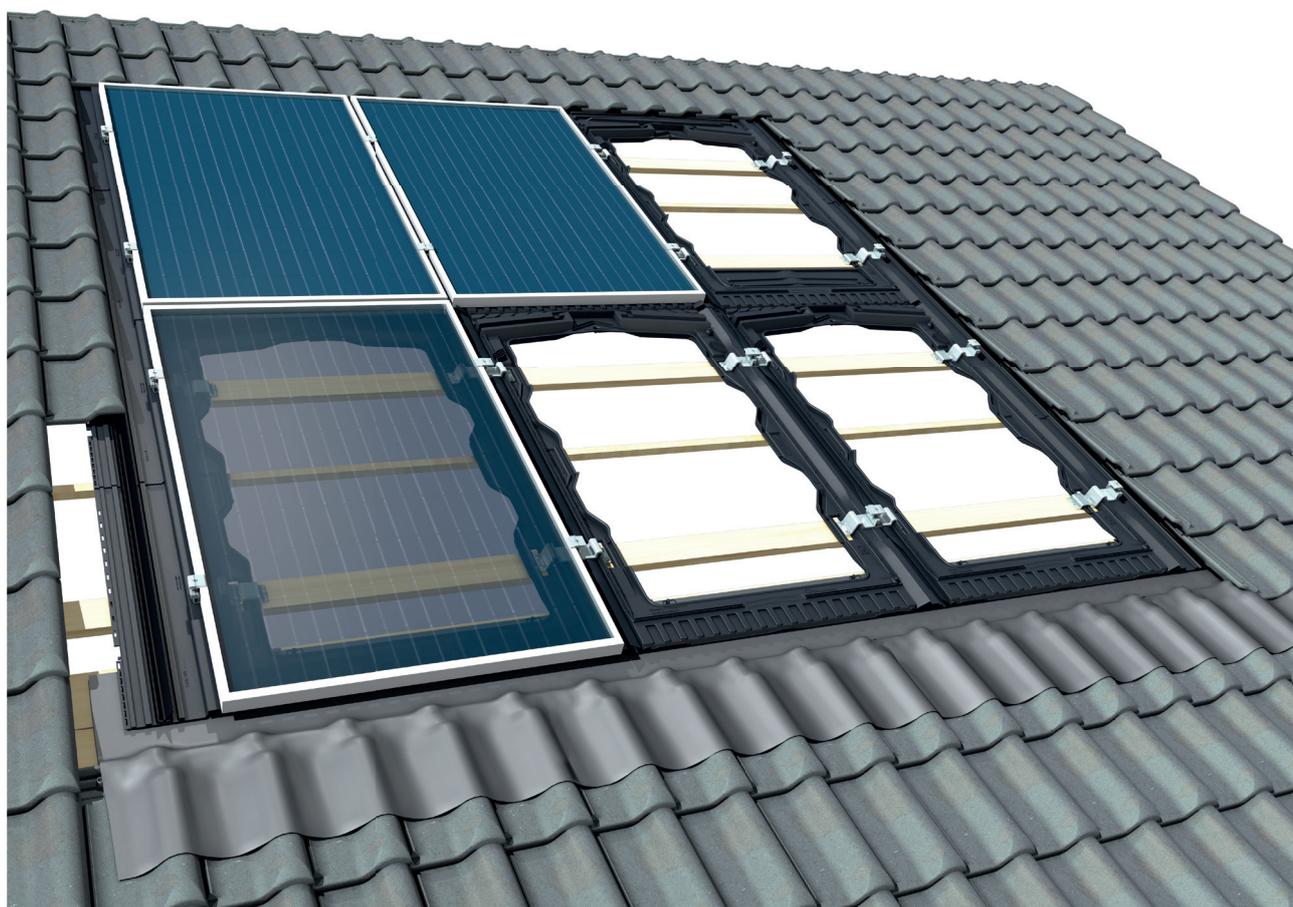




Assembly Instructions

S:FLEX in-roof system P-1 portrait

Mounting system for in-roof solutions



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Read these installation guidelines carefully before installing the S:FLEX mounting system and retain them for future reference!

These installation guidelines are only complete with the project-specific implementation plans (project report)!

1.1 Intended use

The S:FLEX in-roof system is suitable for all pitched roofs with pitch angles between 10° and 50°. Roof-integrated solar panels can also be installed on uneven roofs.

The system is configured for vertical installation:

- Frame P-1 for module size 1661 mm - 1730 mm * 1002 mm - 1023 mm
- Module frame height: 30 mm - 50 mm

Any other use in this regard is considered misuse of the product. In particular, compliance with the instructions in these installation guidelines constitutes intended use. S:FLEX GmbH accepts no liability for damage resulting from non-observance of the installation guidelines or from misuse or incorrect use of the product.

1.2 About this document

This installation guide describes the installation of the S:FLEX in-roof system on pitched roofs with a pitch angle between 10° and 50°.

It must be ensured that only current and complete installation guides are used for the installation process.

1.3 Warnings

The warning texts provided in these installation guidelines relay safety-related information. They are:



Unless observed, there is a major risk of injury as well as a risk of death.



Failure to observe this may lead to property damage.

1.4 General information – standards and guidelines

Every photovoltaic system must be installed in accordance with the instructions contained in the respective installation guidelines and the project report.

These installation instructions are based on state-of-the-art technology and many years of experience of installing our systems on site. It must be ensured that only the current and complete installation instructions are used for the installation, and that a print-out of the installation guidelines is stored in the immediate vicinity of the system. The system and these guidelines are subject to technical changes.

The project report is part of the installation instructions and is created on a project-specific basis. All of the information contained in the project report must be strictly observed. The project report contains the location-based static calculations. The S:FLEX mounting system must be designed and planned using the S:FLEX planning software.

Since individual project-specific features must be considered with every roof, expert advice must always be sought prior to installation. Before installation, the PV system creator must ensure that the existing roofing and roof substructure are suitable for the additional loads. The condition of the roof substructure, the quality of the roof covering and the maximum load-bearing capacity of the roof construction must be checked by the system creator.

Contact a local structural engineer for this purpose.

When installing the PV system, always comply with the module manufacturer's installation instructions. In particular, it is necessary to check that the module manufacturer's instructions regarding the module clamping guidelines (module clamping surface and clamping range) are complied with. If this is not the case, the customer must obtain a declaration of consent from the module manufacturer before the installation; alternatively, the mounting system must be adapted in accordance with the module manufacturer's specifications.

The requirements for the protection of PV mounting systems against lightning and surges must be met in accordance with the DIN and VDE regulations. The specifications of the relevant power supply company must be observed.

Care must be taken that the PV system to be installed does not impair the functioning of the existing lightning protection system. It is also important to ensure that the PV system is designed so that it can be included in the protection zone of the building's lightning protection system. The separation distances between the PV system and the lightning protection system specified in the relevant regulations must be adhered to. During installation, the local fire regulations must be observed, e.g. fire walls must not be built over and the required clearances must be maintained.

If the roofing is altered, the manufacturer's guidelines must be observed. During and after installation, the frame components may not be stepped on or be used as a climbing aid. There is a risk of falling and the roofing underneath could be damaged.

Prior to installation, the creator of the photovoltaic system must ensure that the installation is carried out while strictly adhering to national and location-specific building regulations, safety and accident prevention regulations, standards and environmental protection regulations.

Every person who installs the S:FLEX PV mounting systems is obligated to independently inform himself/herself about all rules and regulations for professionally correct planning and installation, and to comply with said rules and regulations during the installation process. This also includes compliance with the latest versions of the respective rules and regulations.

Installation of the PV system may only be carried out by trained specialists.



All system components must be checked for damage before installation. Damaged components must not be used!

