

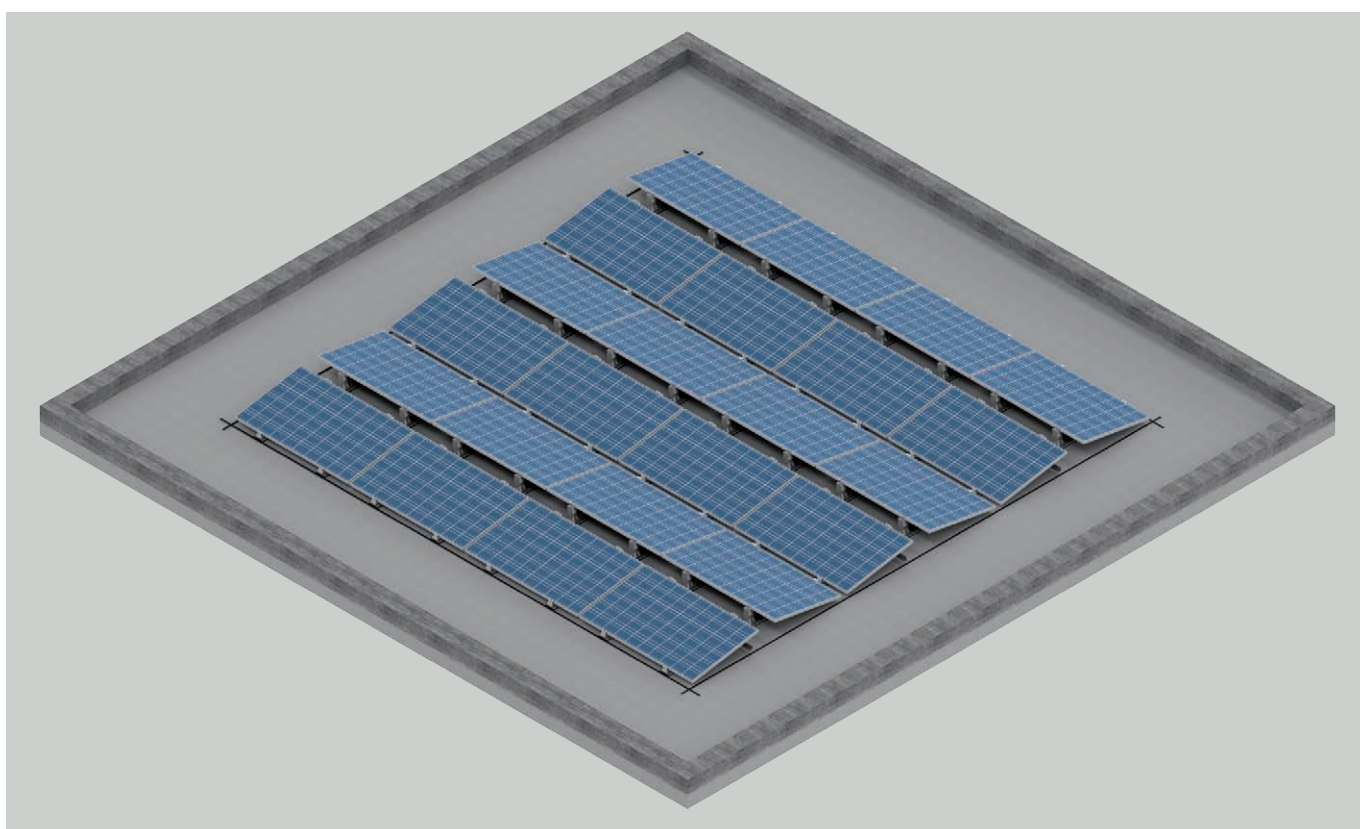


## INSTALLATION INSTRUCTIONS

# ALTEC FD\_OPTIFLEX-10

**East/west orientation – module clamping on long side**

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



## 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.Protocol. 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 8 interconnected modules (2 rows of 2 double 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 15 m at most. This means that a maximum of 7 rows of 6 double modules can be connected to each other. Leave approx. 100 mm between the rows.

## ROOF CLADDING

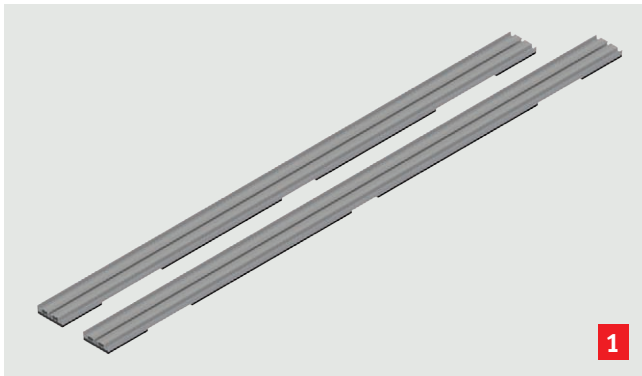
ALTEC FD\_OPTIFLEX-10 can be installed on bitumen, foils and gravel. On gravel roofs, remove the gravel to the width of the base rail. If this is not possible because the gravel layer is too high, the base rails are placed on the gravel and shaken down into the gravel slightly.

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):

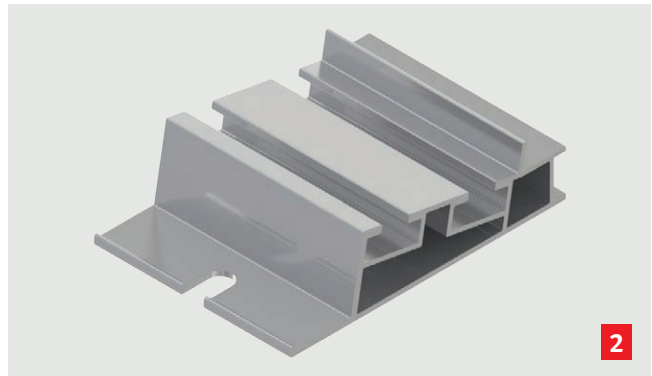
... “Therefore, the installer of a solar system must determine and ensure compliance with the coefficient of static friction specified in the structural survey on site.” ... “A significant influencing factor on evidence that the system is secured in position is the coefficient of static friction between 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  $\mu_h$ .” ... “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 $\mu_h$ 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

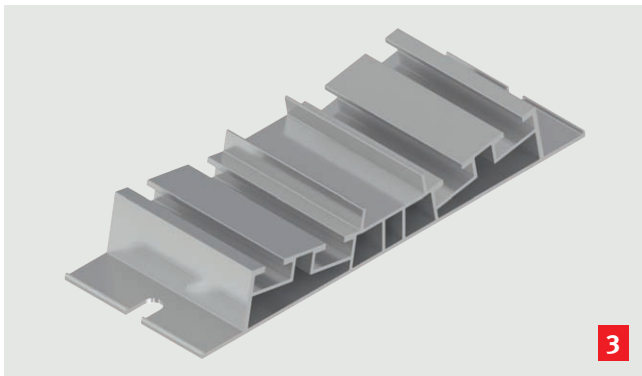
## OVERVIEW OF INDIVIDUAL PARTS



Base profile with building protection mat (rubber-based or aluminium-laminated), length 2370 or 2490 mm



Start support



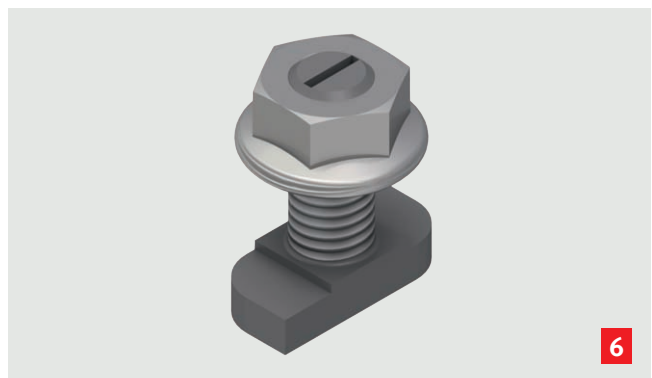
Double support and rail connector



High support



Support levelling for high support

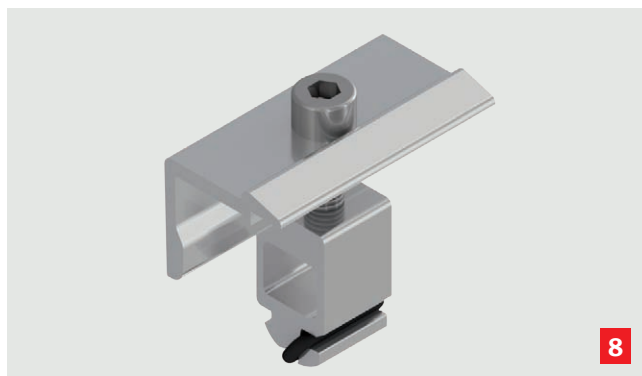


Hammer-head bolt set, mounted with self-locking nut

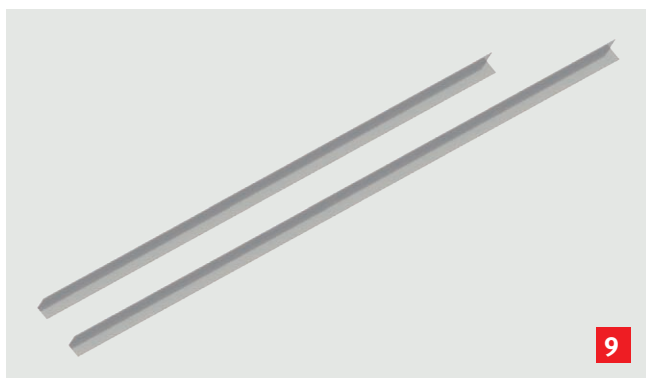
## OVERVIEW OF INDIVIDUAL PARTS



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



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



L-angle profile for 1580–1820 mm or 1821–2200 mm module length as row connector (required) and ballast rail (optional)

