid100 Blockout-Windsafe 10° kit



Cable clips (compatible with: Windsafe sheets, AluGrid100 module support)

129012-008	Proklip-S rectangular cable clip
129065-008	Proklip-Multi8



Lightning protection

169010-000	Lightning clamp with lightning rod for AluGrid, AluGrid100+
169010-002	Lightning clamp with lightning rod for AluGrid100, AluGrid100+
169010-001	Universal clamp for lightning protection and potential equalization

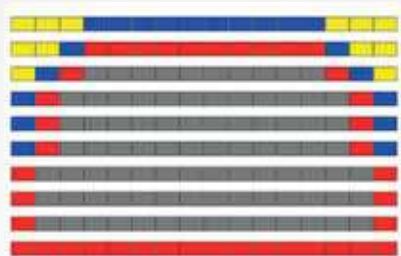


Tools

169008-004	Module clamp pliers for all AluGrid clamps
169008-003	Fastening tool for AluGrid100, AluGrid100+

Technical data / Structural analysis

Technical data	
Windsafe sheet	AlMg3
Continuous beam	Alu ENAW6063 T66
Profiled rubber	EPDM
Lower module support	1.4301
Fastening clamp and module clamp	1.4310
Lower module-bearing profile and cable covering	ENAW6063 T66
Fastening clamp for module-bearing profile	1.4301



Example: Roof layout plan AluGrid



Example: Roof layout plan AluGrid100

Structural analysis

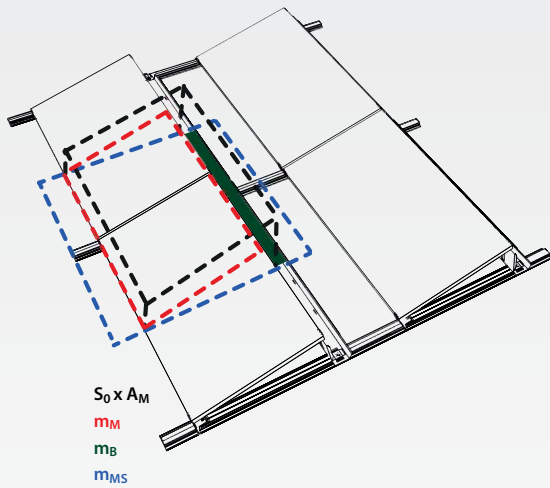
Structural calculation in accordance with current national standards (in Germany DIN1055 and EC1). Structural analysis addendum for the dimensioning of required ballast. AluGrid can be implemented in its basic design with snow loads of up to 2.4 kN/m². By taking a number of smaller additional measures a higher load of up to approx. 5.4 kN can be supported. An additional brace is needed with the AluGrid and AluGrid+ systems to support the weight of the Windsafe sheets. With the AluGrid and AluGrid100 systems the lower module support is implemented with a stronger bearing. All other components are designed to withstand the high snow loads.

Guidelines for implementation on pitched roofs

A solar plant that is not mechanically connected to the building may shift towards the eaves over a period of time due to linear thermal expansion of aluminium components. We therefore recommend that module arrays be secured to correspond with the pitch of the roof. The type of fastening depends on the individual conditions: On east/west gabled roofs, modules lying either side of the ridge can be coupled together. Our tension connector provides the ideal solution. AluGrid is not recommended for roof tilt angles in excess of 10°.

Information regarding the limitation of the module field dimensions

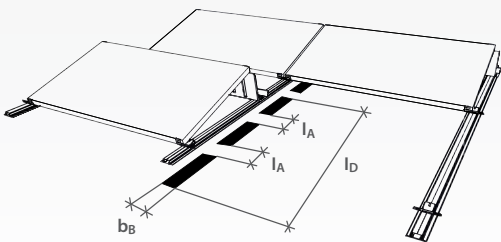
Variance in linear thermal expansion coefficients of the mounting system as compared to those of the roof cladding can result in stress and strain on the roof cladding with temperature change. Depending on the roof covering of the respective building, the maximum module field dimensions should be limited to avoid damaging the roof cladding. On concrete roofs, module field dimensions of about 20 to 30 meters are feasible. To avoid mechanical stress on roofs with membrane coverings, we recommend a maximum module field size of 10m as well as the use of a surface protection system that is compatible with the roof covering, such as the AluGrid rubber underlay. When separating fields, each field must be custom connected and the required lightning protection or equipotential bonding conductor deployed.