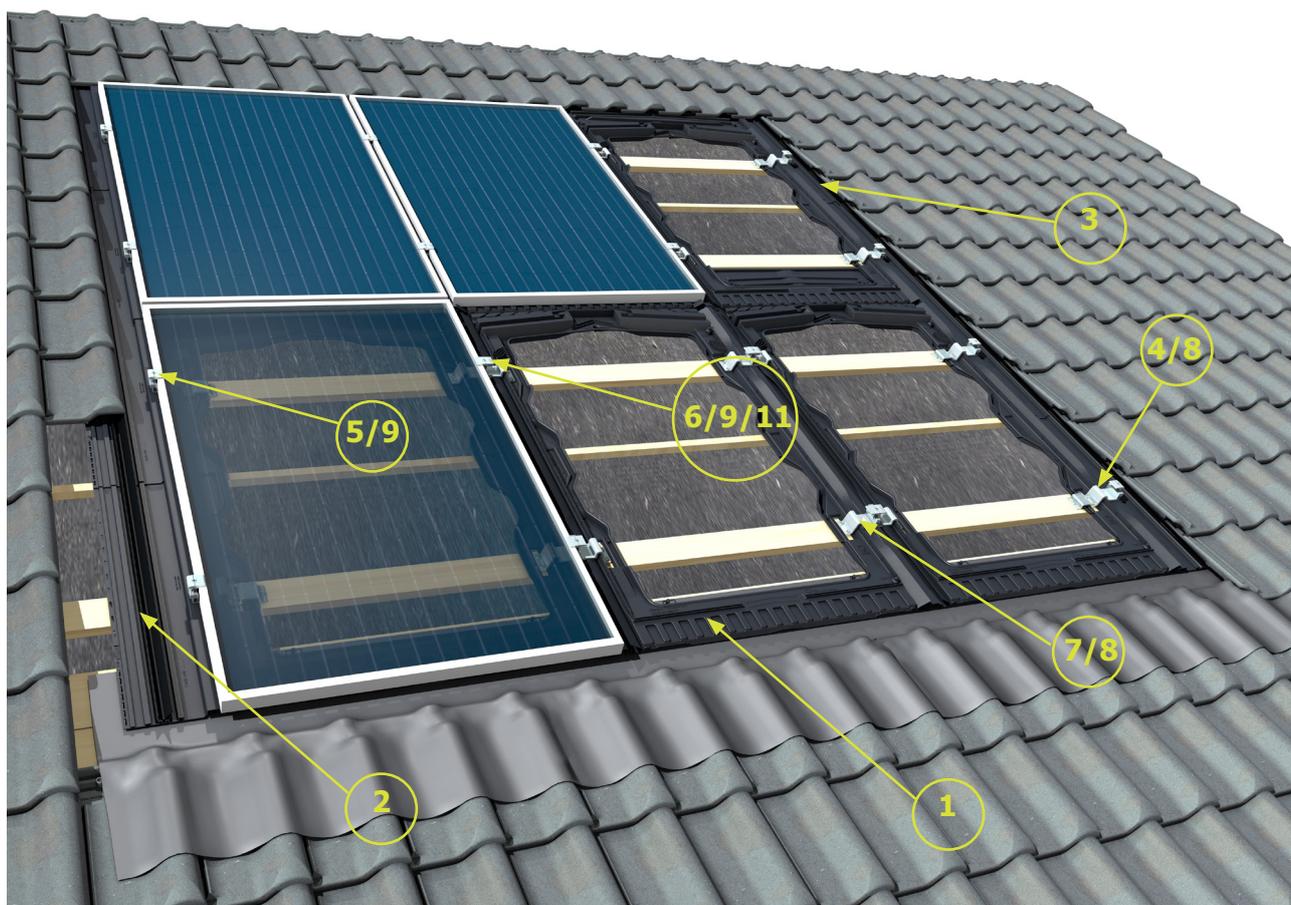


Installation of the S:FLEX substructure and the PV system may only be carried out by trained specialists. System components must not be used as step ladders. The modules must not be stepped on. When working on roofs, there is a risk of falling off and falling through roofs. A fall can result in injury or death. Ensure that appropriate climbing aids and fall-protection equipment (e.g. scaffolding) are provided as well as protection from falling parts.



Check the building statics and construction/condition of the roof substructure before starting the installation. During installation, the instructions in the installation guidelines and project report must be strictly observed. Failure to observe the installation guidelines and the project report may result in damage to the PV system and to the building.

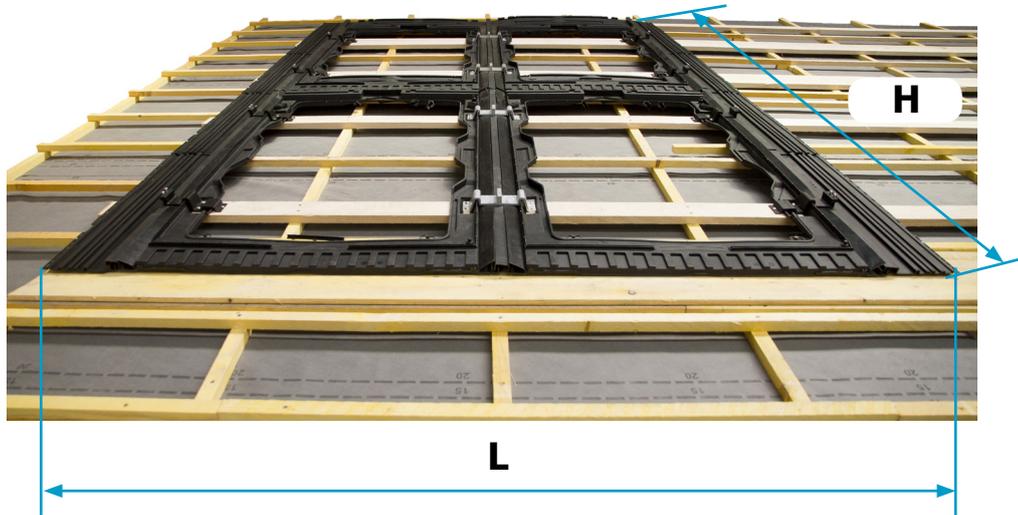
1.5 Description of the system



Positions

- | | |
|---------------------------|---|
| 1. Frame P-1 (black) | 7. Mid bracket |
| 2. Left flashing (black) | 8. Wood screw 6x40 |
| 3. Right flashing (black) | 9. Metric screw 6x40 |
| 4. End bracket | 10. Aluminium assembly tool (not shown) |
| 5. End clamp EVO | 11. Plastic cap |
| 6. Mid clamp EVO | |

2.1 Area calculation S:FLEX in-roof system



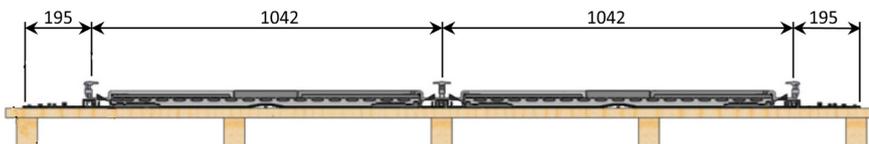
Width of the PV field

Space used: L

Number of modules horizontally: Nx

Nx	1	2	3	4	5	6	7	8	9	10	11
L	1432	2474	3516	4558	5600	6642	7684	8726	9768	10810	11852

For example: $L = (1042 \times 9) + (2 \times 195) = 9768$



Height of the PV field

Space used: H

Number of modules vertically: Ny

		Module length (l)		
		$1661 \leq l_g \leq 1670$	$1671 \leq l_g \leq 1680$	$1681 \leq l_g \leq 1690$
Vertical spacing		1690	1700	1710
		Dimension H		
Number of modules vertically (Ny)	1	1962	1962	1962
	2	3652	3662	3672
	3	5342	5362	5382
	4	7032	7062	7092

For example: $H = (1690 \times (3-1)) + 1962$ (frame height) = 5342

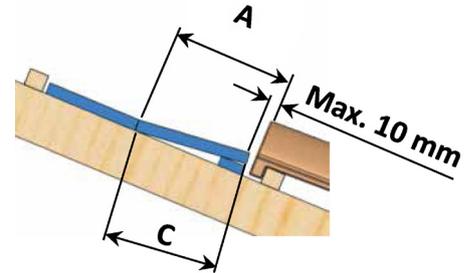


L and H are the minimum dimensions for the space required for the PV field. Tiles can be generously removed.

