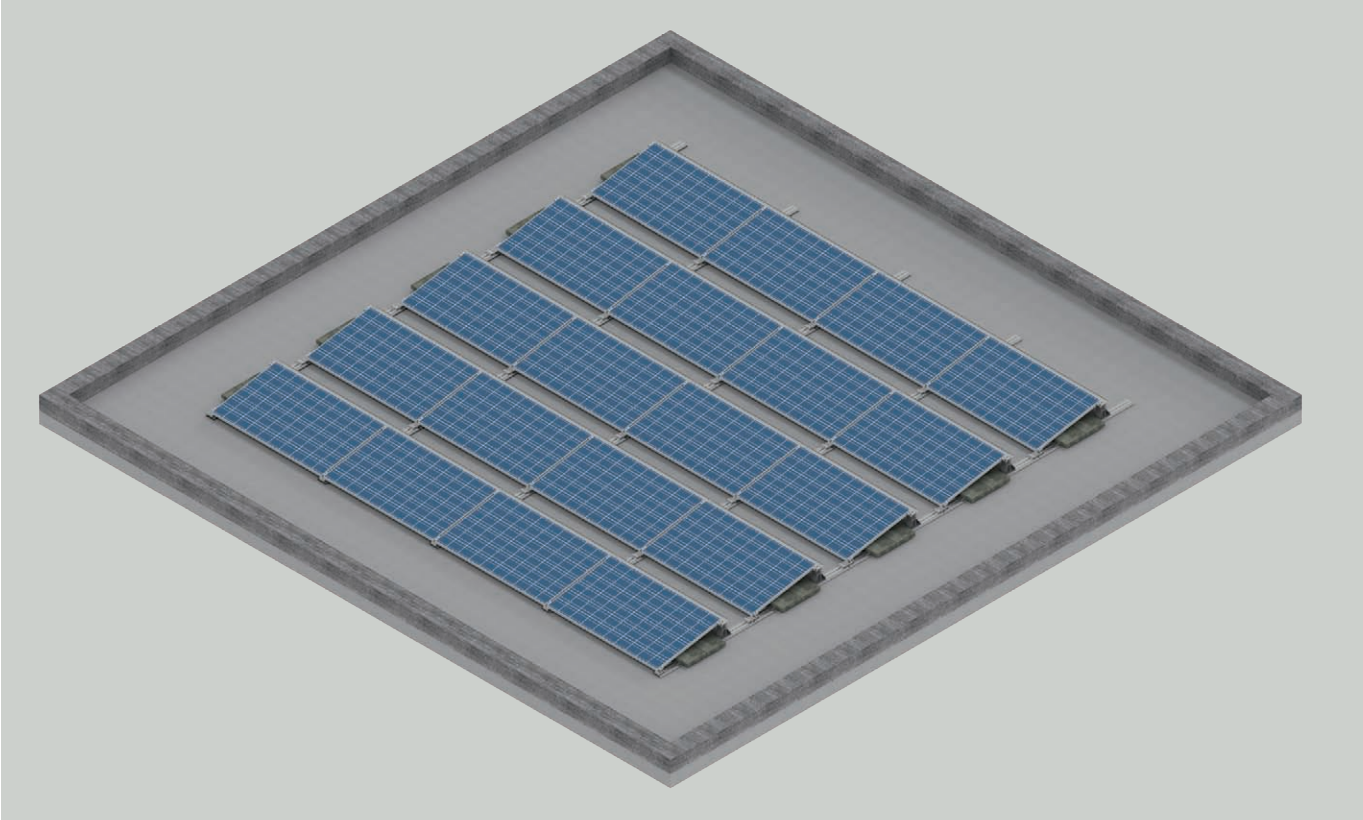
INSTALLATION INSTRUCTIONS

ALTEC FD_*OPTIFLEX-10*

South orientation – module clamping on short side

You must always follow the installation instructions of the module manufacturers.



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INTRODUCTION

These detailed installation instructions must be read carefully and the instructions must be followed.
The ALTEC team is happy to answer any questions by phone or email.
These installation instructions include the project report with drawing and ballast plan. The ballast plan must be followed exactly.
If the module arrangement changes as a result of local conditions, a new static calculation must be carried out. A copy of the installation instructions must be available throughout the period of installation.
Installation must be carried out by trained specialist personnel. The mounting system is used to attach photovoltaic modules to flat or slightly sloping roofs.
The mounting system is supplied complete with accessories. Please check your delivery is complete before starting installation.
The manufacturer's processing guidelines for the roof covering and the modules must be followed.

WARRANTY

ALTEC accepts no liability for damage caused by the use of non-certified components, unauthorised modification of the product, installation errors or failure to follow the installation instructions. ALTEC provides a warranty of 10 years, if ALTEC products are used exclusively. For further information, please see our warranty policy.

MAINTENANCE

Photovoltaic systems are not maintenance-free. Maintenance must be carried out annually, or immediately after heavy storms or heavy snowfall.

During maintenance, the screw and clamp connections must be checked to ensure they are tight and that the tightening torques are in accordance with the installation instructions. Visual inspection to ensure that the system is in perfect condition is also required. You must ensure that the PV system is in the correct position as per the installation plan.
The roof cladding must not have any damage and installation of the PV system must not damage the roof cladding. The ballast must be on the base rail, as specified. Maintenance must be documented.
The warranty shall be void if maintenance is not carried out at the specified intervals.

OCCUPATIONAL HEALTH AND SAFETY

All generally recognised rules of technology must be observed during installation. Please observe the accident prevention regulations from the employers' liability insurance association (e.g. fall protection), all regulations and specifications under public law, as well as EN standards and DIN standards.
Personal protective equipment must be worn (e.g. protective work shoes, safety helmet, work gloves).
Lightning and surge protection of the PV system must be installed in accordance with the current specifications of DIN/VDE 0185 Part 1-4, DIN/VDE 0100 Part 712 and VdS 2010.

SYSTEM PLANNING

The system is planned using our design tool, Altec.Solar.Protool. A checklist must be submitted for this, as well as the desired module assignment plan.
Proof of the static load-bearing capacity of the system components and the required ballasting is entered in the tool using the submitted checklist and calculated for the specific project.
Compliance of the structural conditions (building dimensions, roof pitch, roof cladding, obstacles, etc.) with the design must be checked before starting installation.

Installing PV systems causes increases in loads. A structural engineer on site must provide evidence that the roof is suitable for these increased loads.
Evidence of the roof structure's load-bearing capacity is not part of our offer.

When planning the system, attention must be paid to the drainage of rainwater. The installation must be planned so that the drainage points of the flat roof are not covered over. Before starting installation, you must check the roof cladding for damage.

The minimum clearance from the edge is 0.50 m – a smaller clearance is possible with a surrounding roof parapet.
The maximum permissible roof pitch is 10°. However, from a roof pitch of more than 5°, additional securing of the system in the direction of the roof pitch is required. See installation instructions, page 22.
The minimum system size is equal to 4 interconnected modules (2 rows of 2 modules each).

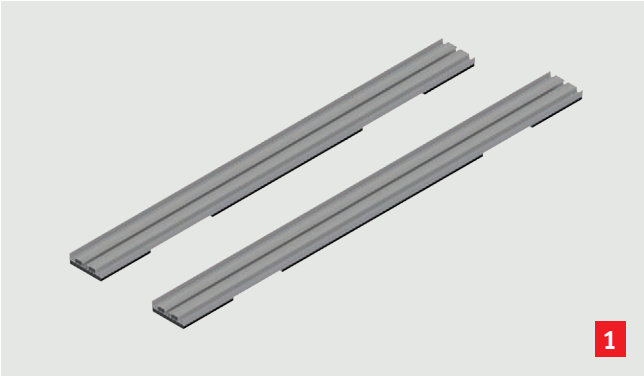
Given different linear expansions of the installation, a maximum module field size is specified. Both short-term and seasonal temperature fluctuations can cause deformations and constraining forces that result in movement of the system caused by thermal expansion. The system must be separated after 12 to 15 m at most. This means that a maximum of 8 rows of 7 modules can be connected to each other. Leave approx. 100 mm between the rows.

ROOF CLADDING

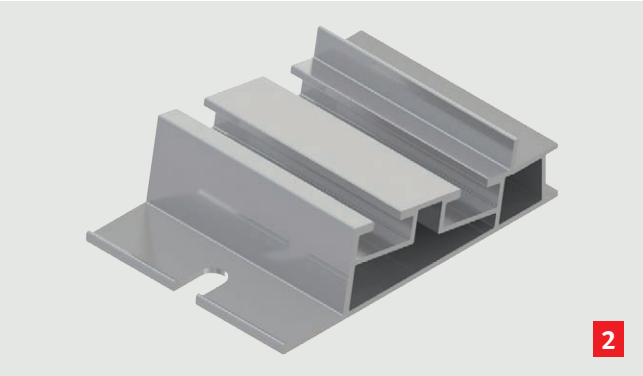
ALTEC FD_*OPTIFLEX-10* can be installed on bitumen, foils and gravel. On gravel roofs, remove the gravel to the width of the base rail. If this is not possible because the gravel layer is too high, the base rails are placed on the gravel and shaken down into the gravel slightly.
On foil and bitumen roofs, a coefficient of static friction is applied. The following was published in the guideline from the German Solar Industry Association (Bundesverband Solarwirtschaft):
... “Therefore, the installer of a solar system must determine and ensure compliance with the coefficient of static friction specified in the structural survey on site.” ... “A significant influencing factor on evidence that the system is secured in position is the coefficient of static friction between the solar system and the roof.” ... “The static frictional force acts against the direction of movement to be prevented and is proportional to the supporting force (normal force) which presses one body against the other and produces the coefficient of static friction μ_h.” ... “This table shows recommendations for which coefficients of static friction can be applied to different combinations of building protection matting for the mounting system and roof waterproofing.” ...