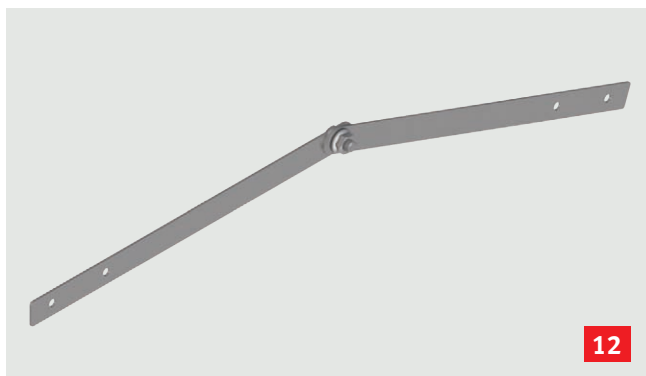


Self-drilling screw for aluminium 5.5 x 20, A4



Universal edge clip

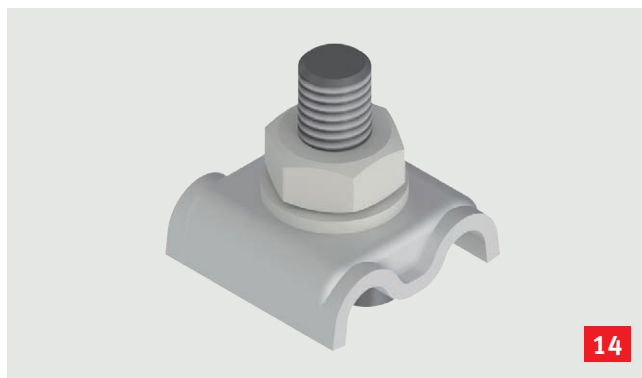
## OPTIONAL INDIVIDUAL PARTS



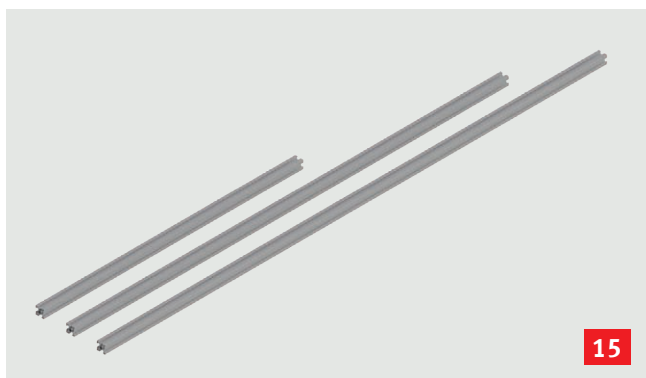
Ridge connector (length-wise)



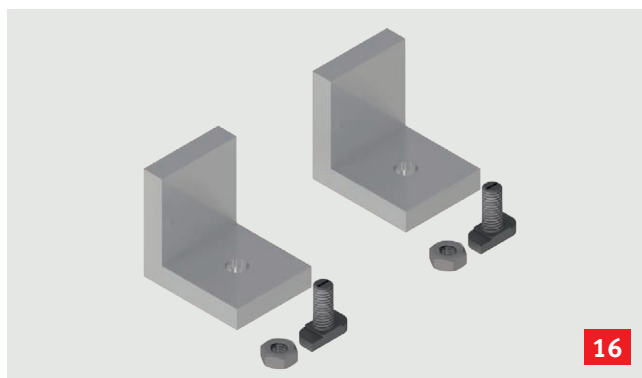
Terragrif 0.5 x 20 x 17-2



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

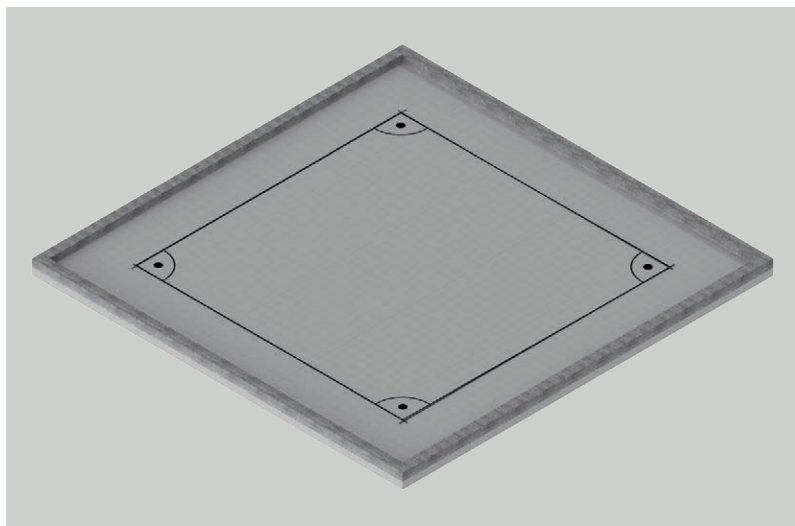


Standard mounting aid profile 40 x 40 for module width up to 1150 mm, module length up to 1820 mm or up to 2200 mm

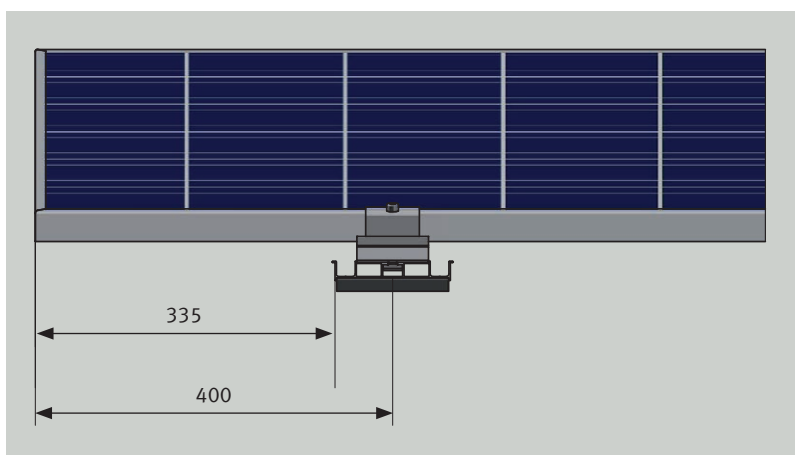


Mounting aid angle set 50 x 50 x 10 with hammer-head bolt and hexagon nut

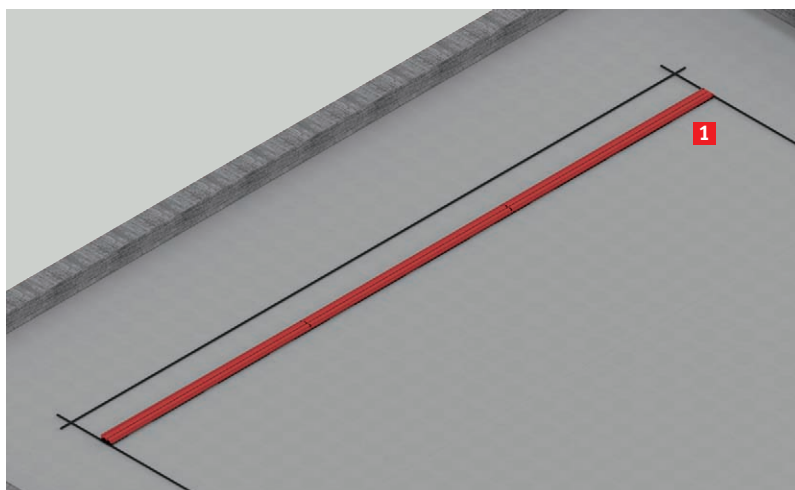
## START OF INSTALLATION



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 outer edges of the modules are the relevant point of reference.



Before installing the first rail run, check the clamping range of the modules. Usually the clamping range is at a distance of 400 mm from the outer edge of the modules. The clearance must be determined in each case using the module data sheet.



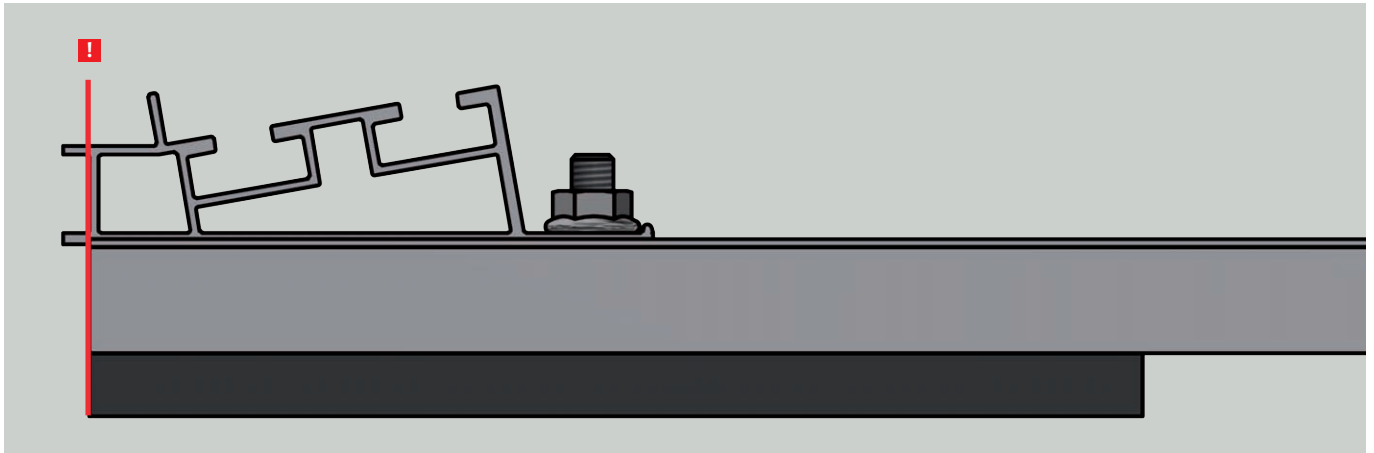
The base profile **1** must be installed with clearance of 400 mm (profile centre) or 335 mm from the marking.