Guidelines for distributed surface load and uniformly distributed load

The uniform distributed load is the term given to load which is distributed evenly across the roof construction. As well as the local snow and wind loads, the surface load calculation must also include the additional load of photovoltaic modules, mounting racks and, where applicable, of ballast material. However, if such loads can be evenly distributed across small areas of racking or rails into the roof structure, then these are not associated with partial contact pressure. Pressure imposed on a small area is known as partial contact pressure.

Areas of contact pressure can be accommodated in different ways depending on the roof sealing methods and on the type of substructure. There is generally no problem in this respect with the presence of hard subsurface materials e.g. wood or concrete beneath the waterproof membrane, however there is a possibility that, with the presence of particularly soft insulation, the maximum permissible partial contact pressure may be exceeded. The customer is responsible for checking that this value remains within the permissible range. The following measures can be taken:



partial contact pressure [kg/m²] =

the sum of loads
relating to one module is therefore:

and the effective surface area designated
to the surface protection mat:

$$\frac{\text{Total loads}}{\text{effective surface area for surface protection mat}}$$

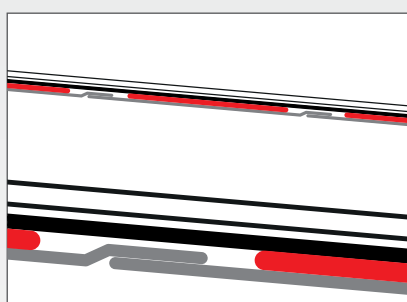
Weight of module **m_M**
+ approx. 5 kg weight of mounting system **m_{MS}**
+ ballast per module **m_B**
+ Snowload x Module surface **S₀ x A_M**

A_{eff} = (length continuous beam per module row **l_D**
– Sum d. surface protection mat strips **l_A**)
x Breadth surface protection mat strips **b_B**

If the contact pressure is exceeded, we recommend the following measures:

- Supplementary continuous beam with additional support points at the center of the module (i.e. doubles the supporting area)
- Additional, thick and wide strips of protective matting 150/20 mm increases supporting surface by approx 35%)

Technical data /Structural analysis



Continuous beam
Levelling mat
Bituminous roofing membrane

Guidelines with very thick roof sealing membranes

Deployment of a thick sealing membrane on a roof - e.g. a bituminous membrane, may result in an unevenness of surface due to the overlap of layers. Particularly at periods of high temperature, this can lead to blistering or to indentation by the continuous beam as these points are subject to a higher contact pressure. Additional underlay matting can be placed beneath the thicker points of the membrane in order to achieve as even a distribution of load as possible.

Guidelines for the deployment of very small units

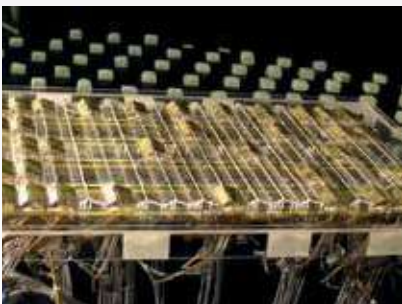
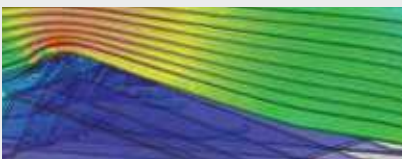
For reasons of structural safety, at least two rows must be interconnected with AluGrid continuous beams. This means the smallest possible configuration is one module per row and two module rows.

Guidelines for deployment on roofs with substrate and gravel

On roofs with a substrate or gravel layer it should be noted that superimposed loads for the system can be kept to a minimum only by ensuring that the connection to the substrate is sufficient to prevent sections of the system from sliding. In the case of gravel roofs, burying the bottom beam flush with the gravel surface usually suffices to maintain stability. On vegetated roofs, slip resistance can be achieved by taking some additional measures. A slip-resistant connection to the substrate can be created using bolts in the continuous beam, for example.

Guidelines for clearance from the roof edge.