Coefficient of static friction μ_h dry/wet Waterproofing	**Building protection mat, rubber-based**	**Building protection mat, aluminium-laminated**
PVC-P	–	0.5
FPO (based on PE or PP)		0.5
EVA		0.5
Polypropylene		0.3
Bitumen elastomer/ polymer bitumen	0.6	0.2
EPDM	0.6	0.7

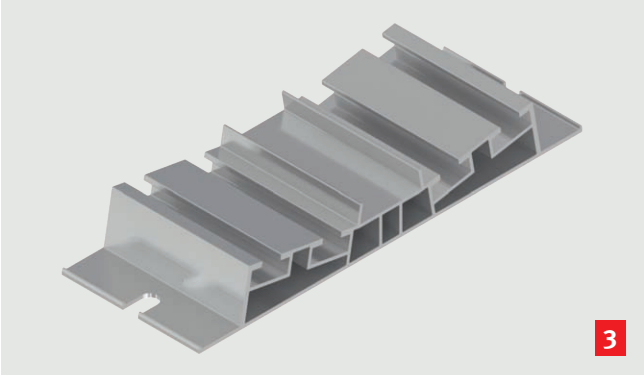
OVERVIEW OF INDIVIDUAL PARTS



Base profile with building protection mat (rubber-based or aluminium-laminated), length 1490 or 1590 mm



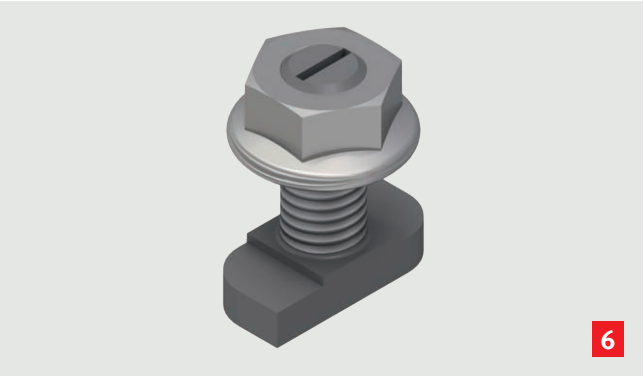
Start support



Double support and rail connector

High support

Support levelling for high support



Hammer-head bolt set, mounted with self-locking nut

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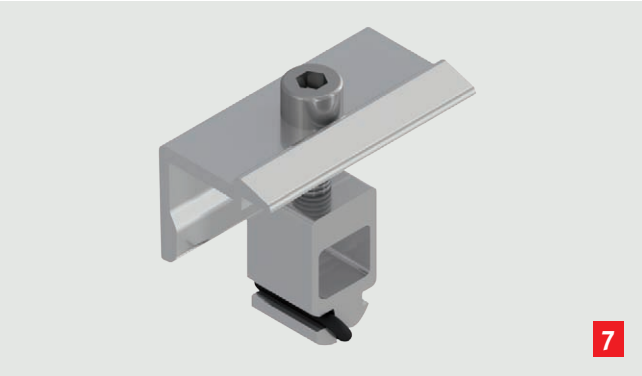
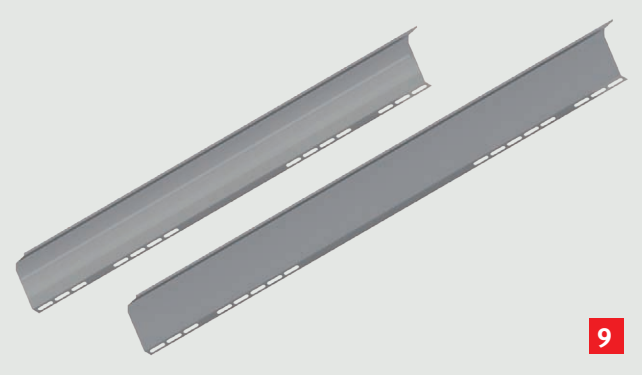
OVERVIEW OF INDIVIDUAL PARTS



Universal end clip with cylinder head screw M8 for module heights of 30–40 mm or 41–46 mm for high support

Universal middle clip with cylinder head screw M8 for module heights of 30–40 mm or 41–46 mm



Optiflex1 wind panel for 1580–1820 modules
Optiflex2 wind panel for 1821–2200 modules

M8 × 20 hammer-head bolt set with washer and self-locking nut mounted

Self-drilling screw for aluminium 5.5 × 20, A4

Universal edge clip

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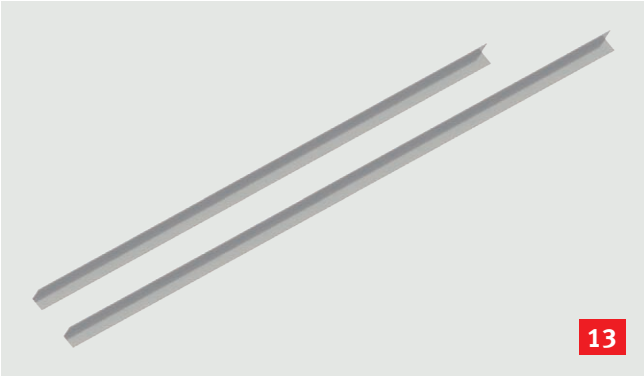
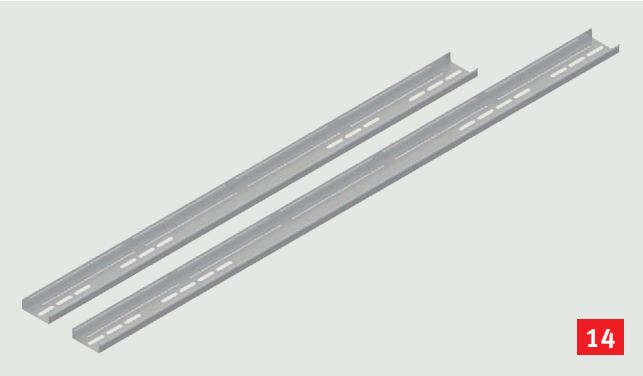
OPTIONAL INDIVIDUAL PARTS



Ballast rail L-bracket 50 × 50 × 4 for 1580–1820 mm module or 1821–2200 mm module



Ballast tray for 1580–1820 mm module or 1821–2200 mm module

Self-drilling screw for aluminium 5.5 × 20, A4

M8 × 20 hammer-head bolt set with washer and self-locking nut mounted

Terragrif 0.5 × 20 × 17-2

Lightning protection terminal block for 8 mm lightning protection wire, pre-assembled with hammer-head bolt

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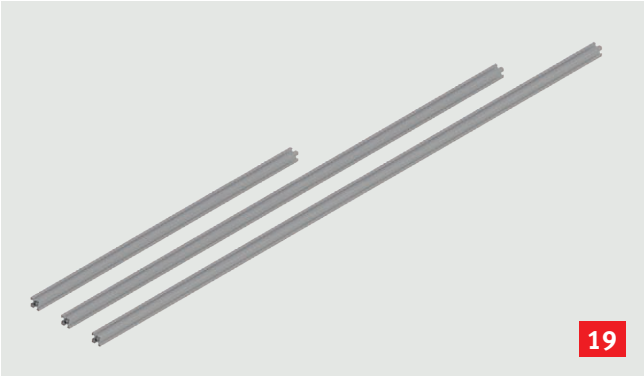
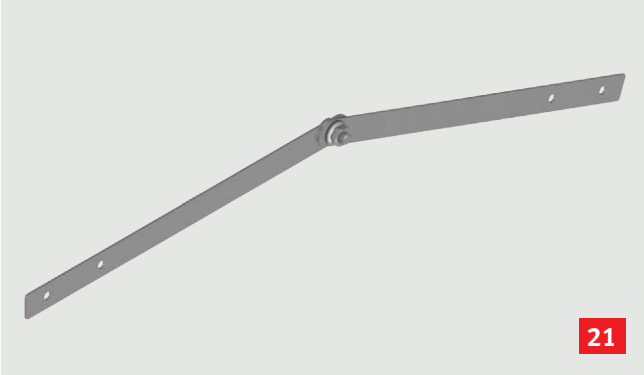
OPTIONAL INDIVIDUAL PARTS



Standard mounting aid profile 40 × 40 for module width up to 1150 mm, module length up to 1820 mm or up to 2200 mm

Mounting aid angle set 50 × 50 × 10 with hammer-head bolt and hexagon nut



Ridge connector (length-wise)

Ridge connector (cross-wise)

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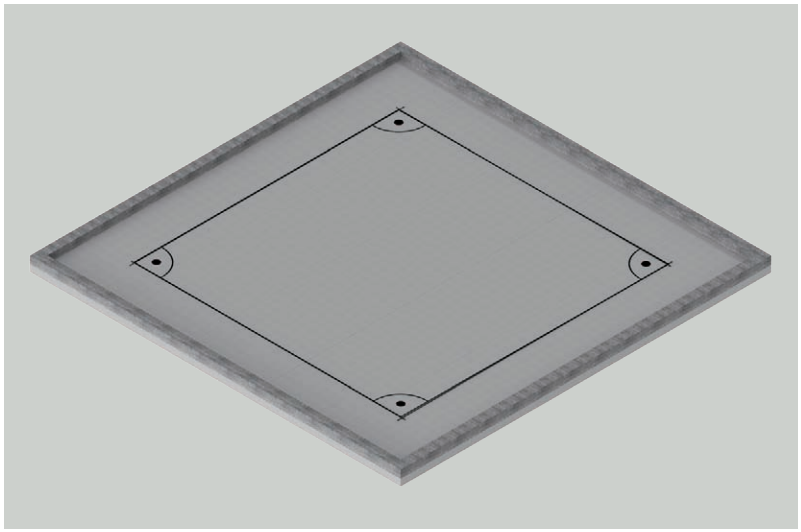
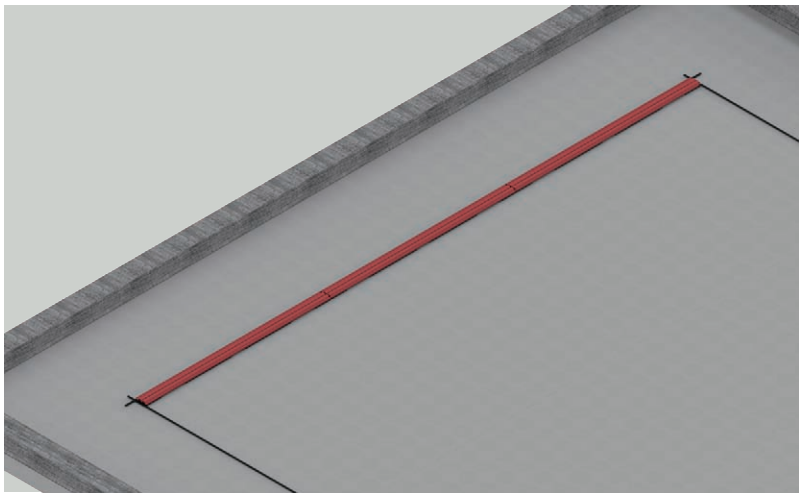


A project-specific installation plan is enclosed with the installation instructions. Using this plan, mark out the roof area to be used with chalk lines. Make sure that the angle is correct. The minimum distance from the edge must be observed.