The rail length depends on the module width:

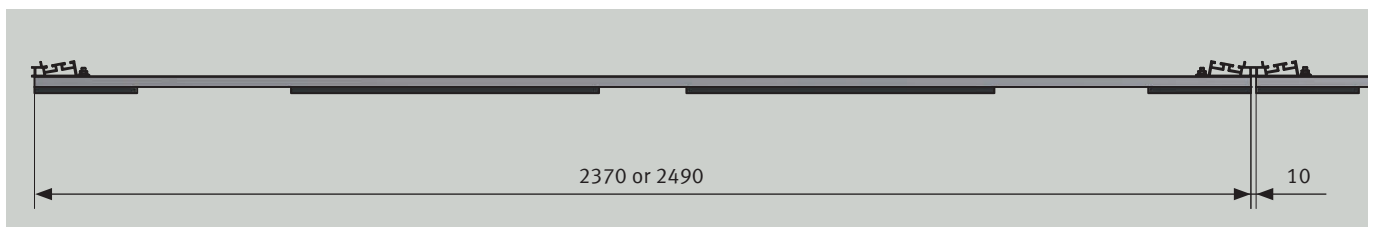
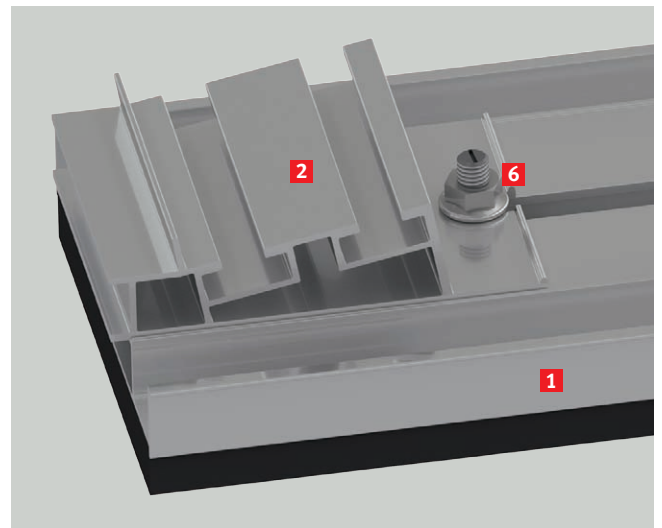
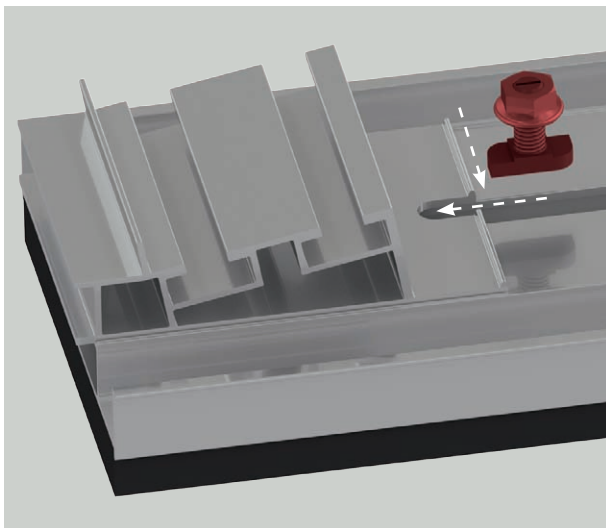
Module width	Rail length
990–1070	2370
1071–1134	2490



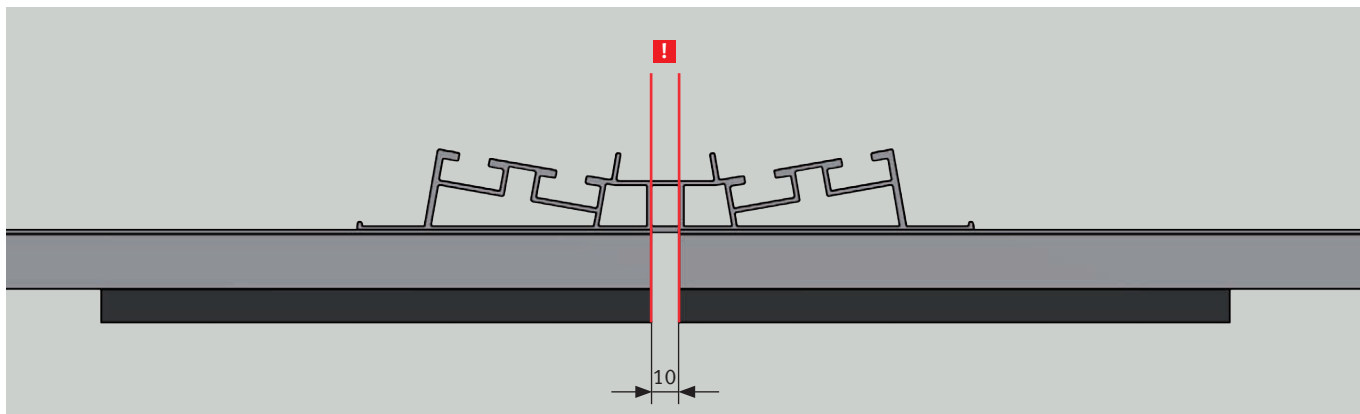
## INSTALLING THE START SUPPORT



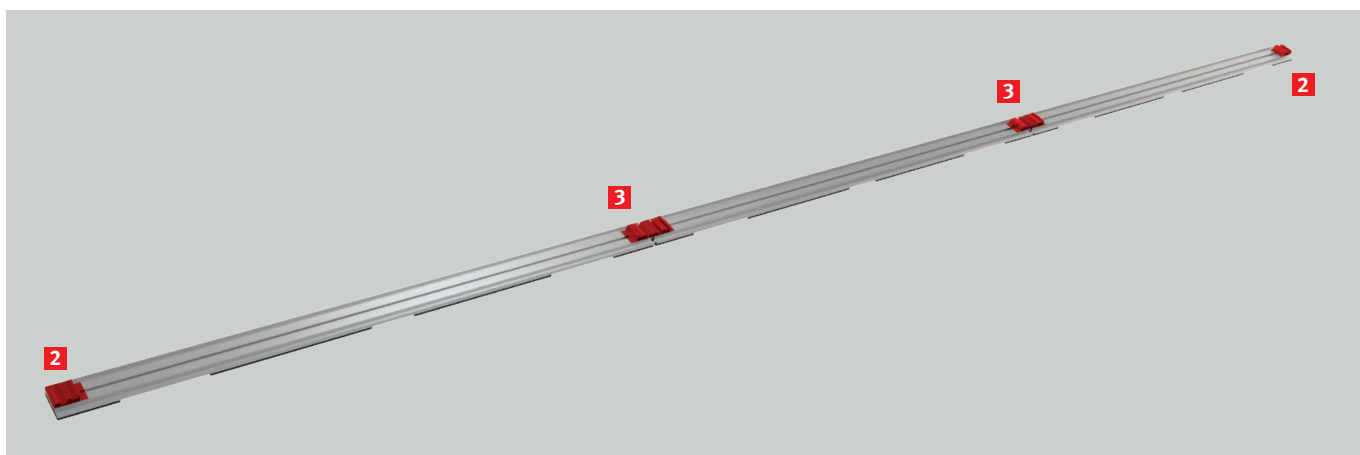
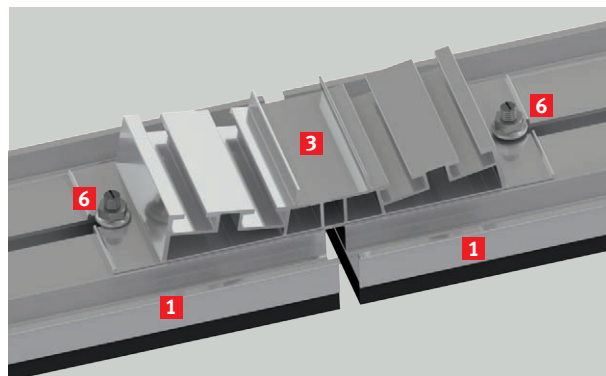
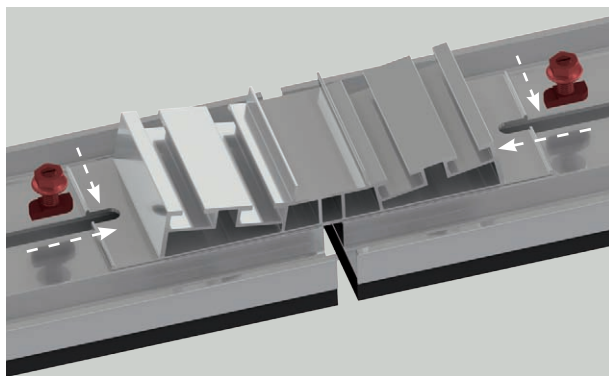
The start support **2** is installed at the start and end of the base profile **1**. When fitting the start support, make sure that the rod of the support forms a line with the base profile edge. Thread the M8 × 20 hammer-head bolt **6** into the base profile, push it forward in the slotted hole and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



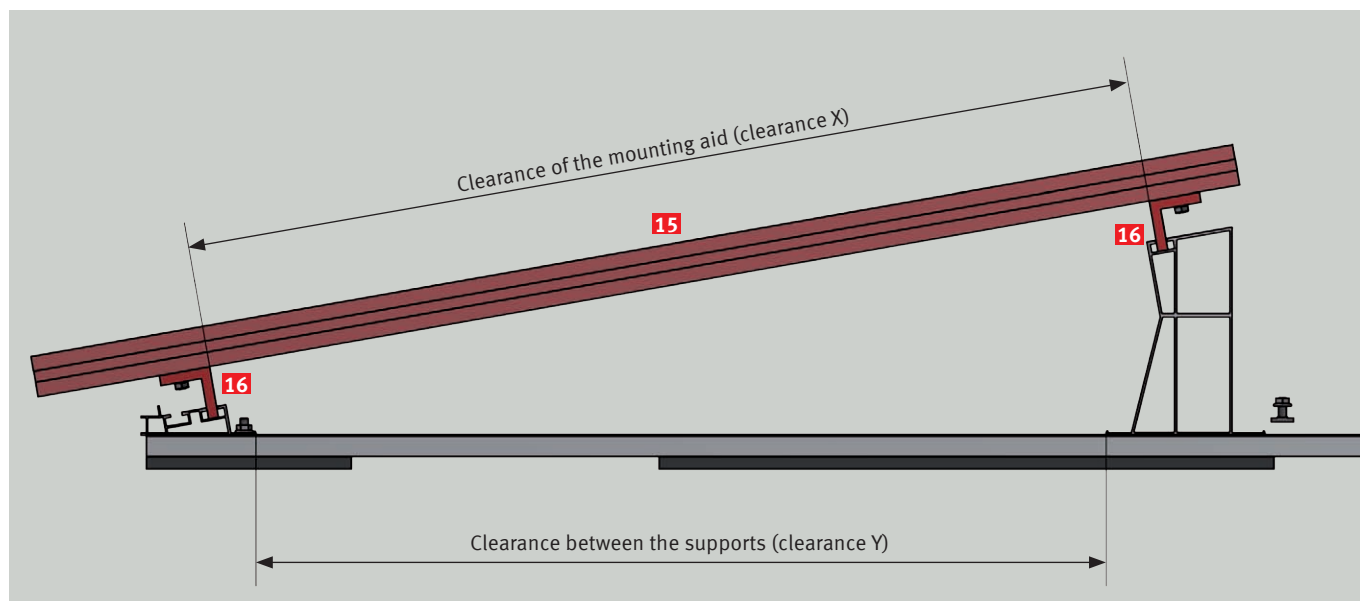
## INSTALLING THE DOUBLE SUPPORT



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.