2.2 Installing the roof connections

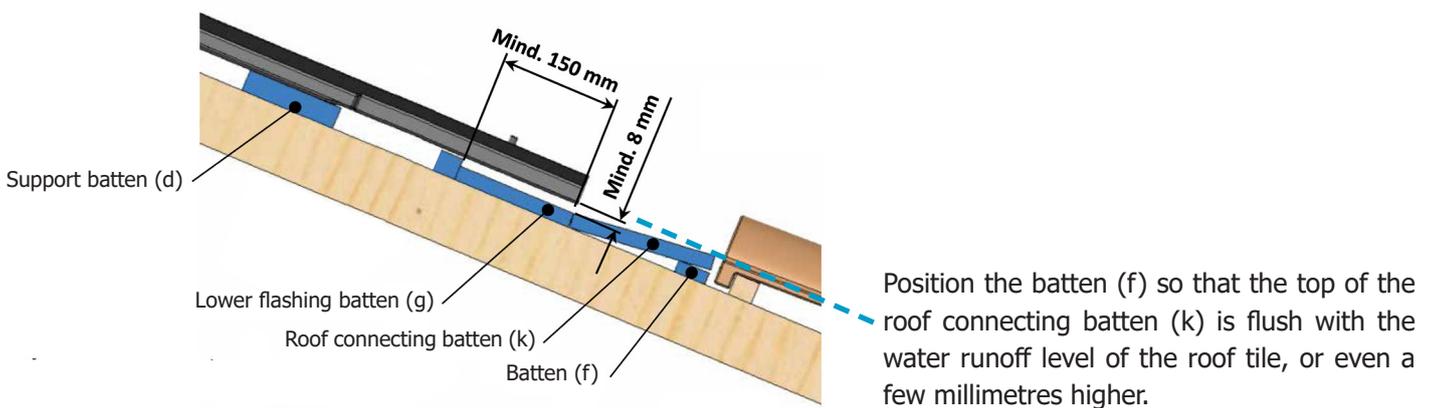
Determining dimension A (support for the roof connections)

Roof pitch (°)	Minimum batten width, dimension C (mm)	Dimension A, minimum (mm)
10 to 12	250	260
13 to 16	220	230
17 to 19	180	190
20 to 24	150	160
25 to 50	120	130



Determine the thickness of the lower flashing batten (g) and the roof connecting batten (k) according to the thickness of the support battens (d). The thickness of the support batten (d) must be at least 27 mm or as thick as the existing battens.

The lower flashing batten (g) and the roof connecting batten (k) must be 8 mm thinner than the support batten.



Support batten (d) \geq 27 mm or as thick as the existing battens

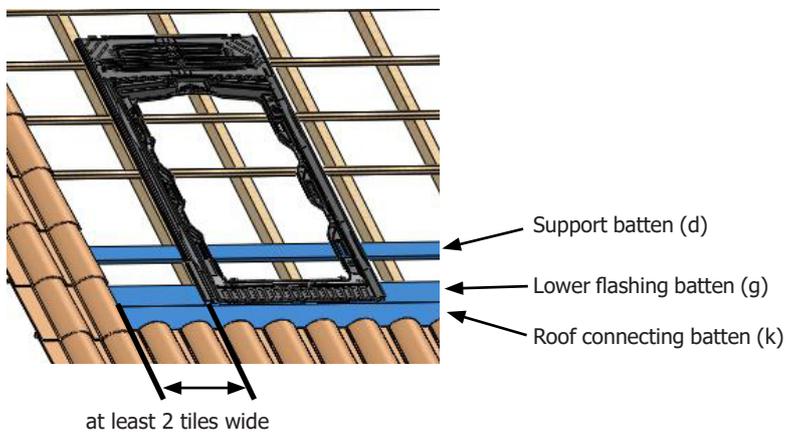


Lower flashing batten (g) and roof connecting batten (k) = support batten (d) - 8mm

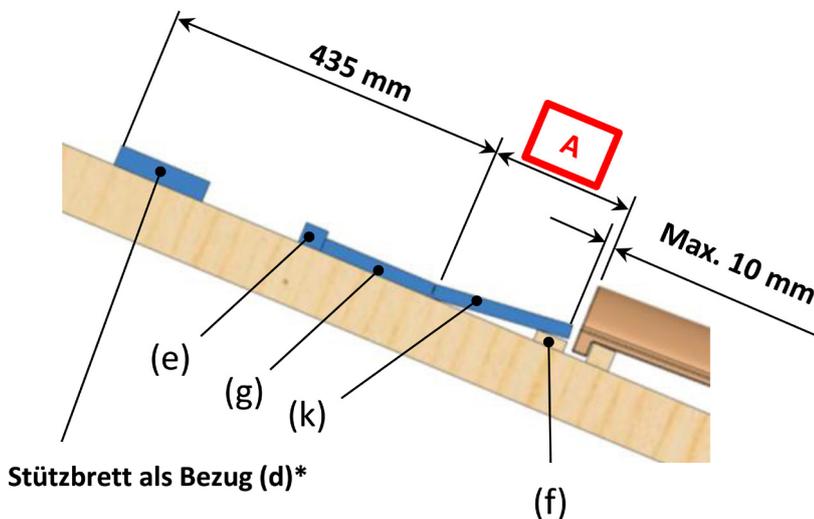


The pitch of the roof connecting batten (k) must always be oriented towards the eaves to ensure water runoff. The roof connecting batten must not have a negative pitch - see Figure p.9!

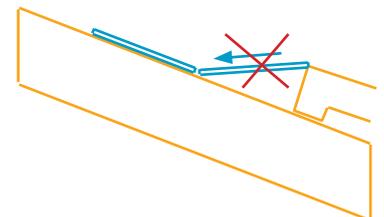
The support batten (d)*, the lower flashing batten (g) and the roof connecting batten (k) must protrude from each side of the module field by at least the width of 2 tiles.



Place the batten (f) for the roof connection at a maximum distance of 10 mm from the highest point of the first roof tile below the photovoltaic area. To do this, use battens (g) and (k) defined in the previous step. Place the tile batten (e) against the lower flashing batten (g). Attach the batten with stainless-steel countersunk screws 5x60.



The roof connecting batten must not have a negative pitch



Place the first support batten as a reference (d)*. Position the batten at a distance of 435 mm from the end of the lower flashing batten.

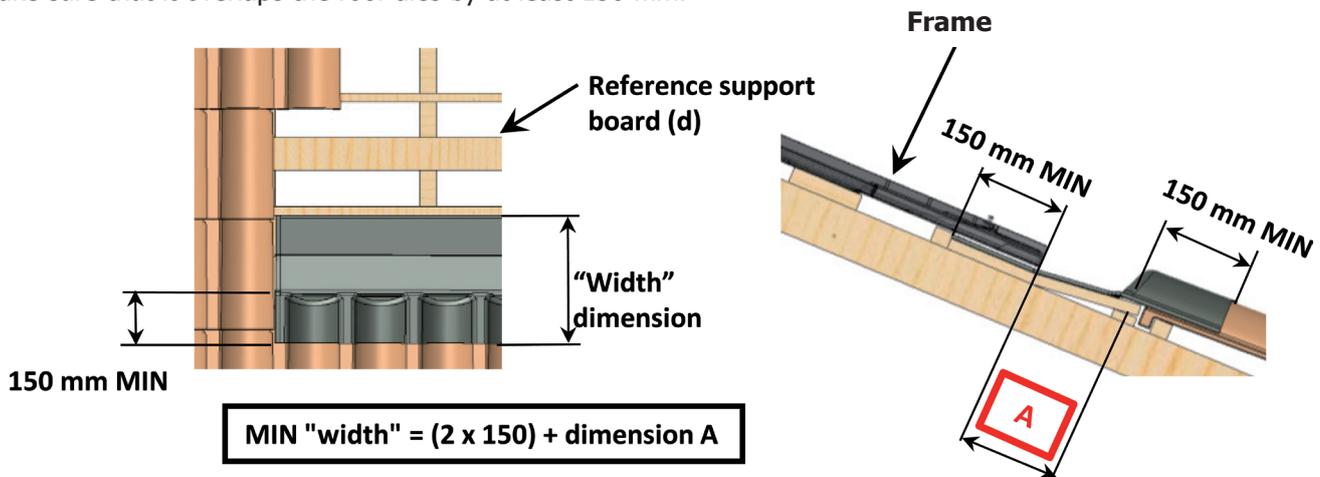
2.3 Installing the lower flashing

Install the lower flashing. Take care not to stick down the sides and upper edge so that you can fold it back later. The overlap on the tiles will depend on the type of flashing used.