The base profile **1** must be laid out along the mark lines. The rail length depends on the module width:

Module width	Rail length
990–1090	1490
1091–1150	1590

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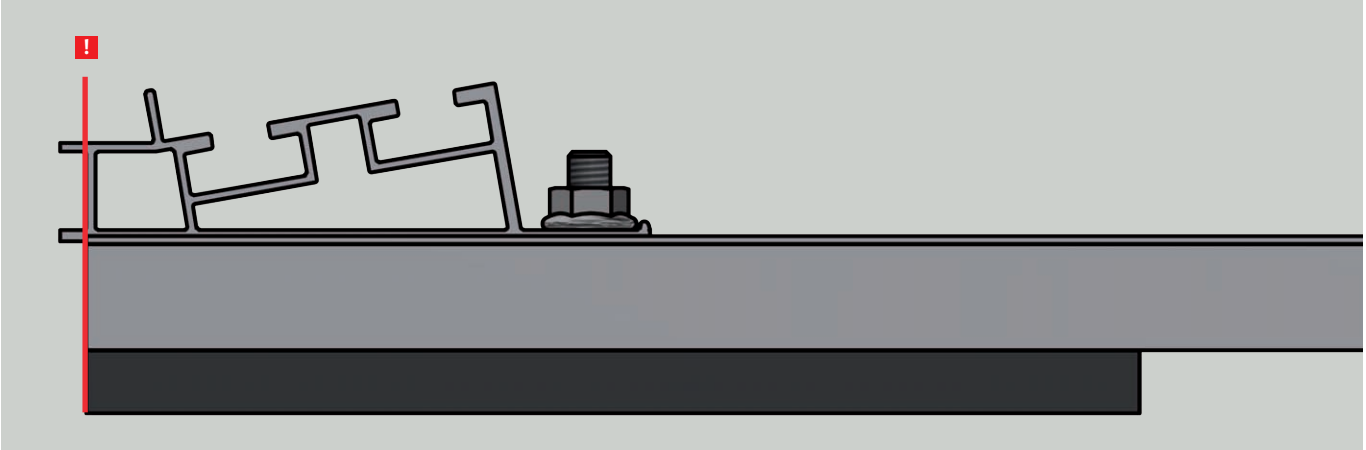
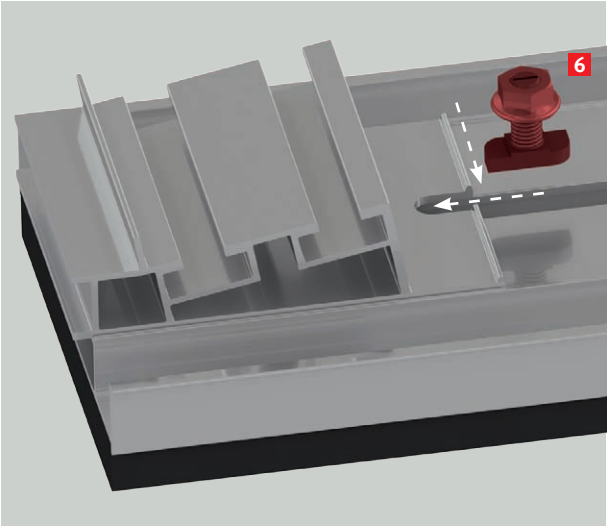
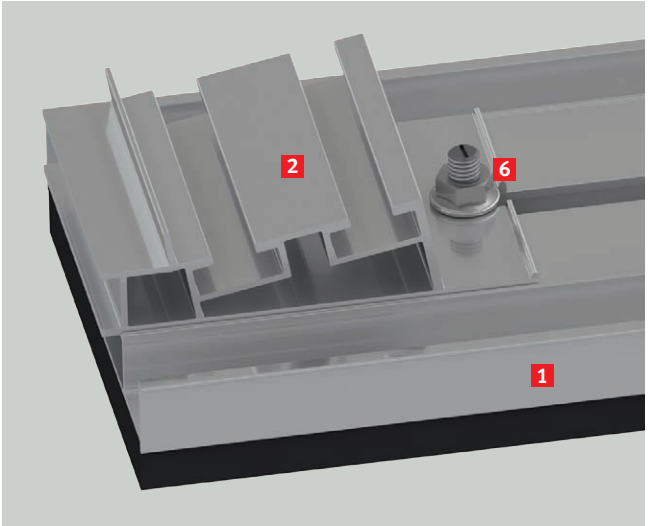
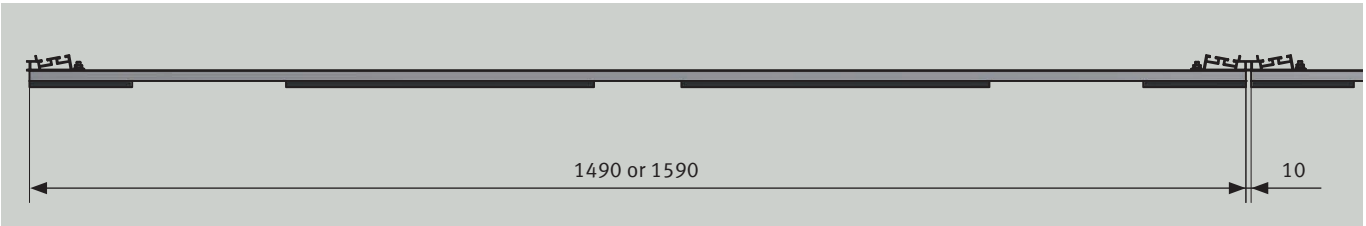
INSTALLING THE START SUPPORT



The start support 2 is installed at the start of the base profile 1. When fitting the start support, make sure that the rod of the support forms a line with the base profile edge. Thread the M8 × 20 hammer-head bolt 6 into the base profile, push it forward in the slotted hole and screw it in to 15 Nm. The hammer-head bolt must be screwed in by 90°.







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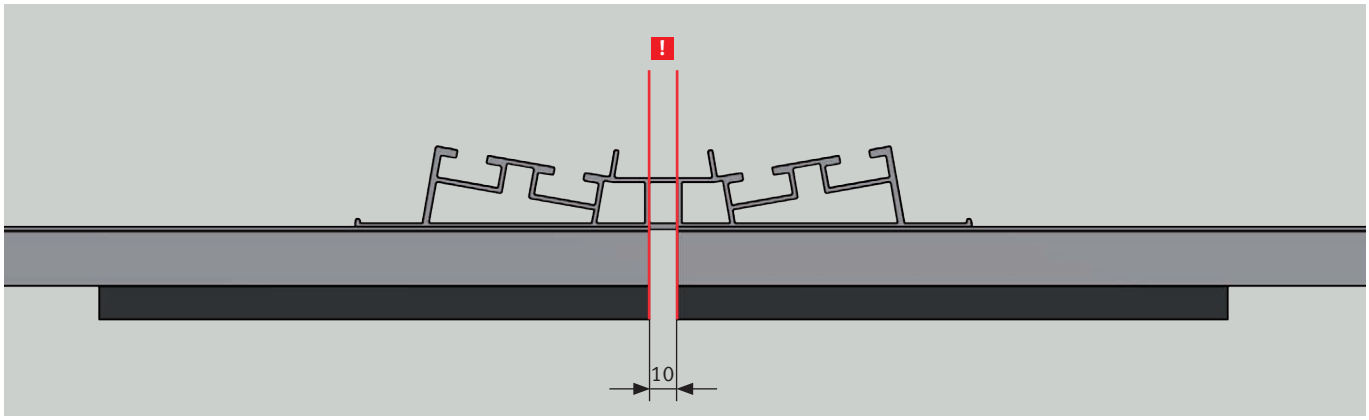
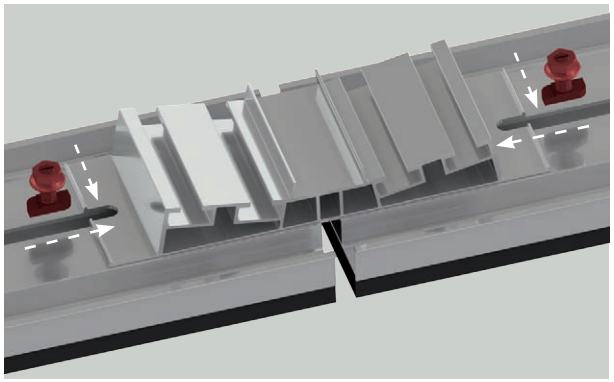
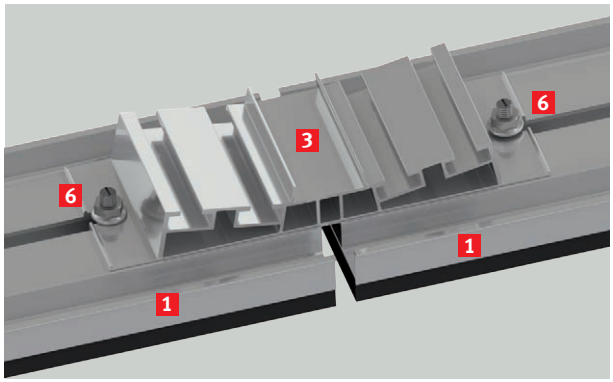
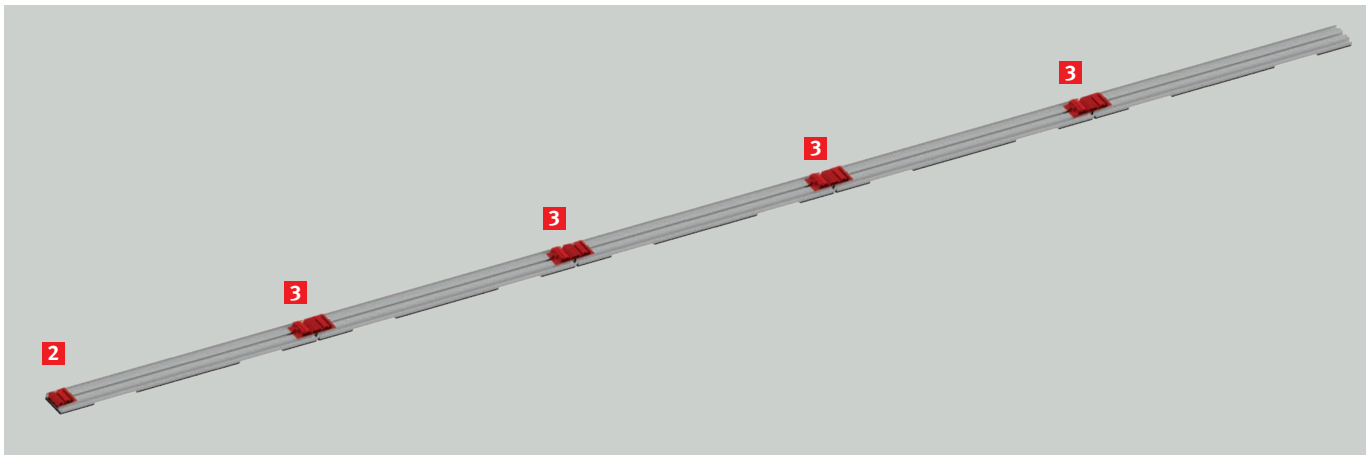
INSTALLING THE DOUBLE SUPPORT



Then fit the double support 3 on the rail joint. The base profiles 1 should be 10 mm apart. Here too, the rods of the support align with the edge of the base profile. The double support also acts as a rail connector. Thread the M8 × 20 hammer-head bolts into the rail, push them forward in the slotted hole and screw them in to 15 Nm. The hammer-head bolts must be screwed in by 90°. The base profile must be connected to all the double supports before the next step.