## 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 **15** + **16**.

Module width in mm	Clearance of the mounting aid Clearance X in mm	Clearance between module supports Clearance Y in mm
990	925	825
1000	935	835
1010	945	845
1020	955	855
1030	965	865
1040	975	875
1050	985	885
1060	995	895
1070	1005	905
1080	1015	915
1090	1025	925
1100	1035	935
1110	1045	945
1120	1055	955
1130	1065	965
1134	1069	969
1140	1075	975
1150	1085	985

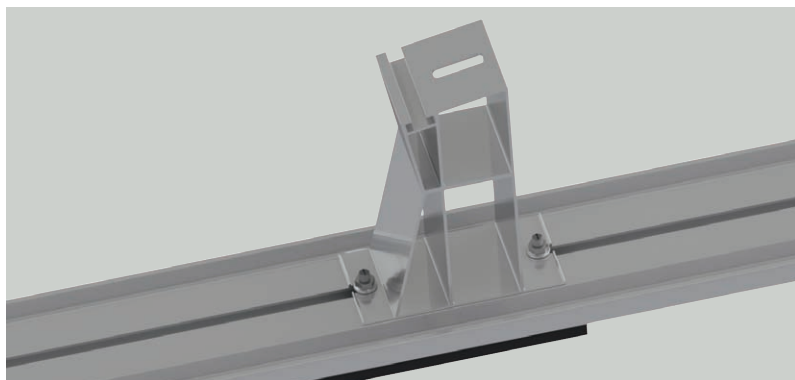
### With optional mounting aid:

The mounting aid brackets **16** are screwed to the mounting aid profile **15** with clearance X as per the table. The inner groove of the start or double support is used.

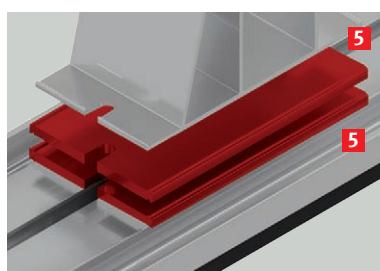
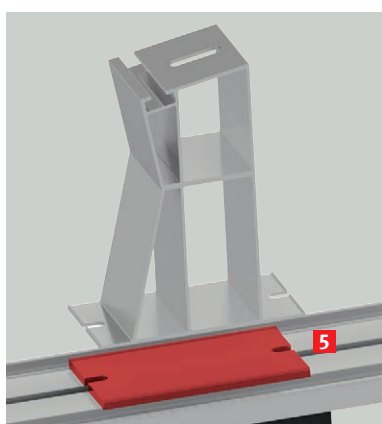
### With your own gauge:

Alternatively, a gauge with clearance Y as per the table can be used.

## INSTALLING THE HIGH SUPPORT



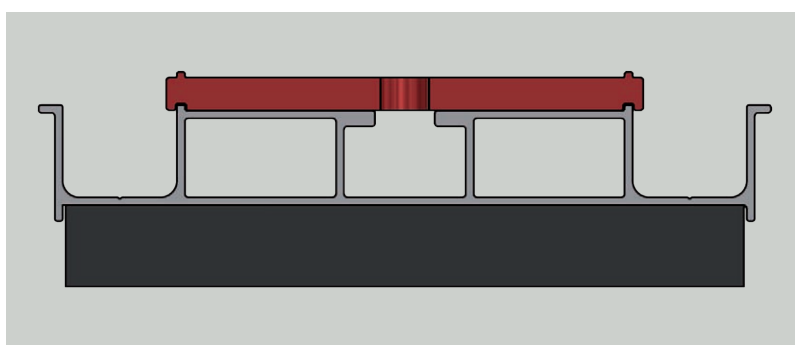
The high support **4** is attached in the same way as the double support **3**: thread two M8 × 20 hammer-head bolts **6** into the base profile, push them forward in the slotted hole and screw them in to 15 Nm. The hammer-head bolts must be screwed in by 90°.



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
990–1030	0	M8 × 20
1031–1090	1	M8 × 30
1091–1130	2	M8 × 30
1131–1150	3	M8 × 40



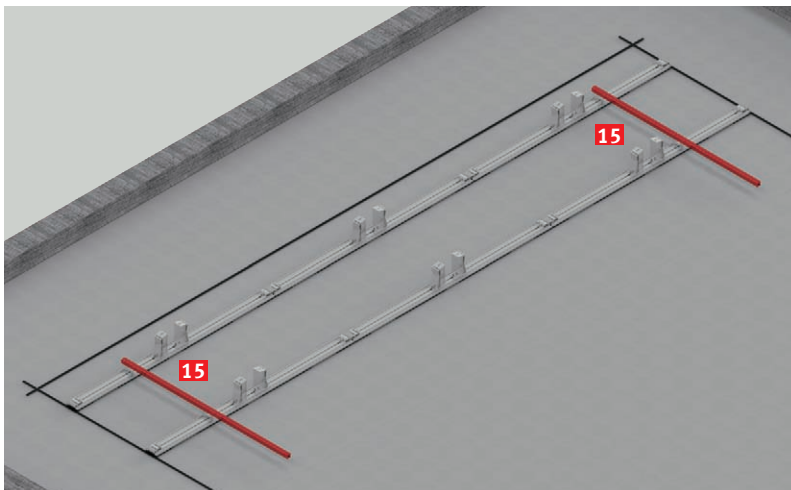
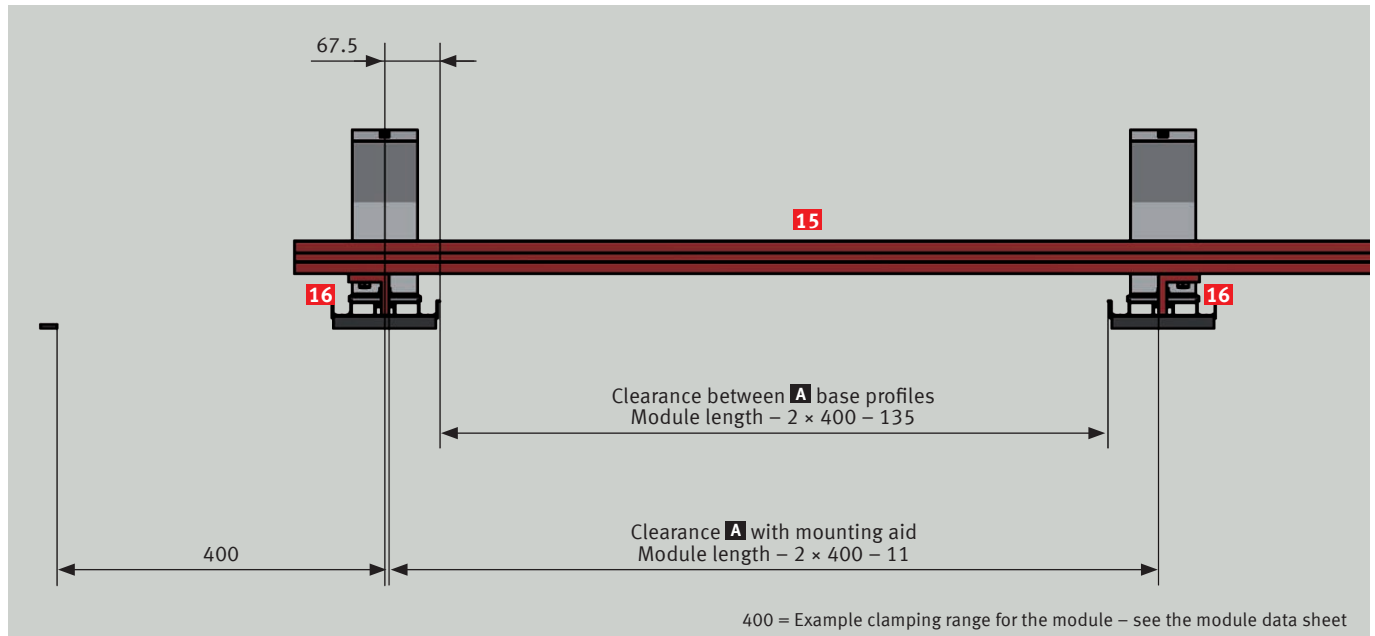
The support levelling shim must be placed exactly on the lugs in the base profile with the groove facing downwards. This prevents the shim from slipping. The high support is then placed on top and mounted at the previously calculated position.

## INSTALLING THE BASE PROFILE RUNS

The first base profile is now completely mounted with module supports. The second base profile must now be pre-assembled with module supports and placed at the appropriate distances.

The clearance **A** of the second base profile depends on the clamping range of the module.