For system variants AluGrid and AluGrid+ a minimum distance of 1.5 times the tilted module height should be maintained from the roof edge. This means, for example, for a horizontally arranged module with dimensions of 1.60/0.99 m the required clearance from the roof edge is 1.5 x 0.99m. There is no mandatory clearance from the edge for system variants AluGrid100 and AluGrid100+, however. The mandatory distance from the edge also applies to roof parapets. Potential clearance from the edge due to shading must also be considered in the plans. The edge and corner zones of a flat roof do not equate to the load zones of the module array, therefore increasing the clearance from the edge does not automatically result in reduced ballasting at the edges of the module field. This is based on the dynamic behaviour of wind flow.



Wind optimization

Flat roofs offer large surface areas that can be utilized for the installation of efficient solar plant on an industrial scale. AluGrid allows for streamlined dimensioning which facilitates the installation of solar modules on roofs which, previously, would not have come into question from a technical or economical point of view. With these load-optimized systems, Schletter has solved a crucial problem that has often impeded the utilization of flat roofs for solar installations in the past. Standardized dimensioning procedures often result in a superimposed load value which exceeds the load-bearing capacity of a roof; project approvals on the basis of individual wind tunnel tests are generally painstaking, time-consuming and often expensive.

Schletter takes a different approach: Instead of neutralizing wind forces through the introduction of superimposed loads, the installation of Windsafe sheets reduces the wind load or, in the case of the AluGrid100 and AluGrid100+ systems, the wind loads are minimized from the start by a strategic module arrangement. Thanks to these technical features, the systems have excellent dynamic wind properties and require astonishingly little superimposed loading. Sophisticated dimensioning software tools also contribute to the reduction in mandatory loading as they leverage from research results published by the internationally renowned institute for wind dynamics by Prof. Hans Ruscheweyh. Schletter bases its calculation of required loads on substantiated research results. Our system models have been subject to intensive wind tunnel testing in Germany and the USA for many years. The current designs are the product of over ten years' experience in constructing solar plants upon flat roofs. Wind deflectors have been an integral component of our designs from the initial concepts. Our plants may be economically efficient but our customers should have no reservations about their structural safety. Our products are not sold on the basis of a promise, rather, on the reliability and resilience of our systems to all weather conditions, supported by the results of structural tests. Sustainability of product and a longterm relationship with our customers are our primary objectives.

We would be happy to assist you in the detailed planning! Please complete the checklist "Inquiry regarding an elevated solar plant" that you can find on our homepage. Click "Download" and "Solar mounting" to navigate to the document. Our conditions of warranty can be referenced at www.schletter.de/AGB_en.

Subject to technical modifications.

References

Customer projects

It is no surprise that the AluGrid system has become a market best-seller within a short period of time : Our cost-optimized racks for flat roof safeguard that solar plants are still economically efficient when the feed-in tariffs are reduced. The Schletter feather-weight champions have not only been optimized in load and materials, but facilitate a reduction in installation effort due to the user-friendliness of the assembly structures. Our customers can save where they need to save without compromising on quality. These inexpensive aluminium racks meet the highest quality standards - a fact which is greatly appreciated by our customers.

Blanco Bruchsal

Module: 1665 x 991
Plant size: 901.6 kWp
Customer: Wirsol



Knüllwald Remsfeld

Module: 1665 x 1005
Plant size: 893.3 kWp
Customer: Sun Garant



LTI Metalltechnik Boxberg

Module: 1650 x 990
Plant size: 361.4 kWp
Customer: Wirsol



References

Großmarkt Karlsruhe

Module: 1650 x 990
Plant size: 199.5 kWp
Customer: Wirsol



Speidel, Weil im Schönbuch

Module: 1685 x 993
Plant size: 57.4 kWp
Customer: Elektro-Breitling GmbH
71088 Holzgerlingen



Technopole Sierre

Module: 1670 x 1000
Plant size: 203 kWp
Customer: Solexis



WADD St Leon Rot

Module: 1661 x 991
Plant size: 95,9 kWp
Customer: Wirsol





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Our members of staff are available from Monday to Friday from 7am to 5 pm to provide comprehensive and competent technical advice for the planning of your solar plant and to answer questions regarding logistics and order processing.

**SCHLETTER**