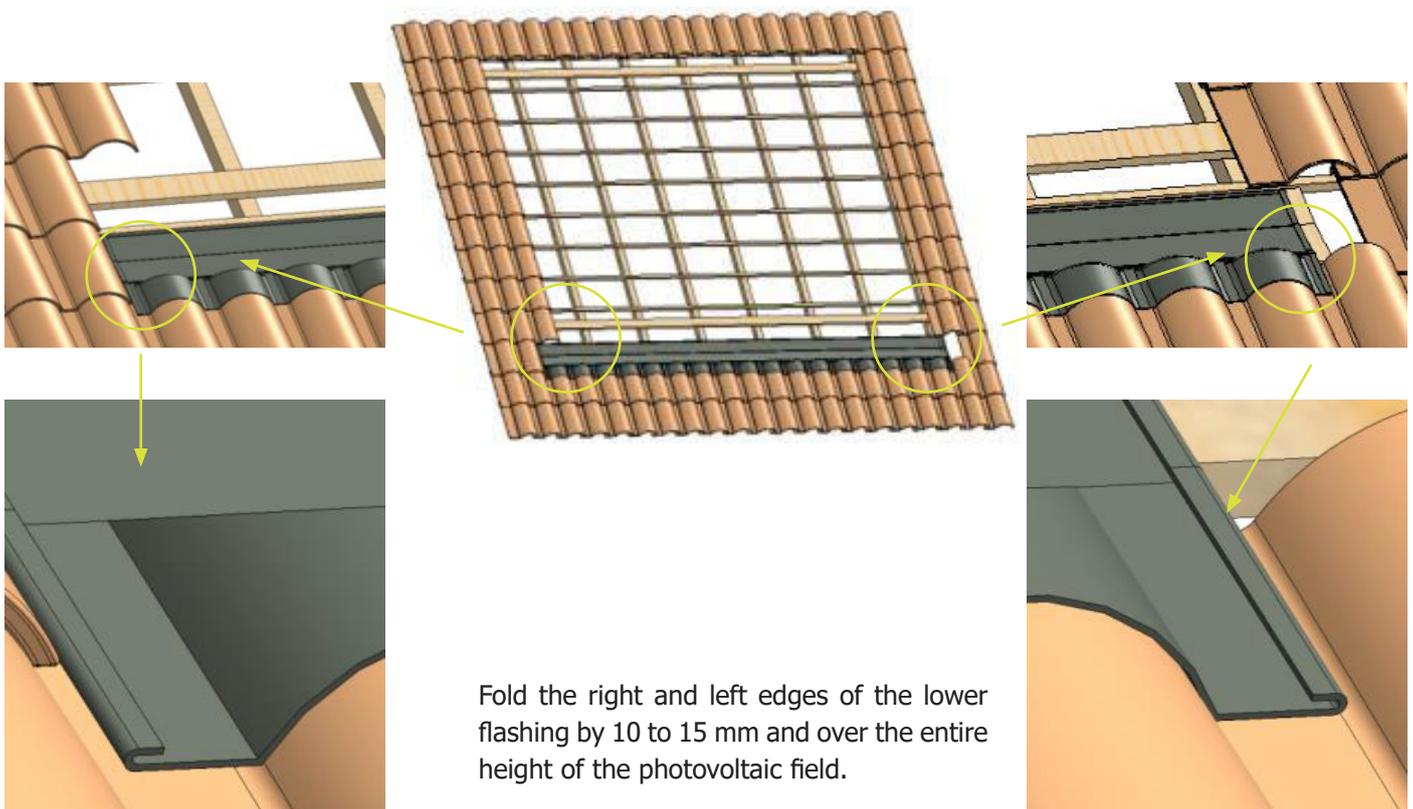


Watertight installation of the lower flashing should be done by a professional tradesperson (roofer).

Make sure that it overlaps the roof tiles by at least 150 mm.



Fold the upper edge of the lower flashing by 10 to 15 mm over the upper batten and along the entire width of the photovoltaic field.



2.4 Laying the roofing underlay

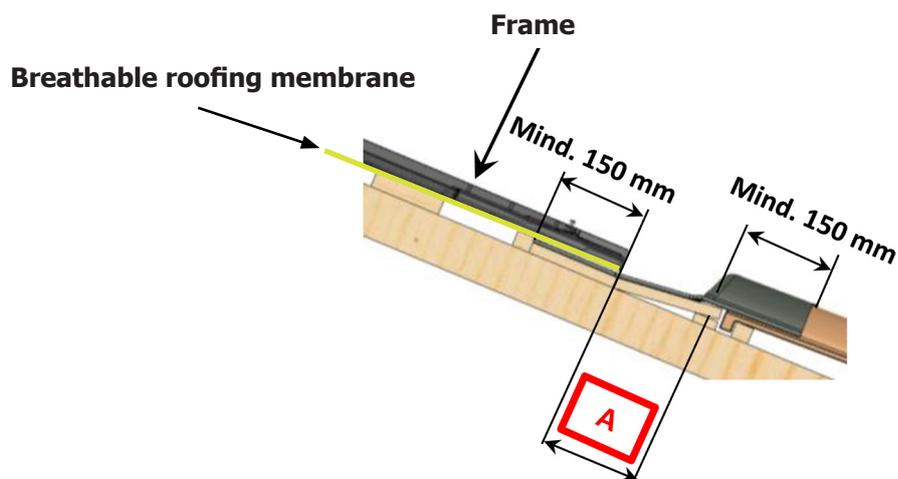


The roofing must be protected from condensation by a breathable roofing membrane.

If the roof is not already fitted with a membrane, then a breathable roofing membrane must be laid. The membrane must be laid under the entire area of the PV installation.