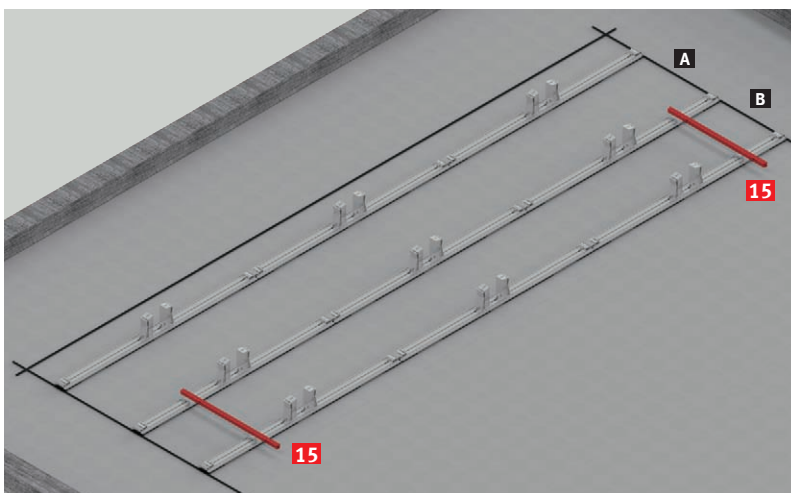
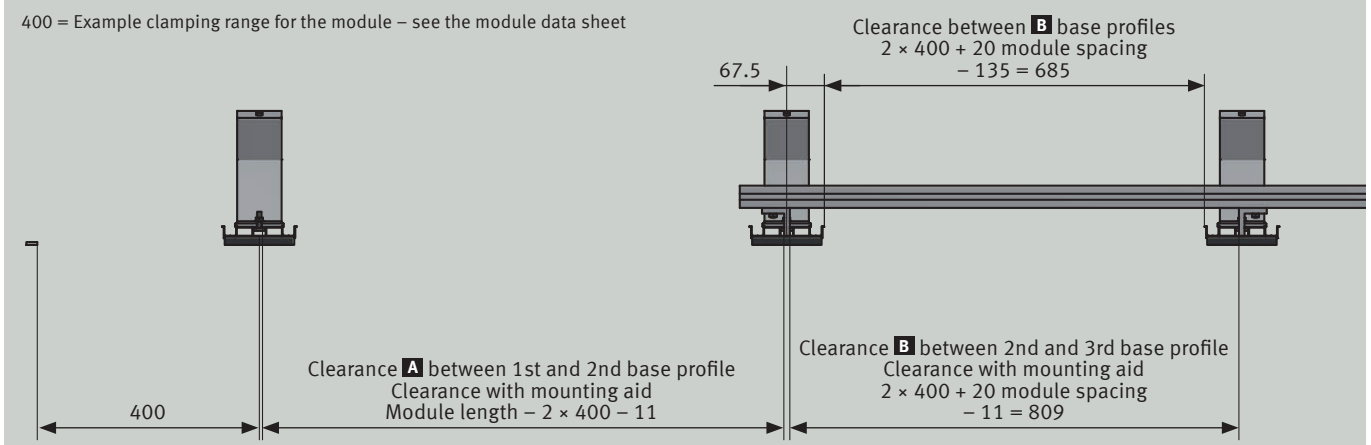
Replace the 400 mm as shown here with the clamping range that applies to the module:



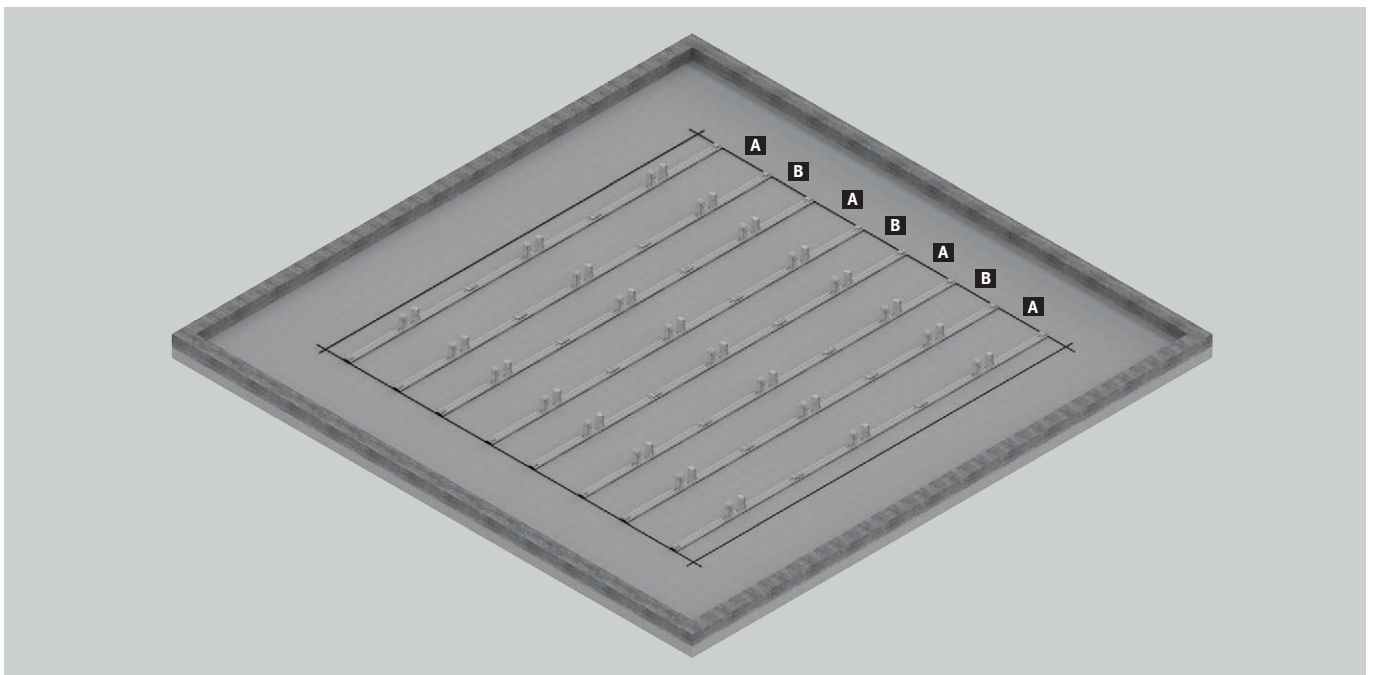
The clearance **A** of the second base profile run can be calculated with the optionally available mounting aid **15** + **16**. When using the mounting aid, the brackets must be mounted with a clearance of module length – 2 x clamping range – 11 mm. When measuring with a tape measure, the clearance is the module length – 2 x clamping range – 135 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.

## INSTALLING THE BASE PROFILE RUNS

400 = Example clamping range for the module – see the module data sheet

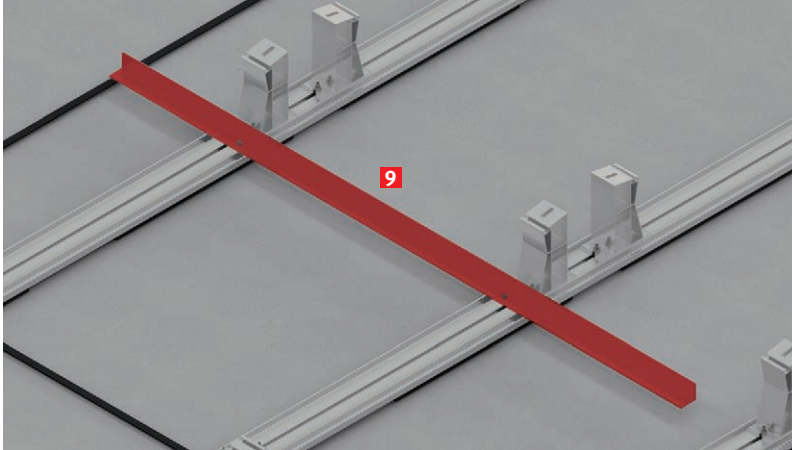


The third rail run has clearance **B**. This clearance is calculated using the calculation on the drawing. For an example edge clearance of 400 mm and a module clearance of 20 mm, the clearance **B** is 809 mm when using the mounting aid. Clearance **B** is followed again by clearance **A**. The clearances always alternate. This is how the whole rail run is built up.



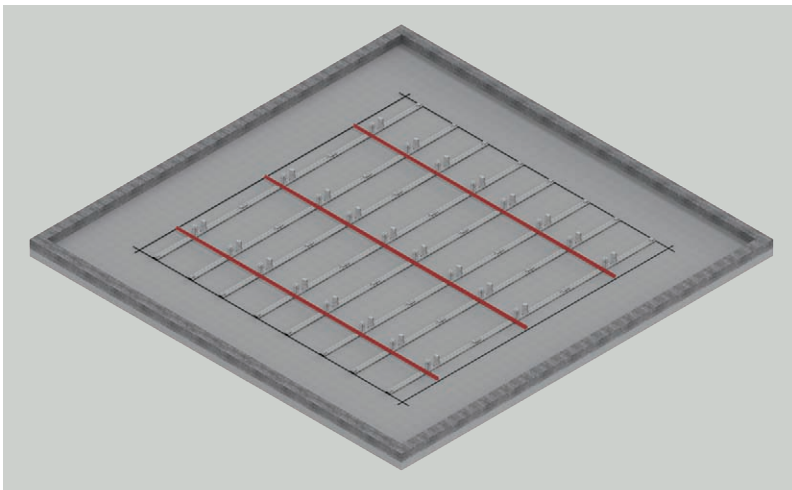
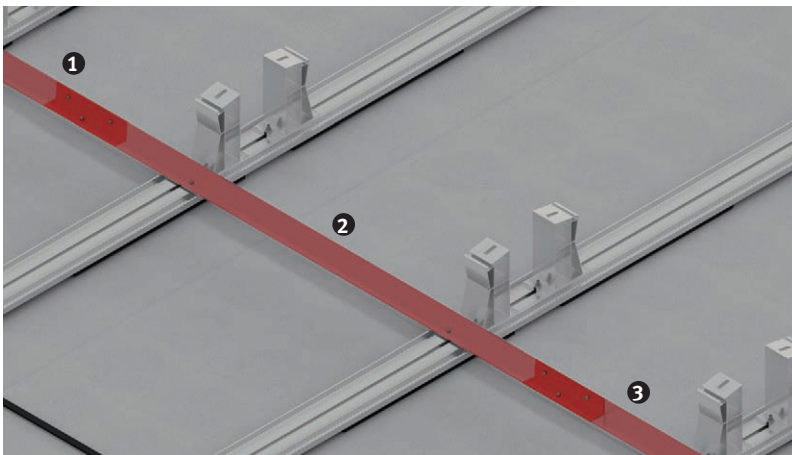