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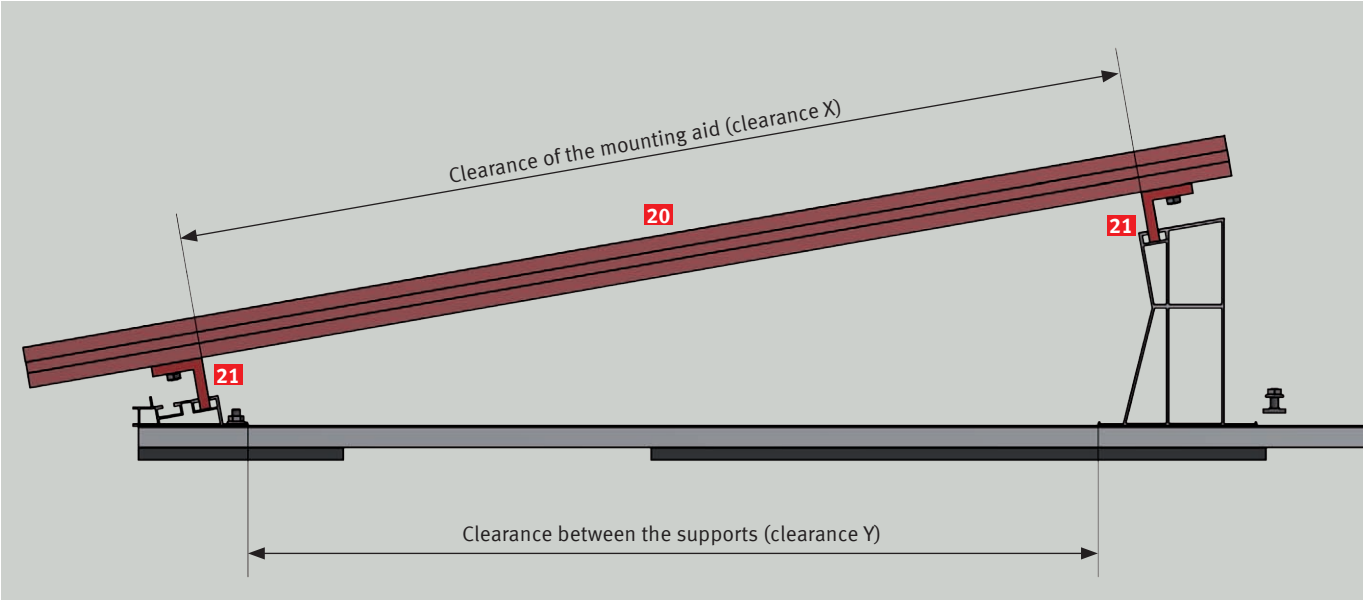
INSTALLING THE HIGH SUPPORTS



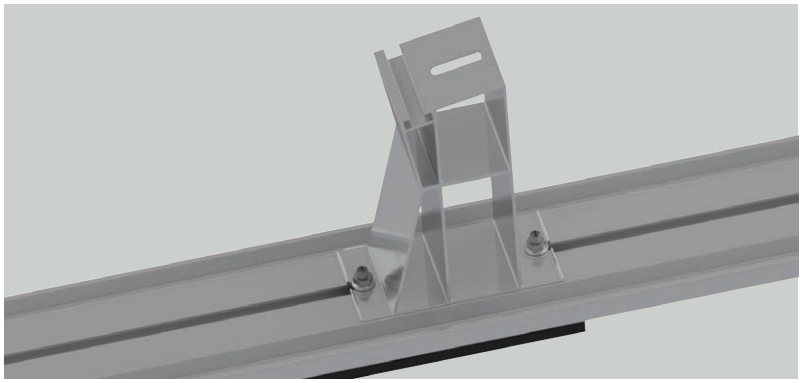
The clearance between the high support and the start or double support can be identified using the optionally available mounting aid 19 + 20.

Module width in mm	Clearance of the mounting aid Clearance X in mm	Clearance between module supports Clearance Y in mm
990	880	780
1000	890	790
1010	900	800
1020	910	810
1030	920	820
1040	930	830
1050	940	840
1060	950	850
1070	960	860
1080	970	870
1090	980	880
1100	990	890
1110	1000	900
1120	1010	910
1130	1020	920
1134	1024	930
1140	1030	940
1150	1040	950

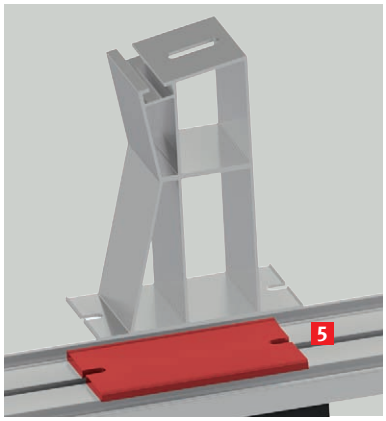
With optional mounting aid:
The mounting aid brackets 20 are screwed to the mounting aid profile 19 with clearance X as per the table. The inner groove of the start or double support is used.

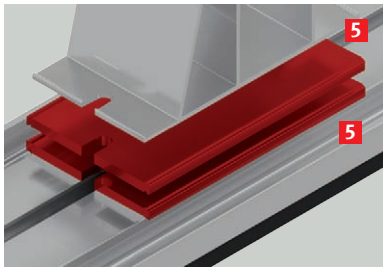
With your own gauge:
Alternatively, a gauge with clearance Y as per the table can be used.

INSTALLING THE HIGH SUPPORT



The high support 4 is attached in the same way as the double support 3: thread two M8 × 20 hammer-head bolts 6 into the base profile, push them forward in the slotted hole and screw them in to 15 Nm. The hammer-head bolts must be screwed in by 90°.

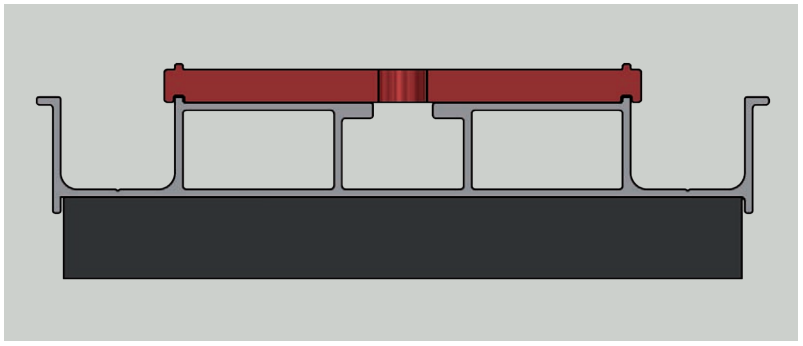




Levelling to the same height with one or more support levelling shims

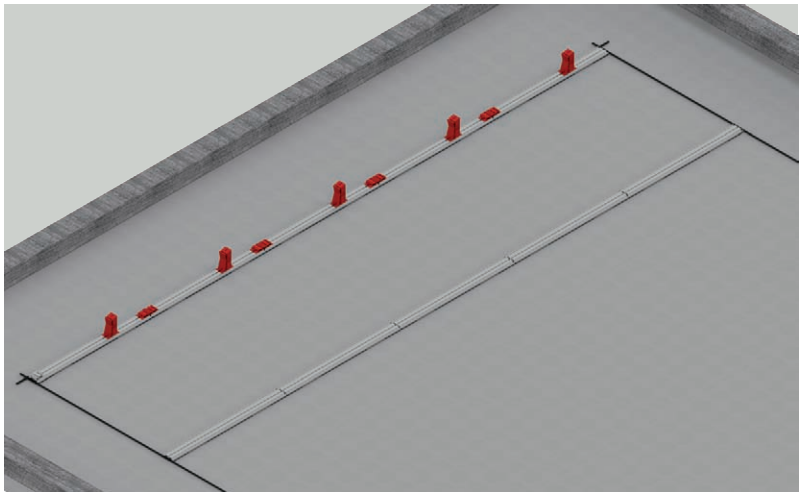
Owing to the different module widths, you may have to level the modules to the same height. To bring them to the same height, use the support levelling shims for high supports 5 with corresponding length of hammer-head bolt:

Module width	Number of support levelling shims	Hammer-head bolt
990–1090	0	M8 × 20
1091–1135	1	M8 × 30
1136–1150	2	M8 × 30

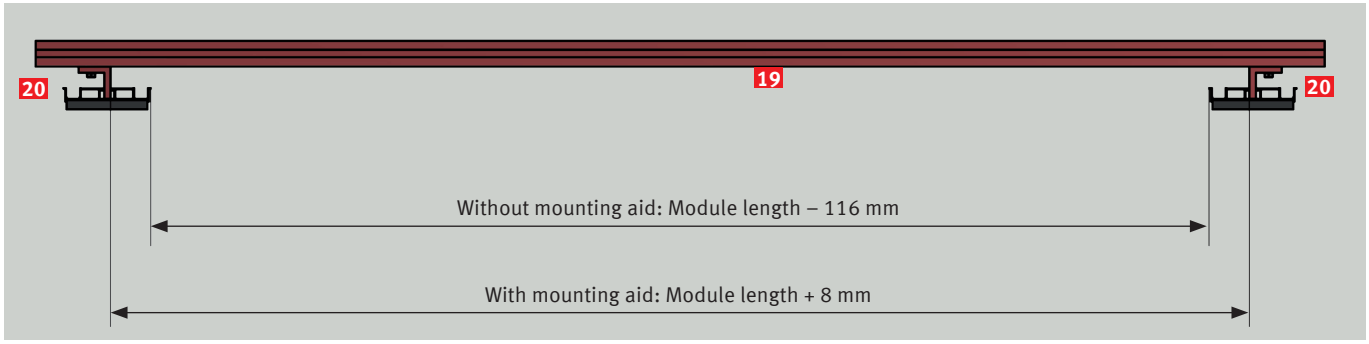


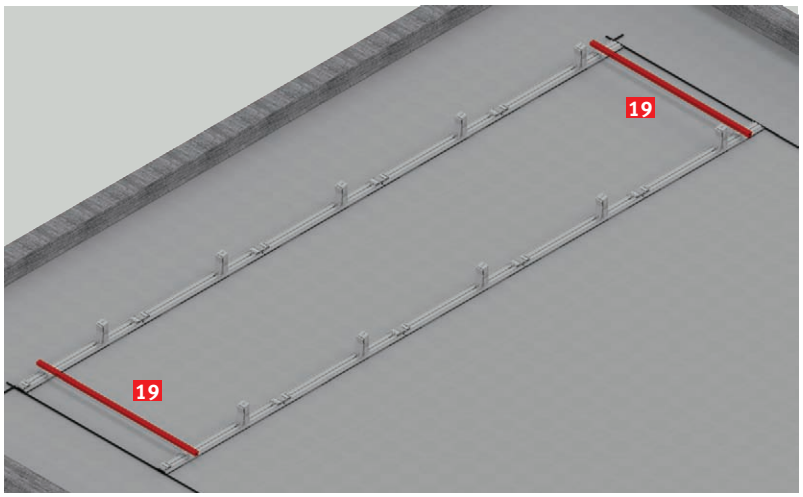
The support levelling shim must be placed exactly on the lugs in the base profile with the groove facing downwards. This prevents the shim from slipping. The high support is then placed on top and mounted at the previously calculated position.