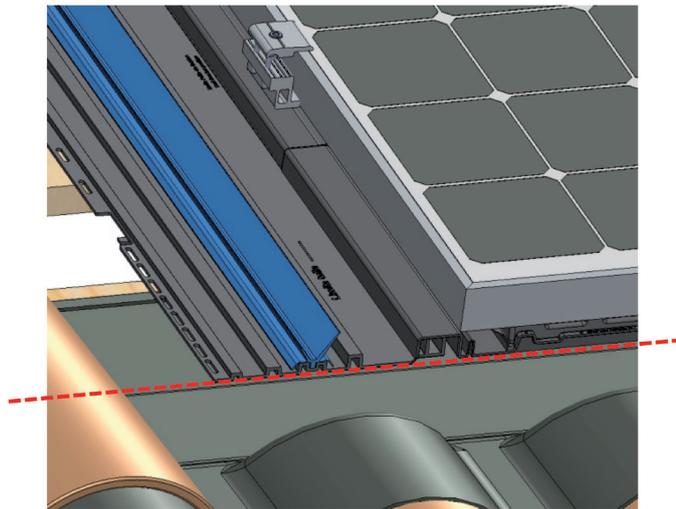
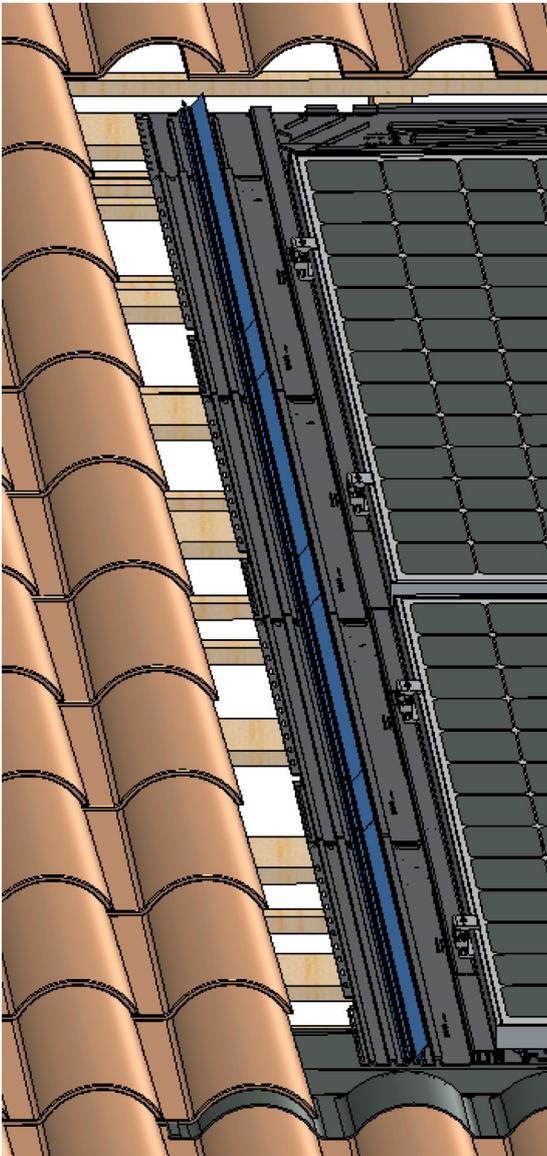
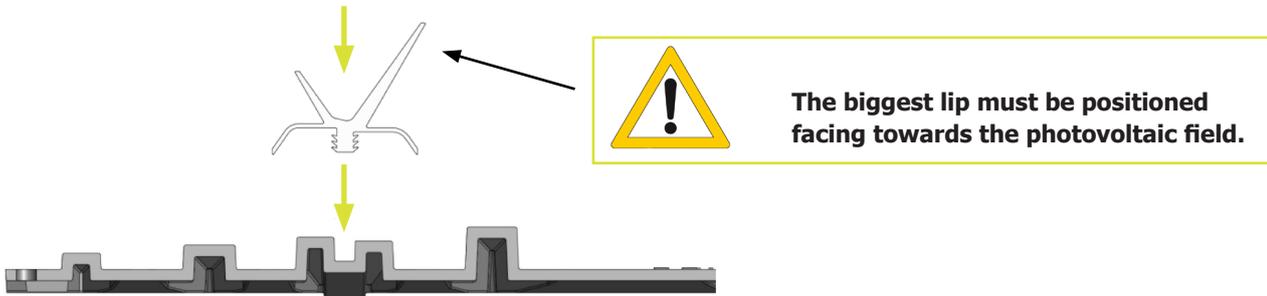
It is fixed to the battens of the substructure. The breathable roofing membrane is tacked into position on the battens, the sides of the membrane under the tiles can also be rolled up to fix it even more securely.

On the front edge, the membrane ends at the frame but must overlap the lower flashing by at least 150 mm.

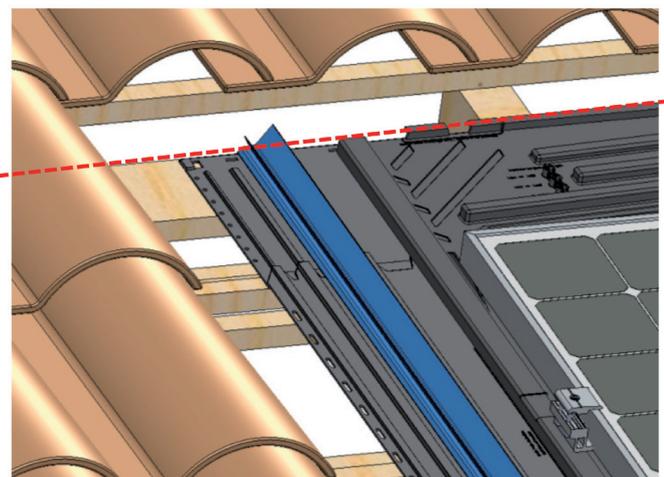


2.5 Installing the deflectors

Place the deflectors in the groove of the side flashing.

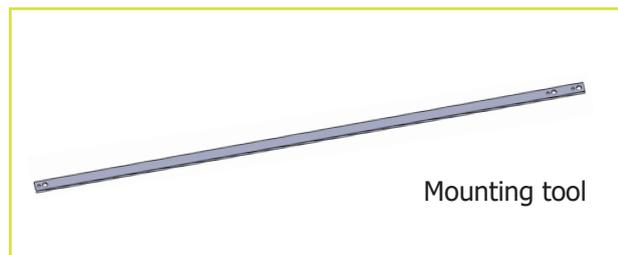
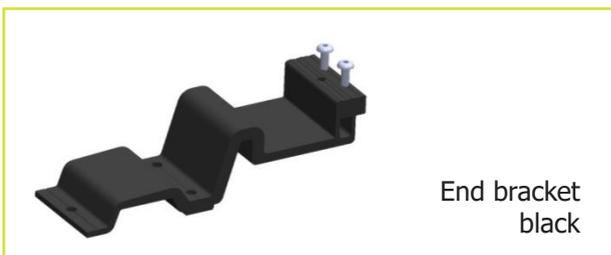
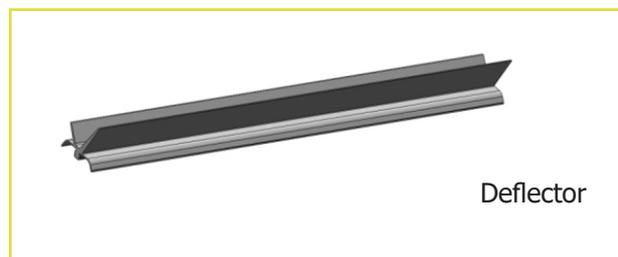
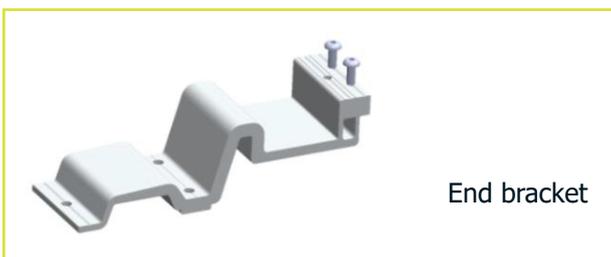
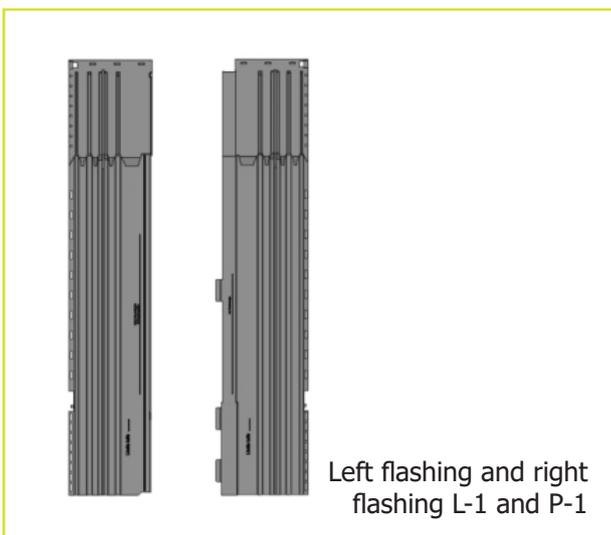
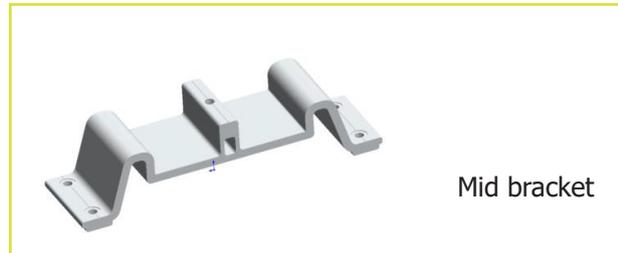
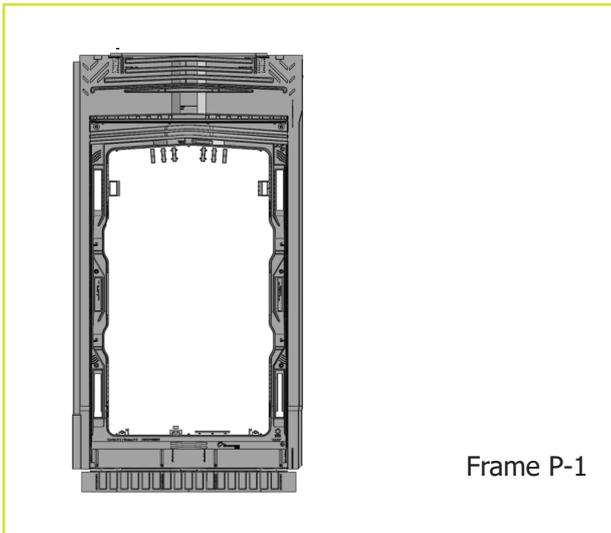