## ROW CONNECTION BY L-ANGLE PROFILE

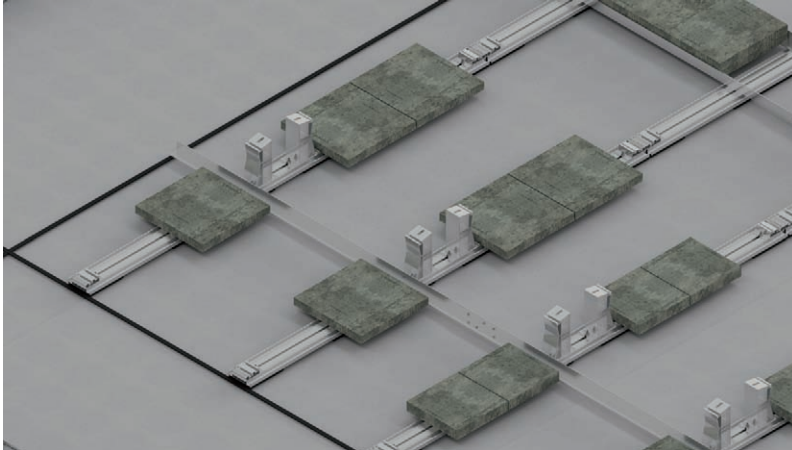


The L-angle profile **9** must be used to connect the individual rows and must be attached to the base profile **1** with one self-drilling screw **10** each. The L-angle profiles must overlap: **1** and **3** are positioned and attached. L-angle profile **2** is positioned on **1** and **3** and attached with 3 self-drilling screws **10** each.

One L-angle run per double module is required and therefore the steps described above must be repeated until the rows are completely connected.



## BALLASTING



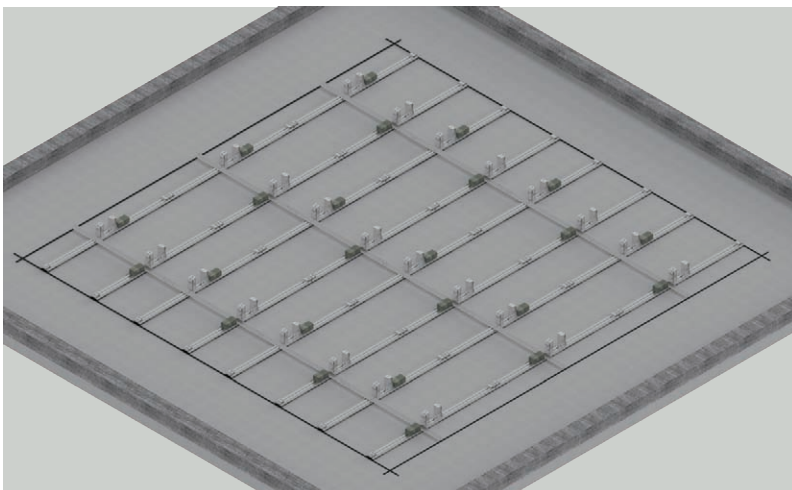
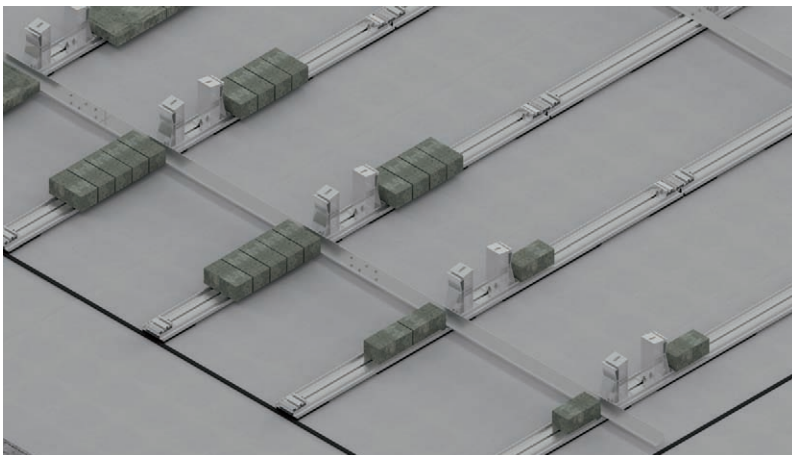
**The ballast plan supplied must be strictly complied with.**

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

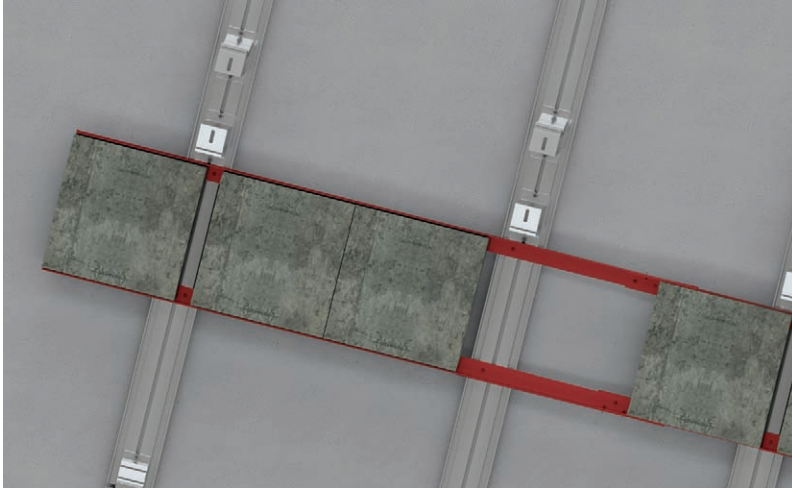
The ballast is placed centred over the base profile to prevent tipping.

A maximum of 28 kg may be placed on each side of the base profile, i.e. 56 kg per module and 112 kg per double module.





## BALLASTING



If the required weight is higher than 112 kg per double module, the ballast must be placed between two L-angle profiles **9**. In this case, 84 kg per module or 168 kg per double module can be used as ballast.

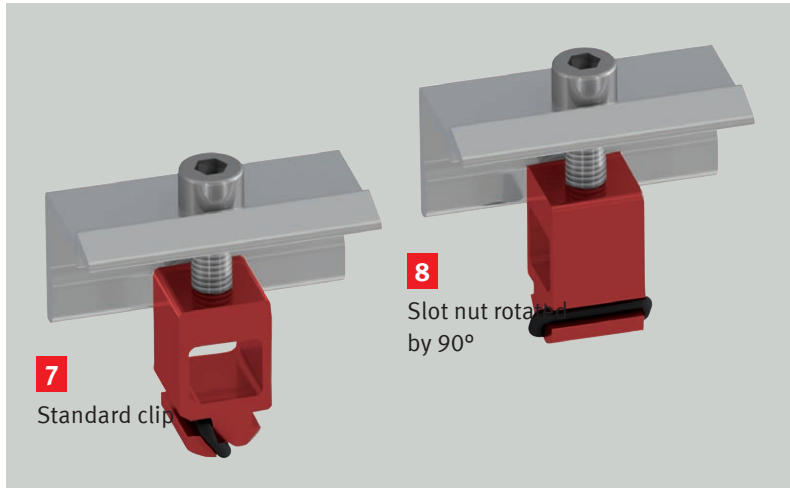
The ballast rail must be attached with self-drilling screws **10**, in the same way as the already mounted L-angle profile. The contact faces of the L-angle profiles face each other.



When arranging the slot nuts, make sure that the slot nuts do not come into conflict with the self-drilling screws **11**.

The inner ballast rails must be installed adjusted to the width of the ballast. The distance between the outer ballast rails must therefore be at least 8 mm wider than the width of the ballast.

## PREPARATION FOR MODULE INSTALLATION



**The modules may only be installed after ballasting.**

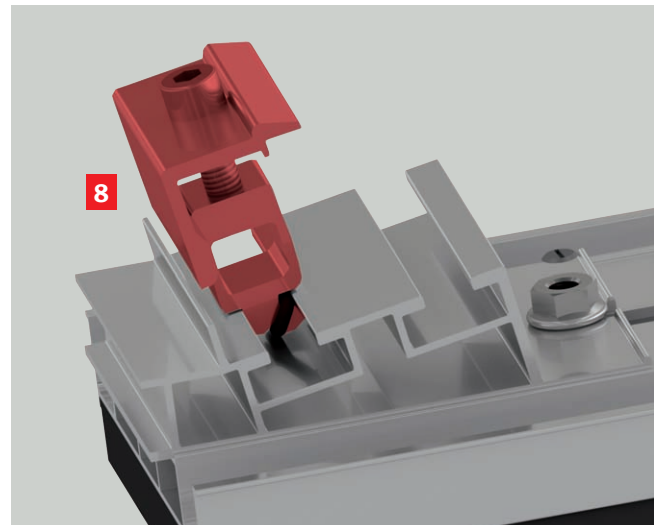
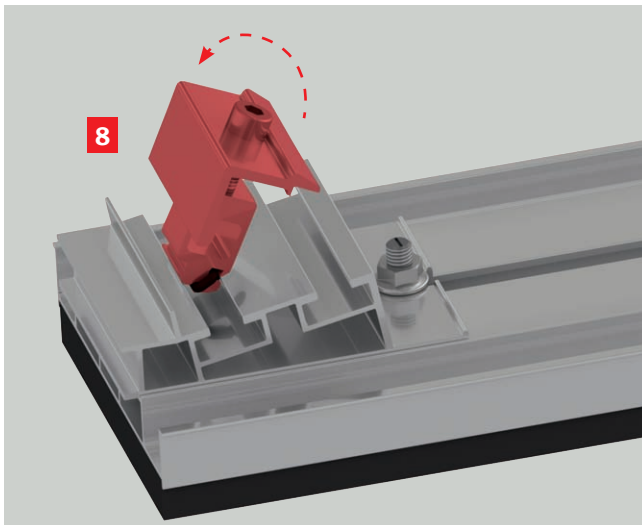
Clip **8** must be used for start support and double support.