INSTALLING THE BASE PROFILE RUNS

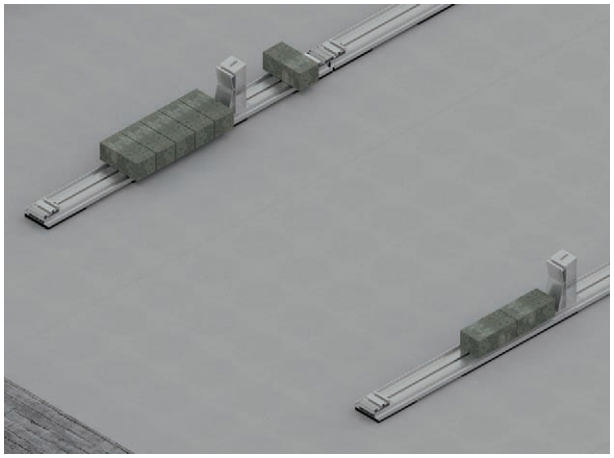


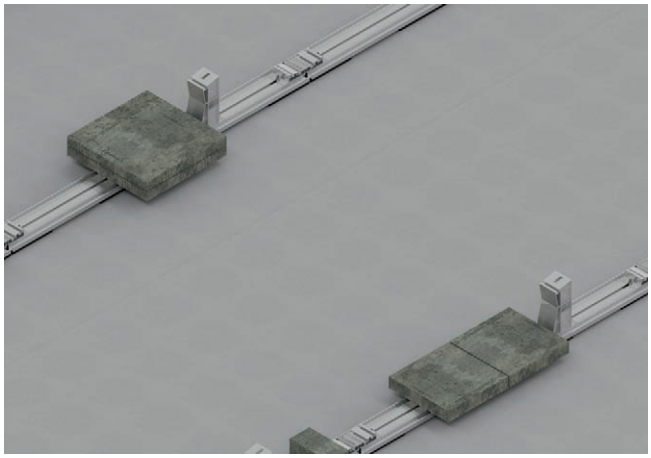
The first base profile is now completely mounted with module supports.
The second base profile run must be placed at the mark lines.
Then install the start or double supports and then the high supports on the base profile.





The clearance of the second base profile run can be calculated with the optionally available mounting aid 19 + 20. When using the mounting aid, the brackets must be mounted with a clearance of module length + 8 mm. When measuring with a tape measure, the clearance is the module length minus 116 mm. For quick positioning of the second base profile run, we recommend two mounting aids – one at the start and one at the end of the base profile.
Repeat these steps until the module field is complete.





The ballast plan supplied must be strictly complied with.

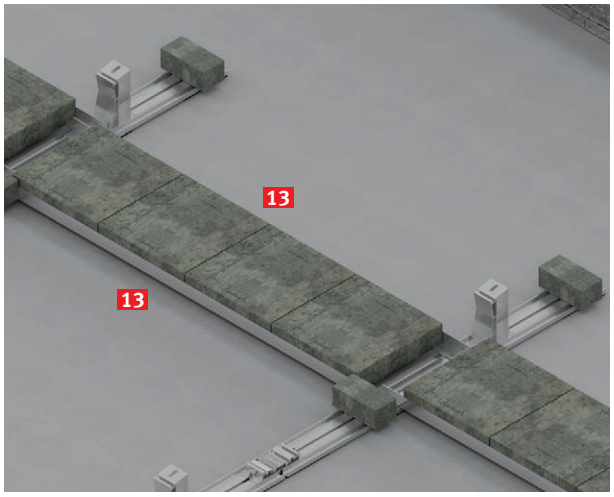
We recommend the following for using ballasting:

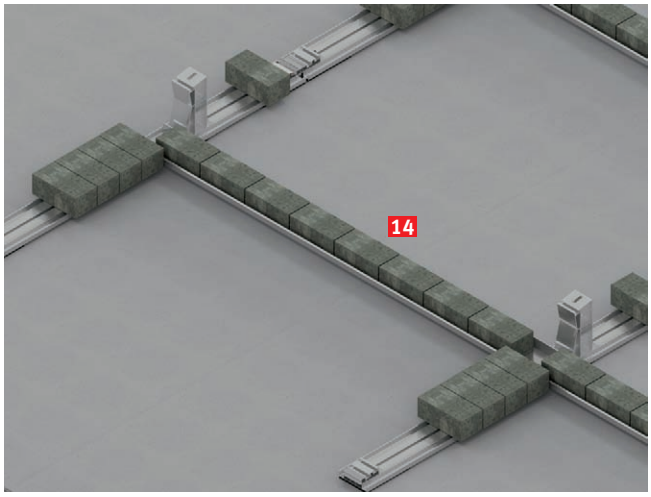
Type	Dimensions	Weight
Concrete paving stones	100×200×80	3.6 kg
Paving slabs	300×300×50	10.3 kg
	400×400×40	14.0 kg
	400×400×50	18.5 kg

The ballast is placed centred over the base profile to prevent tipping.

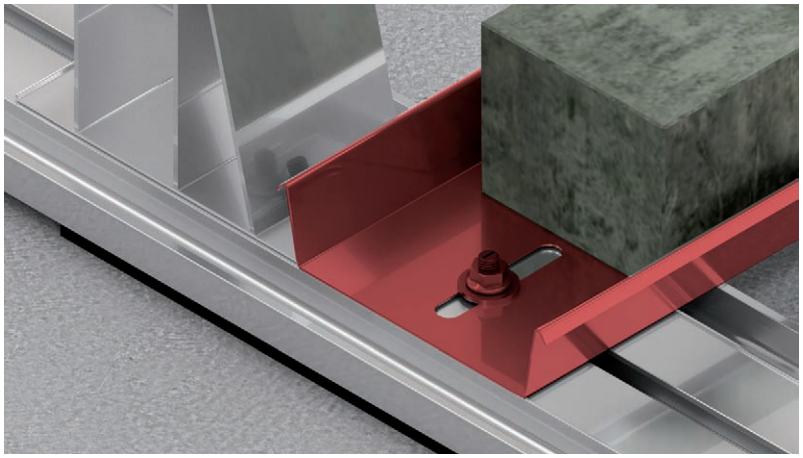
A maximum of 28 kg may be placed on each side of the base profile, i.e. 56 kg per module.

If the required weight is higher than 56 kg per module, the ballast can be placed in a ballast tray 14 or between two L-angle profiles 13. Using a ballast tray, 65 kg can be placed per module; using two L-angle profiles, 126 kg ballast is possible per module.

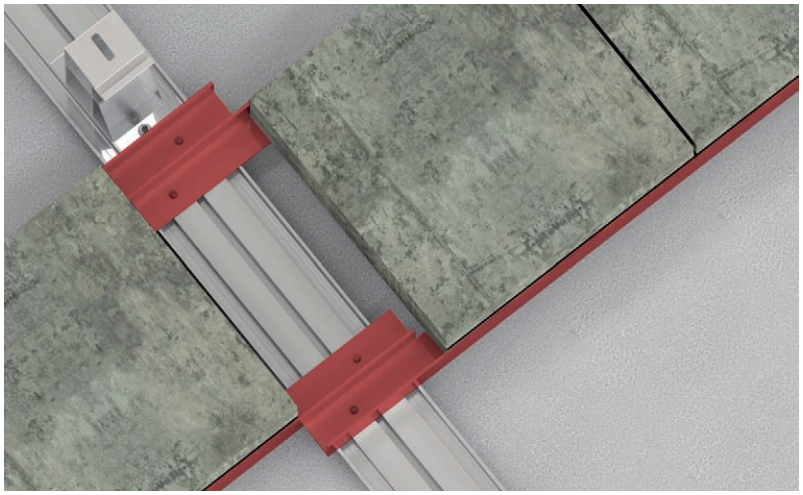




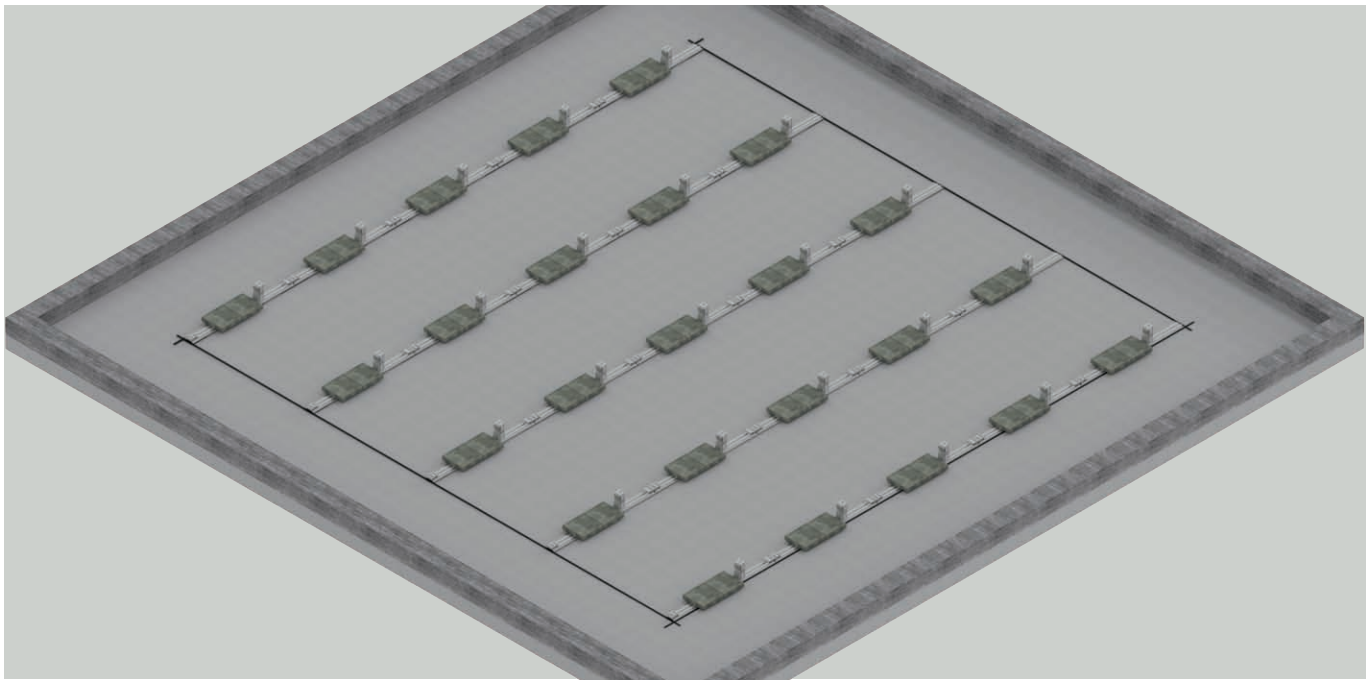
INSTALLING THE BALLAST TRAY/BALLAST RAIL (OPTIONAL)



M8×20 hammer-head bolts with washers 16 are used to attach the ballast tray 14.
Thread the hammer-head bolt through the slotted hole of the ballast tray into the middle groove of the base profile and screw it in to 15 Nm. The hammer-head bolt must be screwed in by 90°.



The ballast rail 13 is screwed directly onto the base profile with one self-drilling screw 15 per rail, using a depth stop.
No pre-drilling is necessary for this step.
Two ballast rails must be used per ballast. The clearance between the rails is adjusted to the width of the ballast material. The adjoining ballast rails are staggered.