(Bottom of the PV field)



(Bottom of the PV field)

3.1 System components



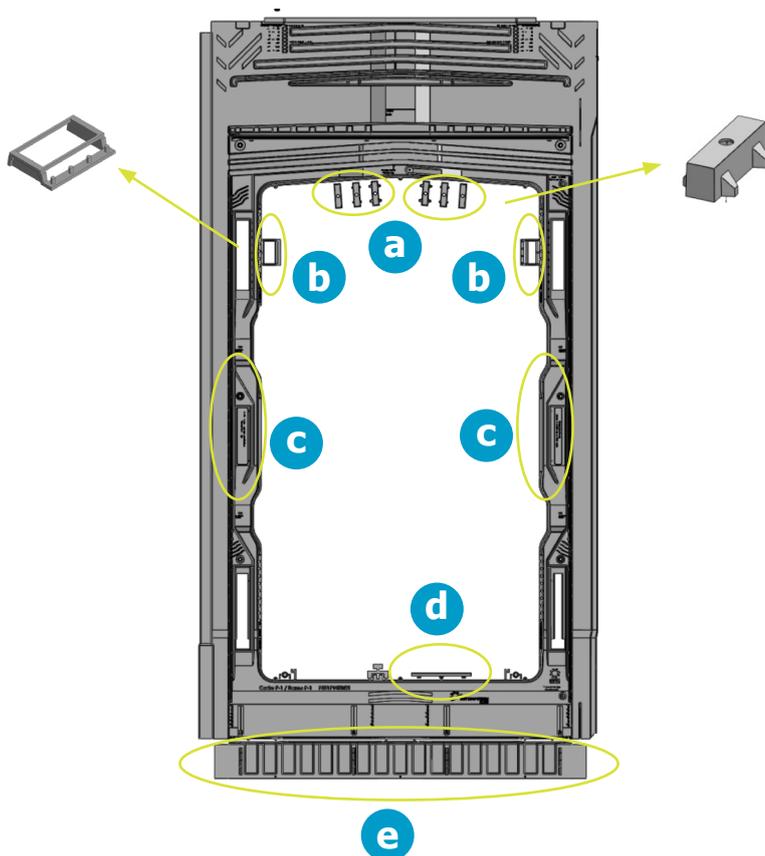
3.2 Preparation

End bracket / end clamp EVO preparation



Align the height of the securing screw of the end clamp EVO so that it is flush with the top of the module.

Frame preparation



a

Remove the six plastic caps located on the inside of the frame. The plastic caps function as spacers and anti-rotation devices for the mid clamp. Select the plastic cap according to the module dimensions.

b

Remove the two plastic clips.

c

For assembly with six brackets, remove the two mounting brackets.

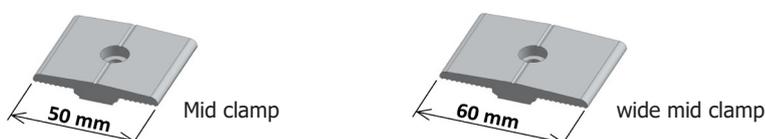
d

Remove the upper sealing strip support located on the inside of the frame.

e

Remove the grille located at the bottom of the frame.

Mid clamp preparation

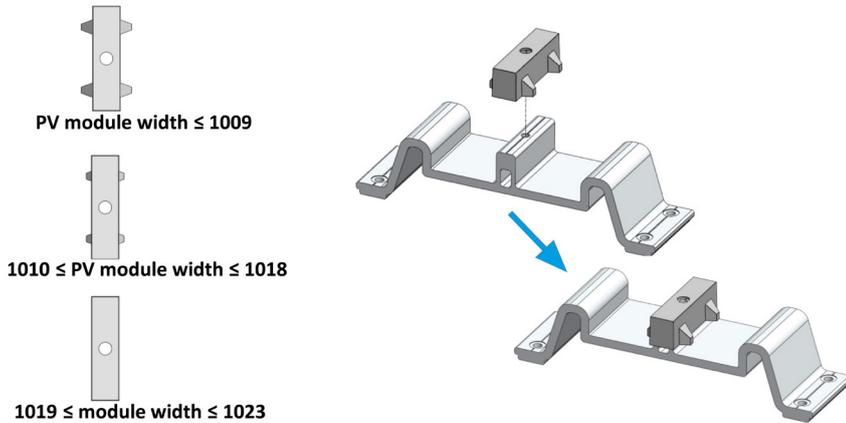


Select the mid clamp according to the width of the PV module to be installed:

≤ 1014 mm: wide mid clamp

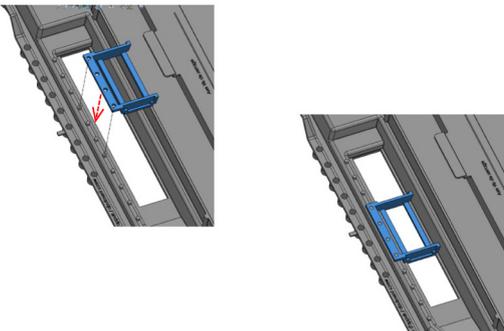
> 1014 mm: mid clamp

a Mid bracket preparation



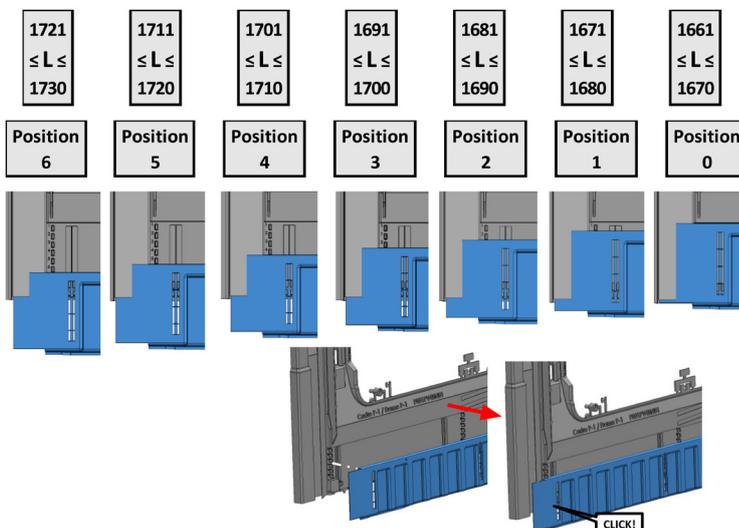
Slide a plastic cap onto the guide of each mid bracket. Select the plastic cap according to the width of the PV module to be installed:

b Plastic clips preparation



Put the plastic clips in the desired position.