Clip **7** is used for the high support.

The first step is to install the end clips **8** on the outside. Make sure that the outer (lower) groove on the start or double support is used.

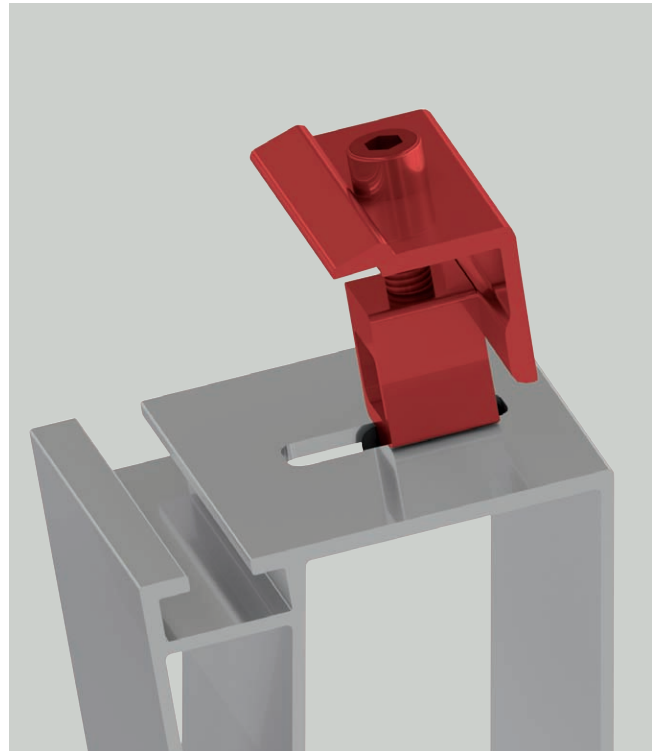
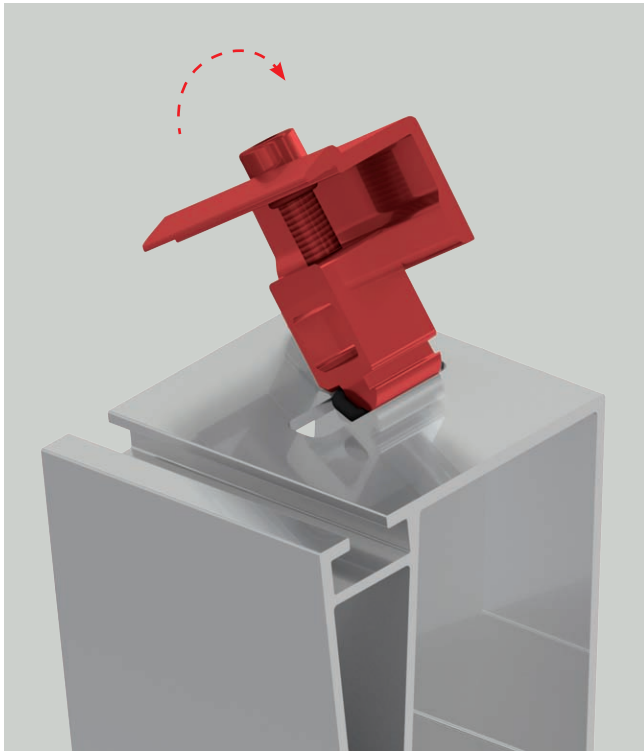
Place the clip with rubber on the profile groove and screw it in until you hear a click. Make sure that the clip fits into place exactly.

This clicks the end clips into the start and double supports.



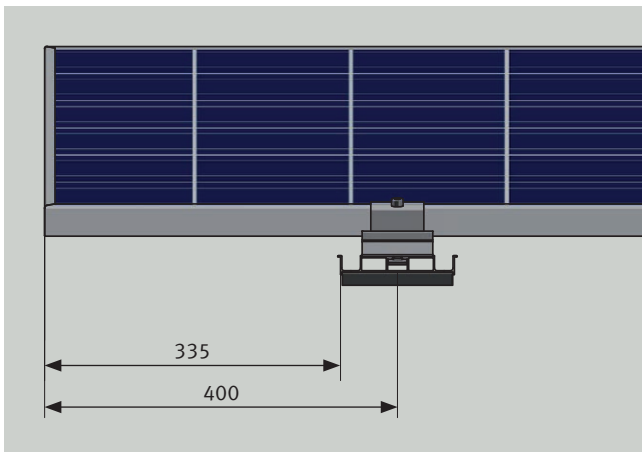
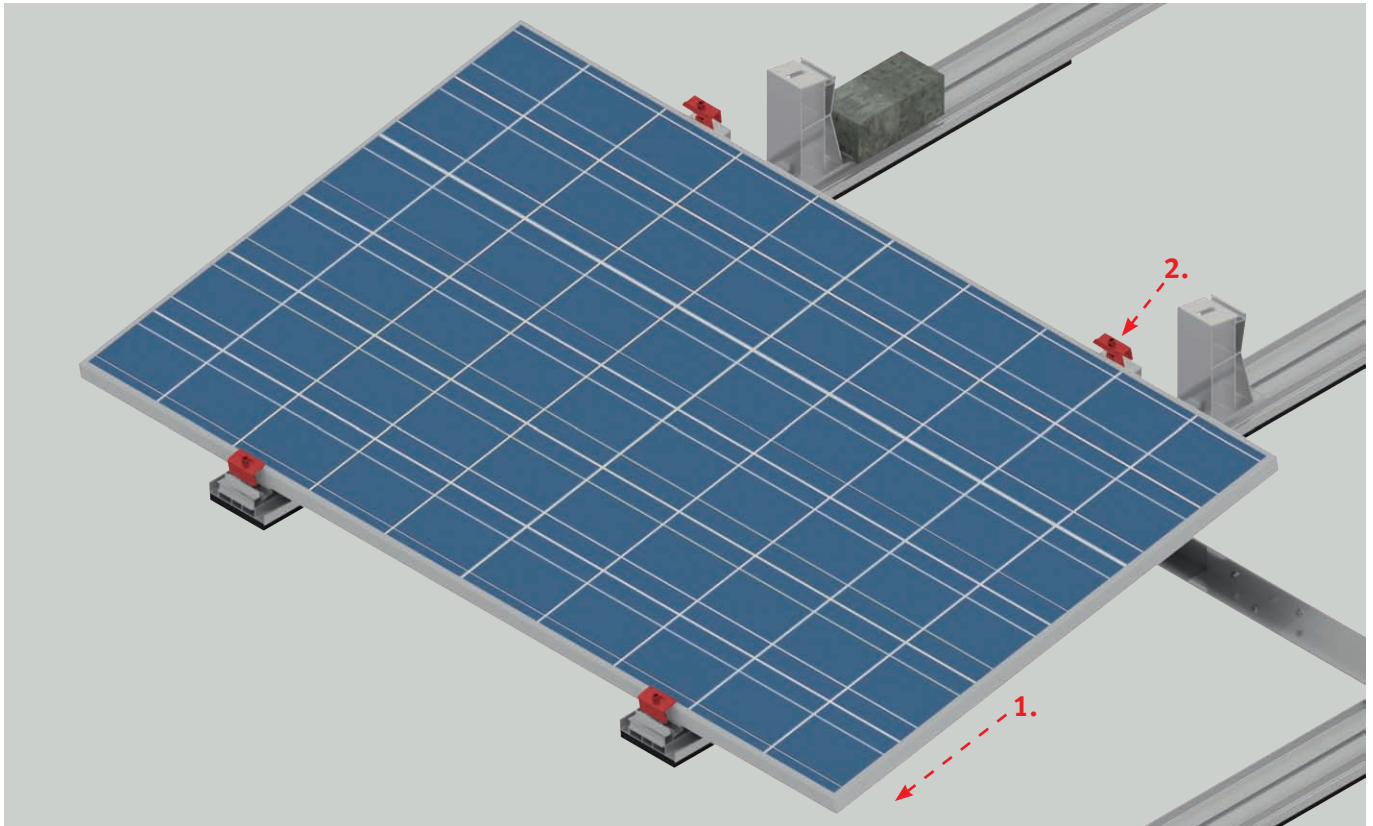
## PREPARATION FOR MODULE INSTALLATION

Click the end clip **7** into the slotted hole of the standing rib. Place the clip with rubber on the slotted hole and screw it in until you hear a click. Make sure that the clip fits into place exactly. Push the clip all the way up the slotted hole. This attaches all the end clips into the high support.



## MODULE INSTALLATION

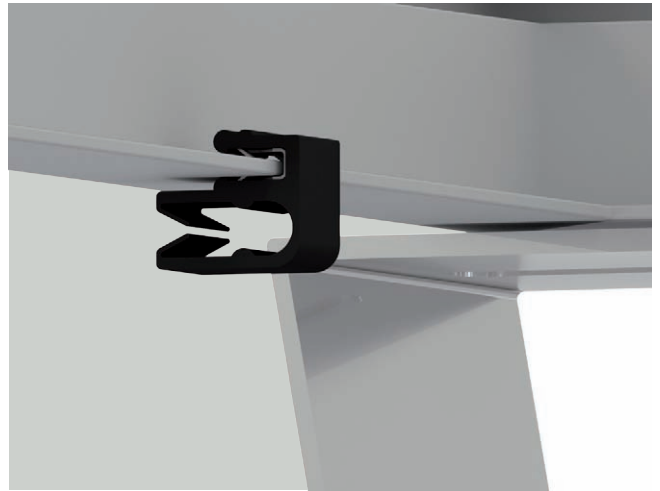
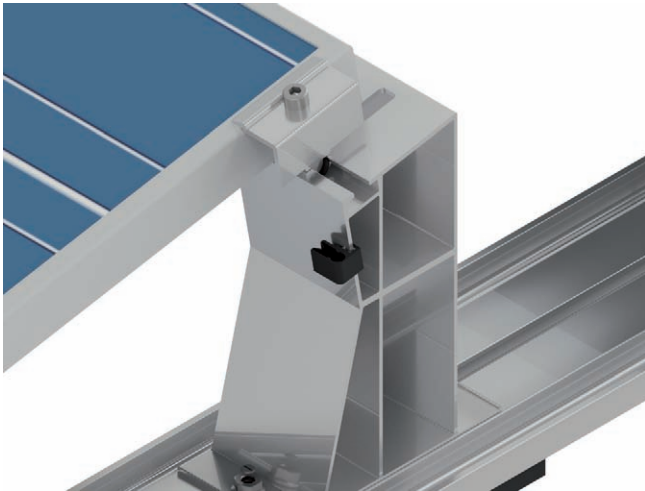
Once all end clips have been clicked in, install the first module. The module must be placed on the start support and pushed under the end clip. Then place the module on the high support and push the end clip up to the module.