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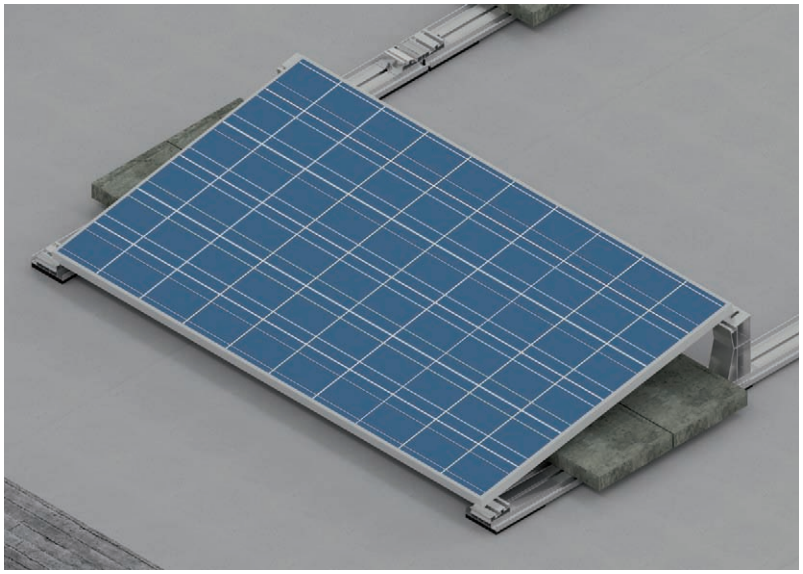
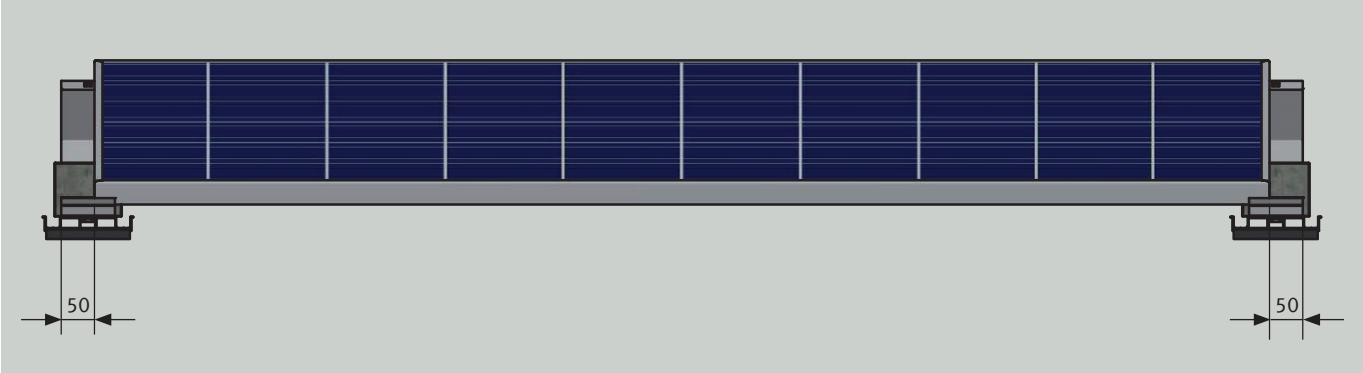


The modules may only be installed after ballasting.

The first module is placed at the upright of the front module support. Make sure that the module is exactly centred above the rail run. The clearance to the outer edge of the front module support is 50 mm.



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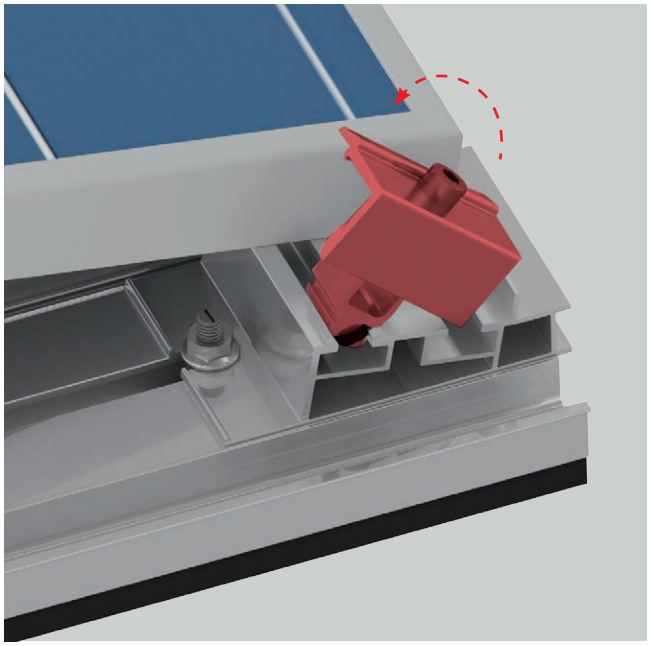
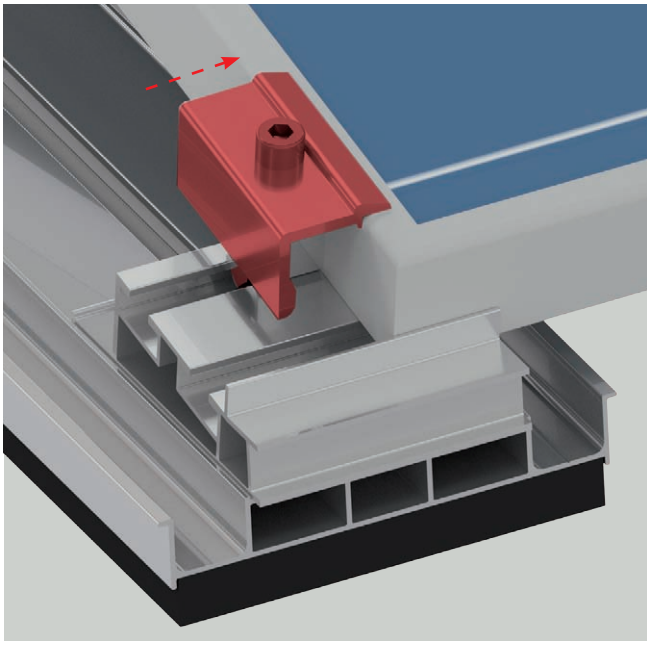
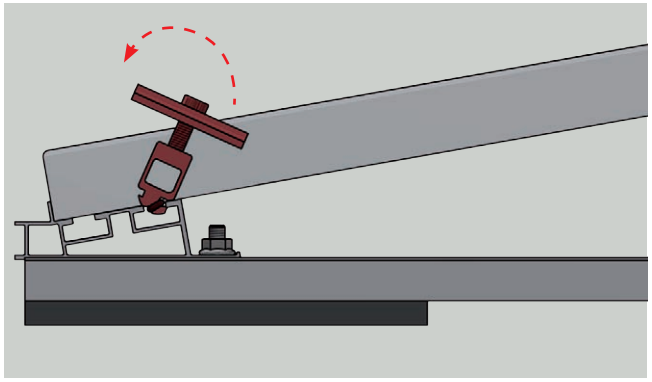
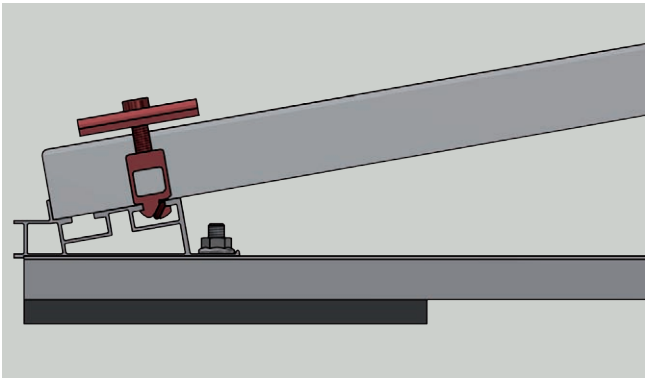
The first step is to install the end clips 7 on the outside. Make sure that the inner (upper) groove on the start or double support is used.
Place the clip with rubber on the profile groove and screw it in until you hear a click. Make sure that the clip fits into place exactly.
The rubber is only designed to aid installation (placeholder). After tightening, the rubber has no further function. The clip is then pushed onto the module and pressed against the module frame.
There must be no gap between the slot nut and the end clip. Push the end clip down and tighten the screw slowly and in a controlled manner to **15 Nm**. Make sure that the clip does not twist and that the module does not slip.
Next, attach the second end clip in the same way on the high support.

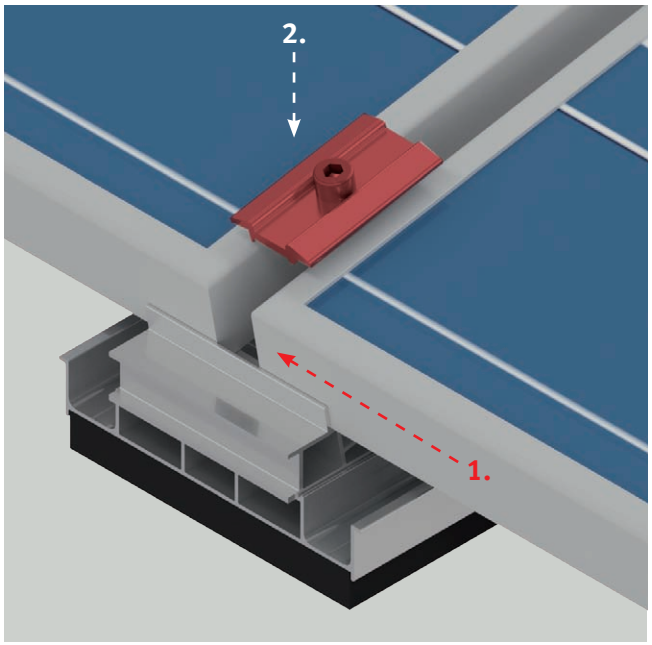




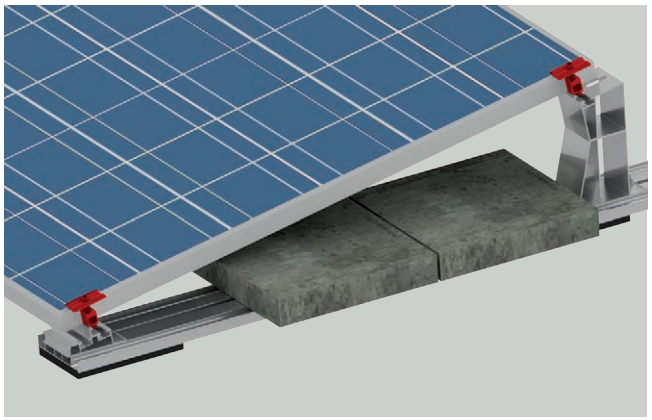
Next, the centre clips 8 are clicked into the inner groove of the start or double support and high support and pushed onto the module. You can now fit and align the next module.