e Grille preparation



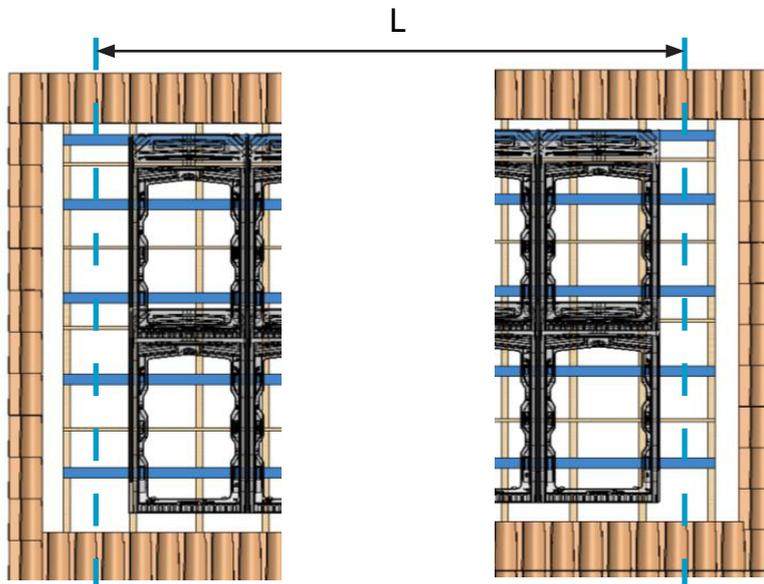
Align the grille with the markings and click into place.

3.3 Installation – support



Description for standard installation in the centre of the roof area. The module field ends with tiles on each side.
Special installation instructions apply if installing in the roof edge areas (verge, eaves, ridge).
Please contact S:FLEX.

The length “L” of the support batten to be used (d)* must be at least as long as the total length of the photovoltaic area. To find the value of “L” refer to the table on page 7 of these instructions. Increase the “L” dimension of the battens if necessary, so that the support battens are supported on the rafters on both sides of the photovoltaic field.



Determining the distance B1

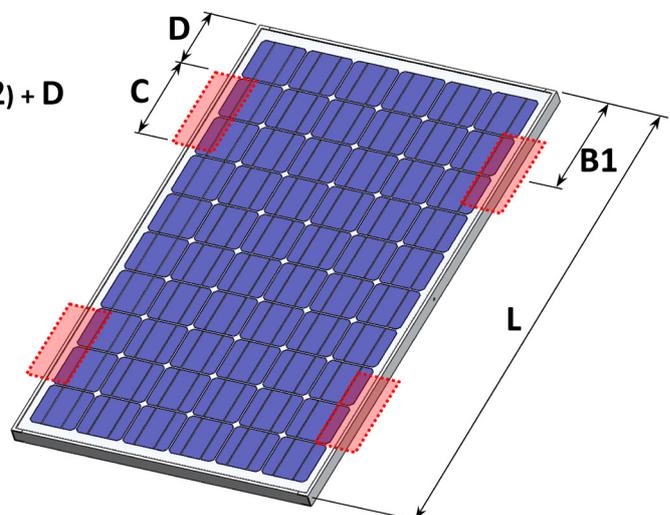
$$B1 = (C/2) + D$$

B1

Distance between the top of the PV module and the centre of the permitted clamping area.

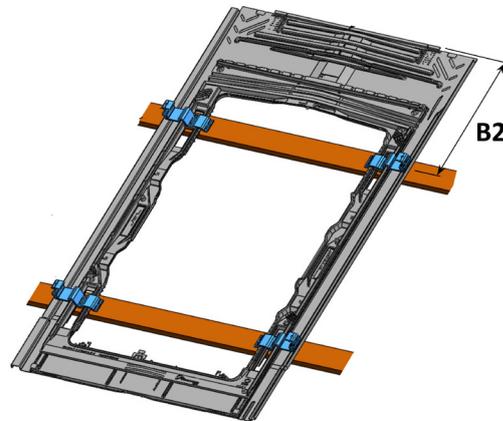
L

Length of the PV module (mm)



Determining the distance B2

B1 (in mm) Tolerance range	B2 (in mm) Nominal
B1 < 308	585
309 < B1 < 328	605
329 < B1 < 348	625
349 < B1 < 368	645
369 < B1 < 388	665
389 < B1 < 408	685
409 < B1	705



Determining the distance G

B2

Distance from the top of the P-1 frame to the top of the upper bracket (mm)

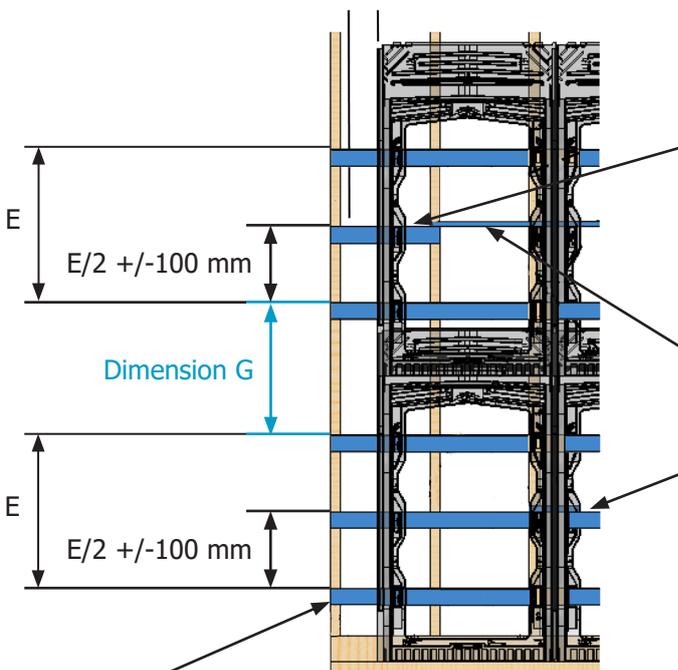
L

Length of the PV module (mm)

G

Distance between the support battens (mm)

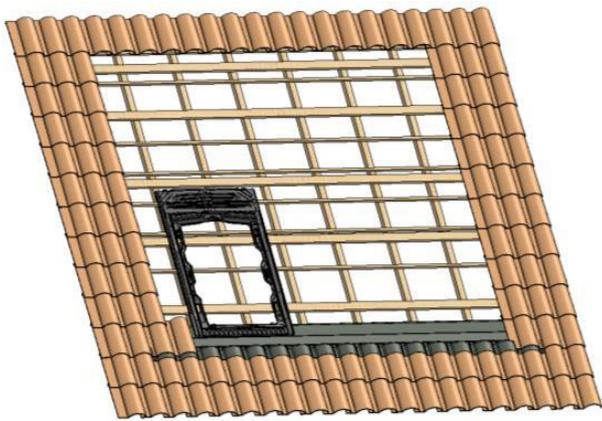
	B2							
	585	605	625	645	665	685	705	
L	1661 ≤ L ≤ 1670	630	670	690	730	770	810	830
	1671 ≤ L ≤ 1680	640	660	700	740	780	820	840
	1681 ≤ L ≤ 1690	650	670	690	730	790	830	850
	1691 ≤ L ≤ 1700	660	680	700	740	780	820	840
	1701 ≤ L ≤ 1710	670	690	710	750	790	830	850
	1711 ≤ L ≤ 1720	680	700	720	740	780	820	840
	1721 ≤ L ≤ 1730	690	710	730	750	790	830	850