The module must be precisely aligned according to the selected clamping range (example: 400 mm). You can then screw on the end clips. 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. There must be no gap between the slot nut and the end clip. The rubber is only designed to aid installation (placeholder). After tightening, the rubber has no further function.

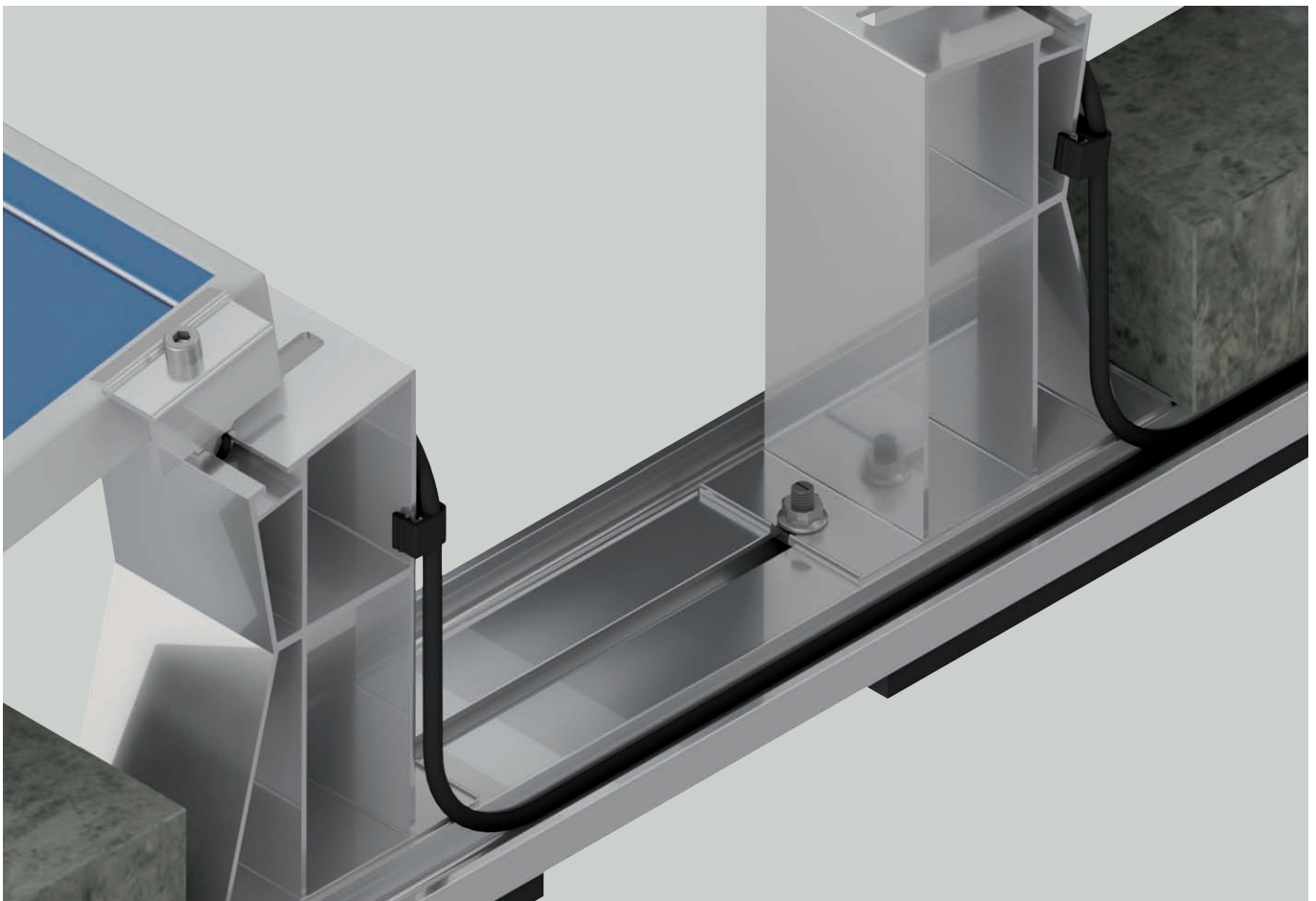


## EDGE CLIPS



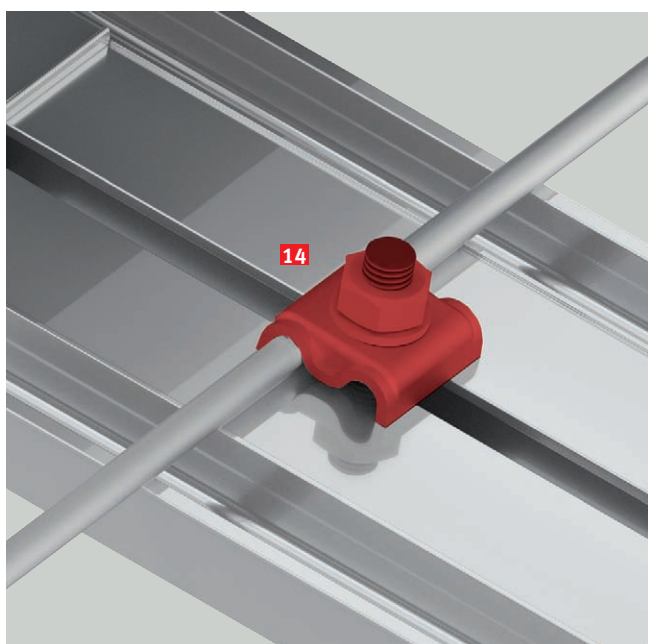
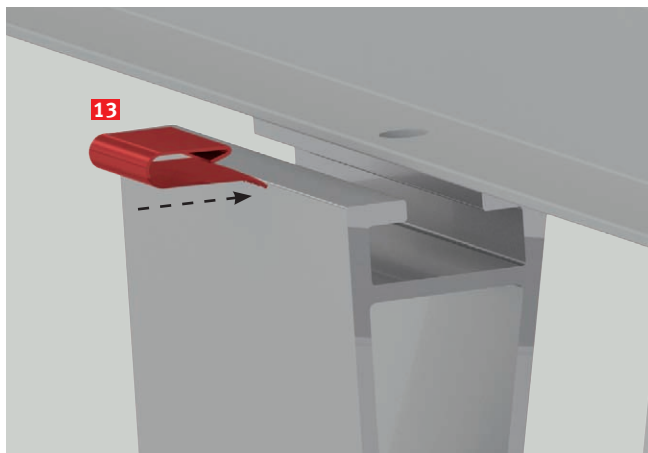
The mounting system includes 2 edge clips **11** per module. You can click these edge clips into place on the high support **4** or on the underside of the module.

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.



## POTENTIAL EQUALISATION AND LIGHTNING PROTECTION (OPTIONAL)

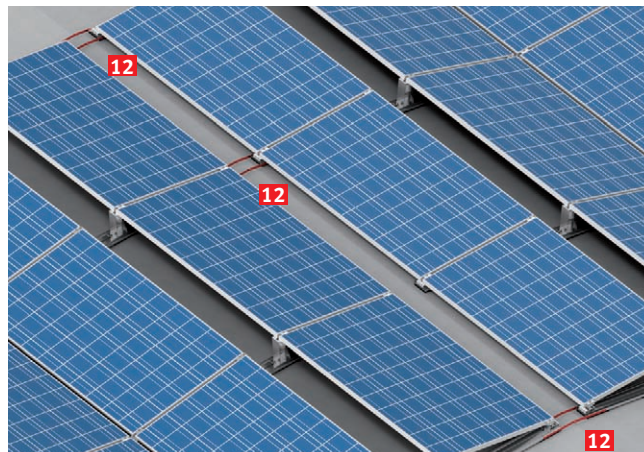
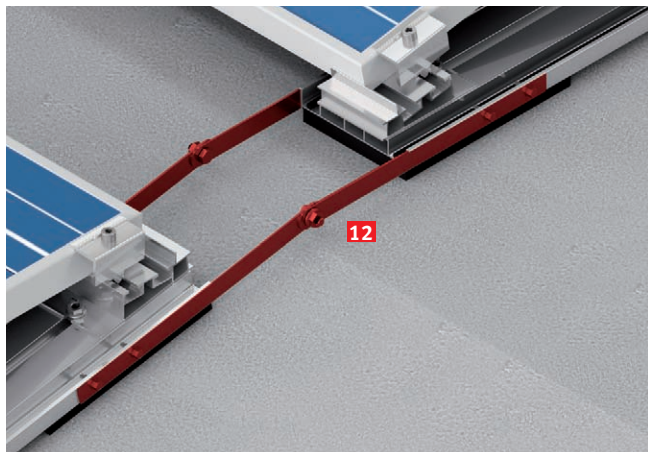
The Terragrif **13** clamping element can optionally be used to provide equipotential bonding of the modules. The Terragrif must be carefully tapped into the underside of the module, on the support face of the high support. Only then is the module placed on the high support and attached.



To attach the lightning protection wire, the lightning protection clamping block **14** is optionally available. It is suitable for 8 mm wire. The wire must be placed on the base profile, then thread in and screw tight the hammer-head bolt of the clamping block.

## 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) **12**. It must be attached to both sides of the base profile with x2 5.5 × 20 self-drilling screws **10** each. The ridge connectors must be mounted on every other base profile.



## 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.