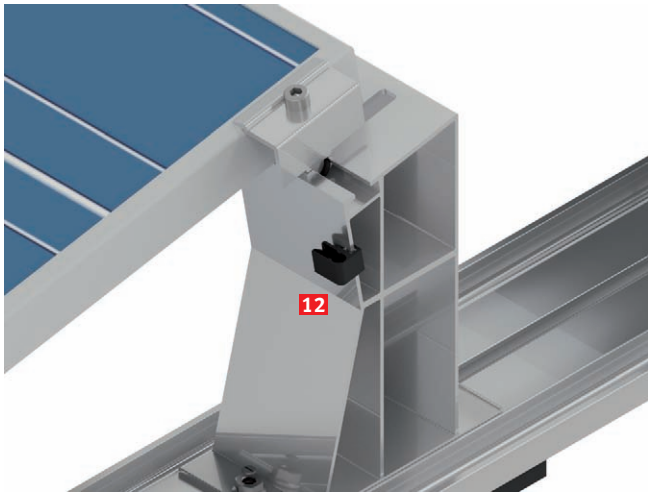


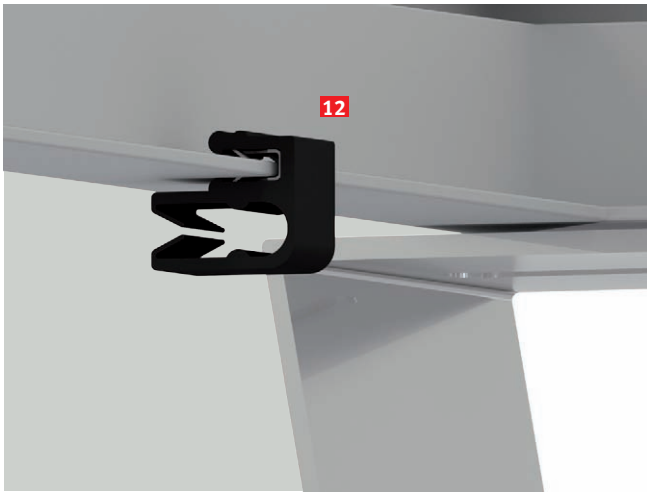




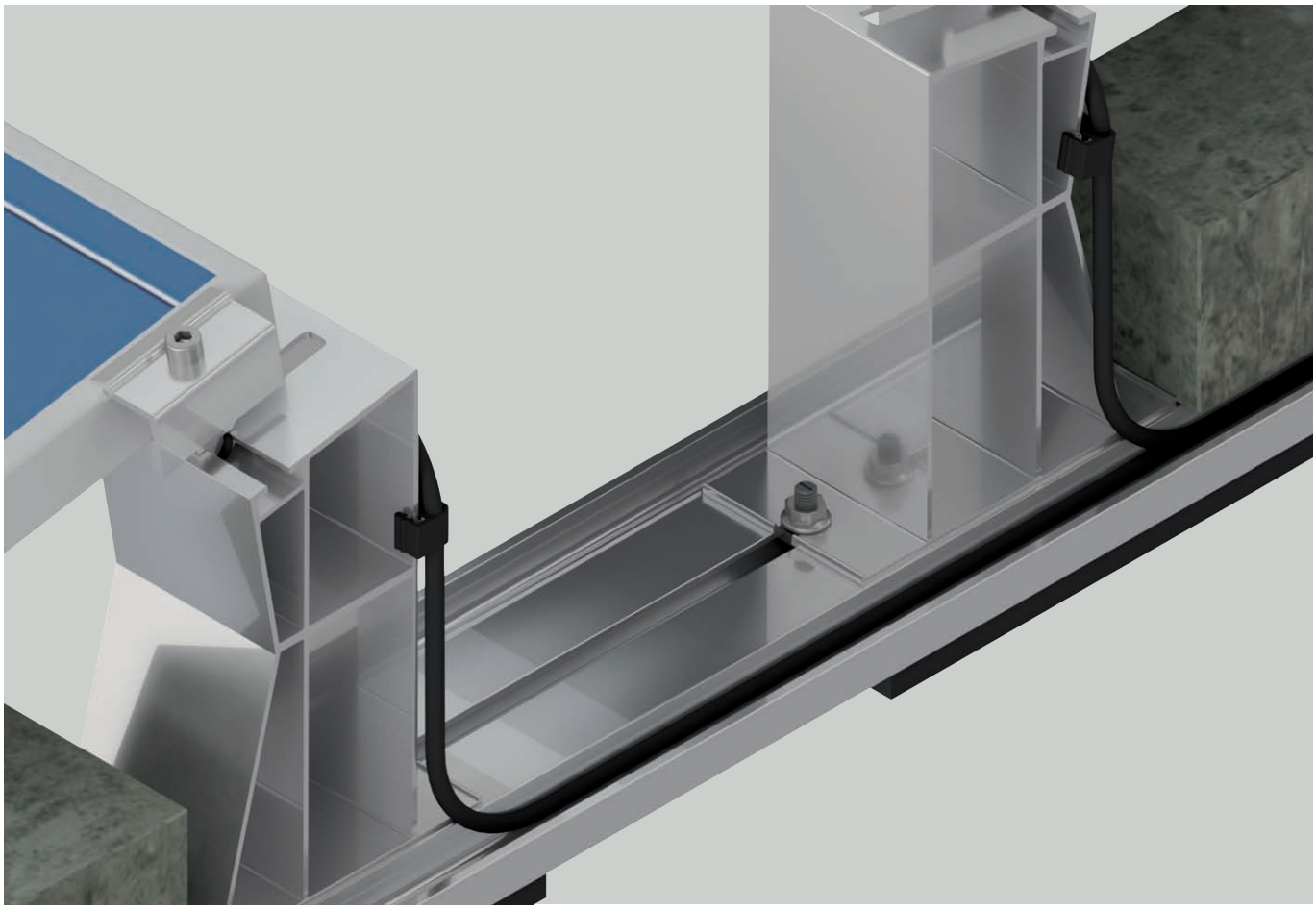
The second module is placed on top and pushed onto the centre clips. For both modules, the distance to the centre clip must not be greater than 1 mm. Push the clip down and tighten the screw slowly and in a controlled manner to 15 Nm.
Two end clips per module are installed again at the end of the row of modules.
Now all the modules of the system are installed.

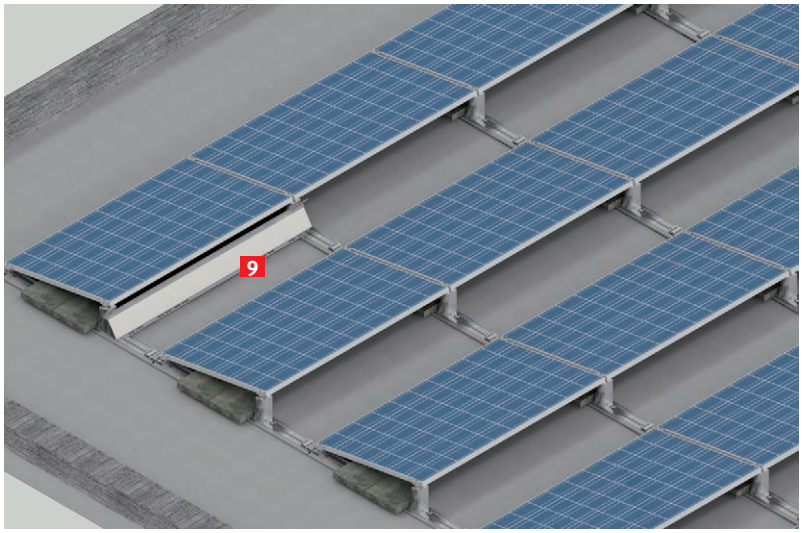




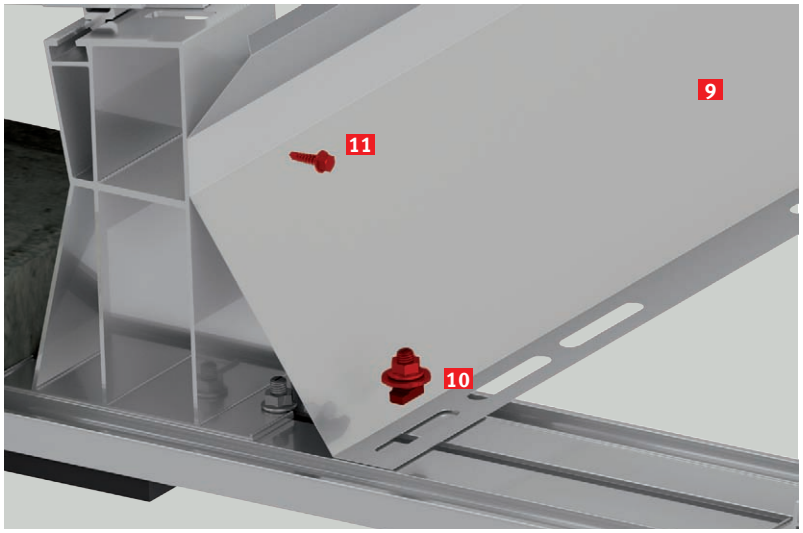


The mounting system includes 2 edge clips 12 per module. You can click these edge clips into place on the high support or on the underside of the module.
The cables are laid in the base profile's cable duct and routed upwards through the high support.
If more edge clips are required, they must be ordered separately.





The wind panels 9 must be installed after the cabling.
The wind panel must be placed on the rail and lent against the high support. The wind panel must not protrude beyond the module.



The wind panel 9 must be bolted to the rail using the hammer-head bolt with washer and self-locking nut 10.
To do this, thread the hammer-head bolt through the slotted hole of the wind panel, screw it into the rail and tighten it to 15 Nm.
Then screw the wind panel to the high support with a self-drilling screw 11 using a depth stop.

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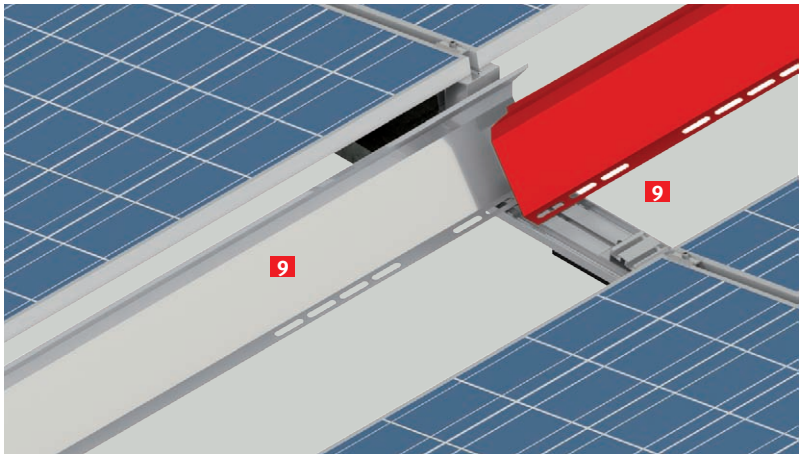
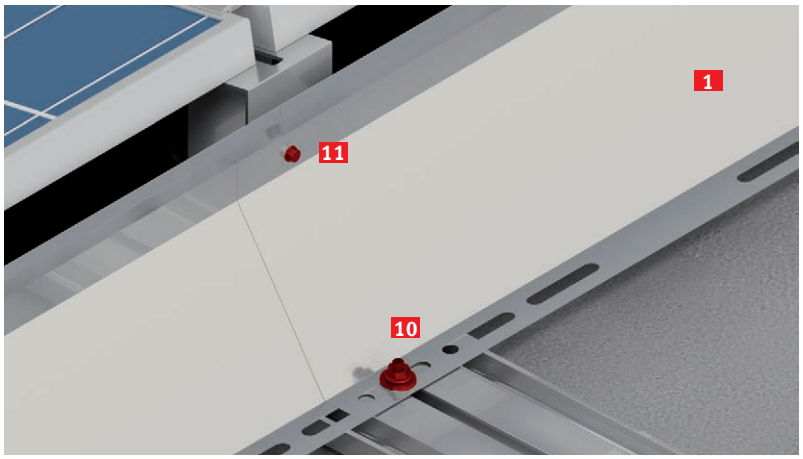
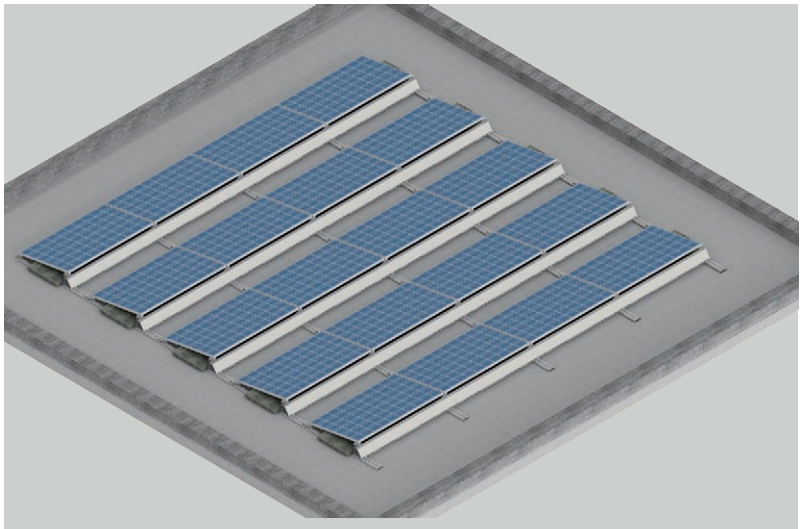


The second wind panel must be installed overlapping with the first wind panel. The installation steps are the same as the first wind panel.

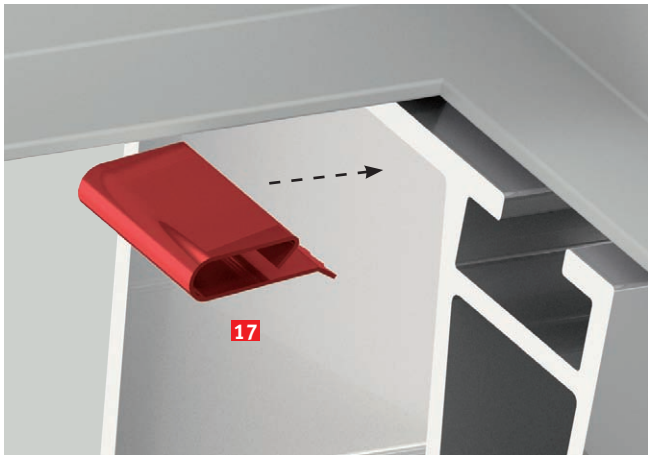


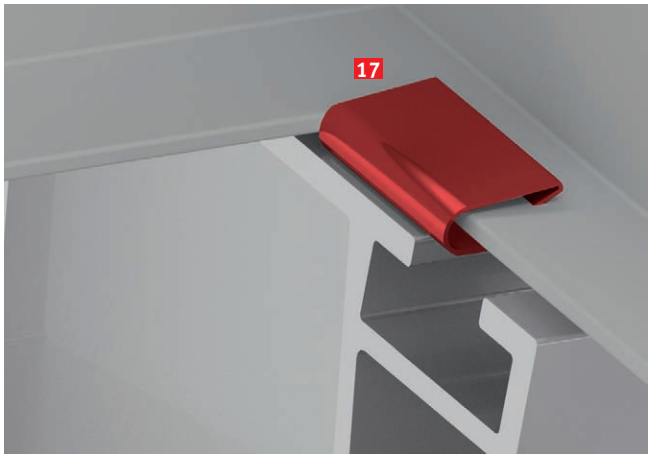
The wind panels must be connected by a self-drilling screw 11 and M8×20 hammer-head bolt with washer 10, using a depth stop. Wind panels must be installed for the whole system in this way.

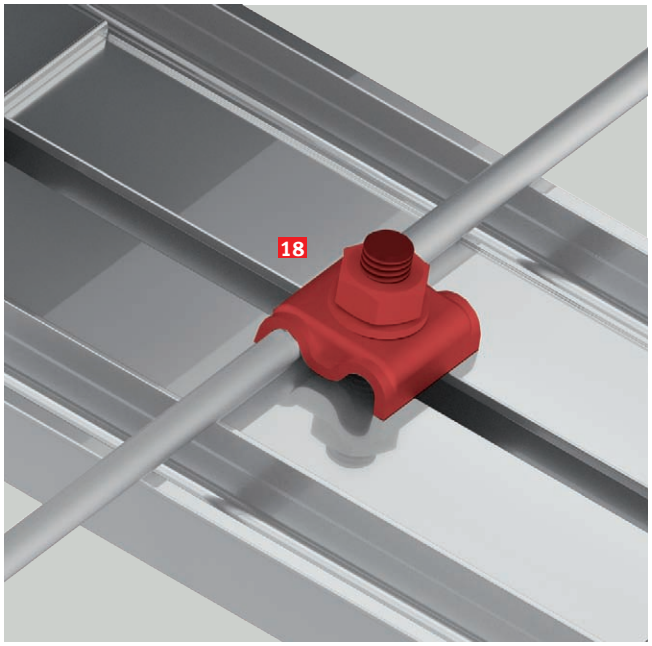


POTENTIAL EQUALISATION AND LIGHTNING PROTECTION (OPTIONAL)

The Terragrif 17 clamping element can optionally be used to provide equipotential bonding of the modules. The Terragrif must be carefully tapped into the underside of the module, on the support face of the high support. Only then is the module placed on the high support and attached.



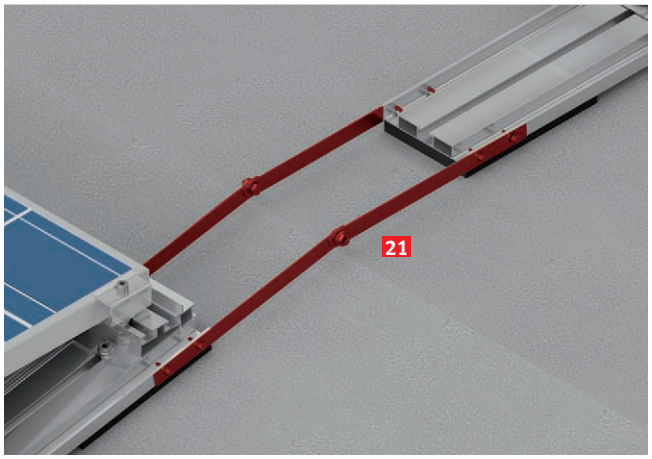


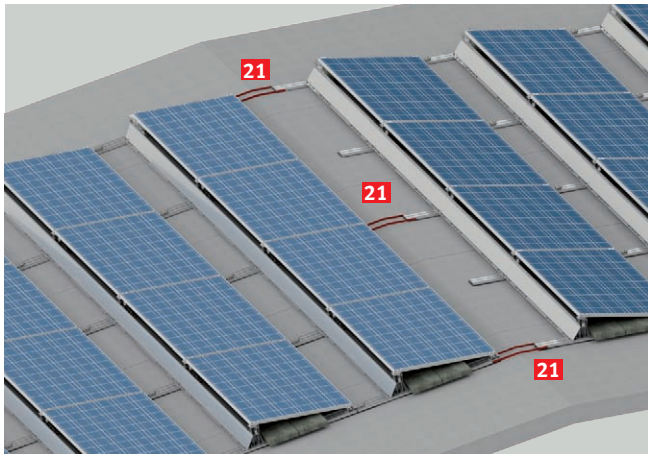


To attach the lightning protection wire, the lightning protection clamping block 18 is optionally available. It is suitable for 8 mm wire. The wire is placed on the base profile, then the hammer-head bolt of the clamping block is threaded into the rail and screwed tight.

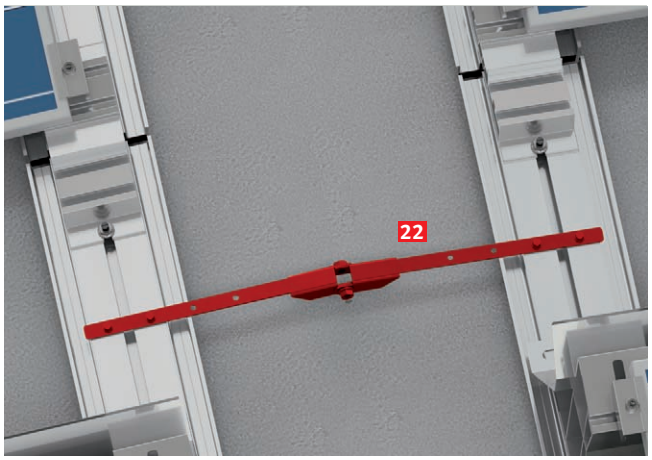
RIDGE CONNECTOR (OPTIONAL)

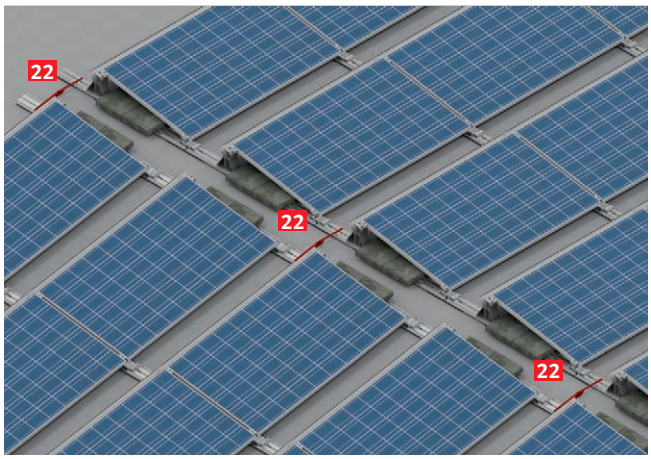
From a roof pitch of more than 5° to a maximum of 10°, the substructure must be connected via the roof ridge. Both sides of the roof must be almost identically covered with modules. When arranging the modules lengthwise to the eaves, use the ridge connector (length-wise) 21. It must be attached to both sides of the base profile with x2 5.5 × 20 self-drilling screws each. The ridge connectors must be mounted on every other base profile.





If the modules are arranged in the direction of the edge, the ridge connector (cross-wise) 22 must be used. It must be attached to both sides of the base profile with x2 5.5 × 20 self-drilling screws each. The ridge connectors must be mounted on every other module.





FINAL STEPS

After completing all the work, all the screw and clamp connections must be checked. The roof cladding must be checked for damage.

The final inspection must be documented. Please note the maintenance instructions on page 2.