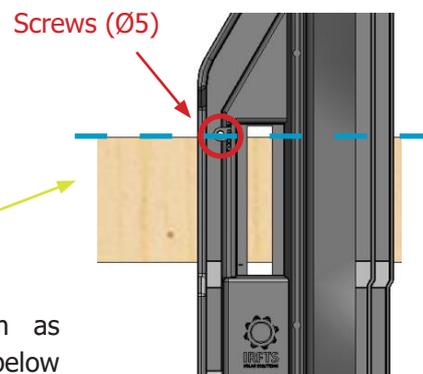
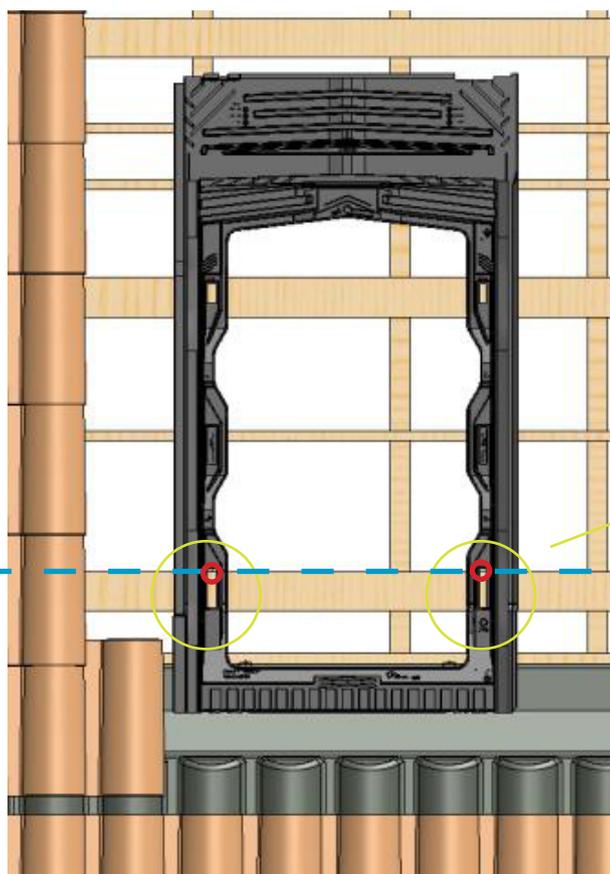
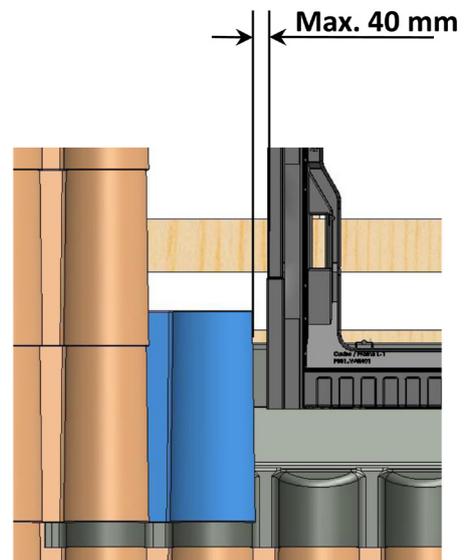
Support batten as a reference

1. Position a support batten every 900 mm (d)*
2. In edge areas, an intermediate batten must be positioned between the support battens (450 +/- 100mm) as support. Thickness of the intermediate batten = thickness of the support batten (d)*
3. The frame must be level and must not be allowed to sag. If the existing battens are not sufficient then additional roof battens must be installed.
4. For assemblies with 6 brackets per module an additional support batten needs to be installed. Distance from the front support batten 450 mm.

3.4 Installation – frame



Insert the first roof tile on the lower left corner and position the first frame a maximum of 40 mm from the edge of the roof tile.



Support batten as reference (d)* below

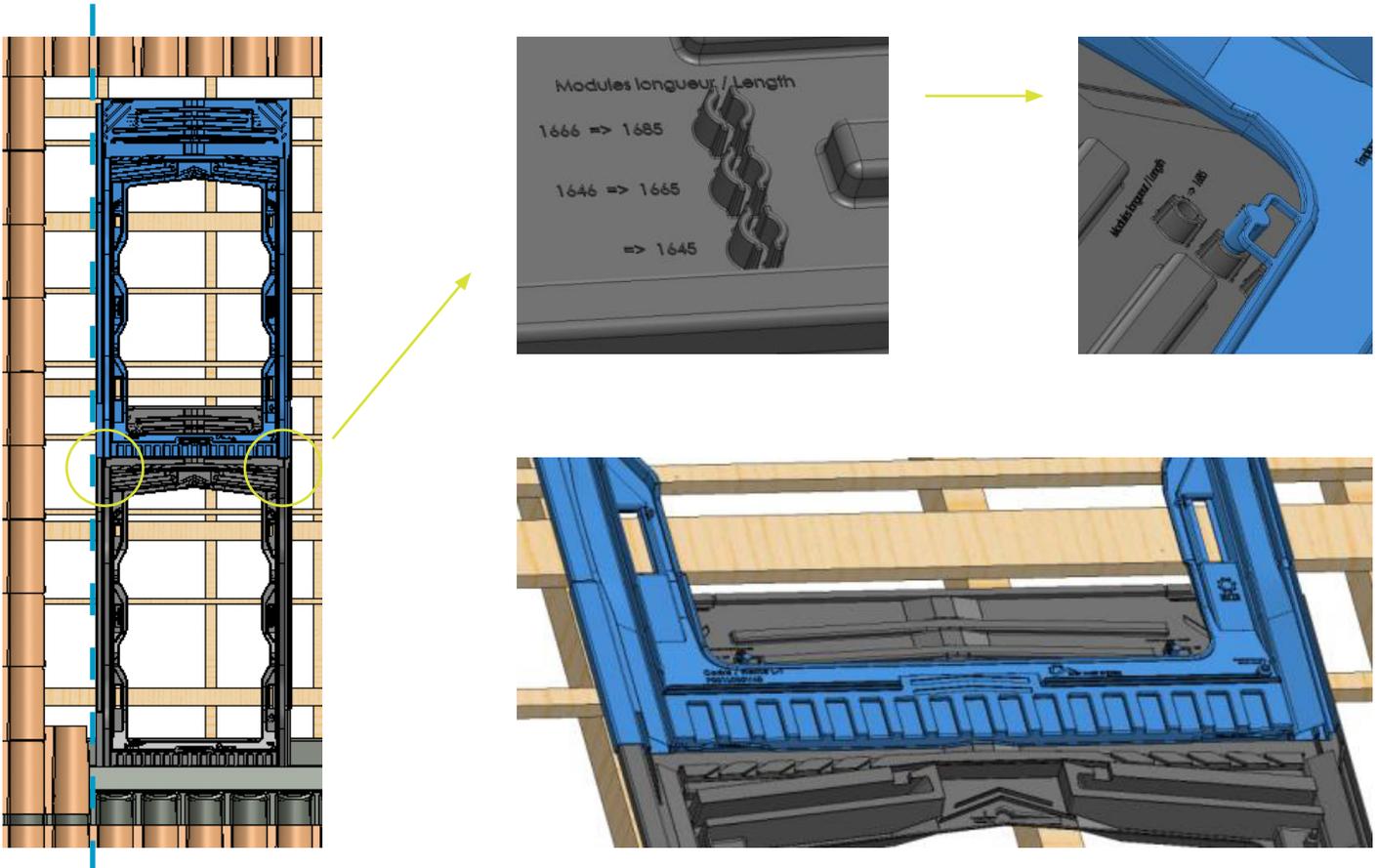
Mount the frame along the pitch of the roof using two screws (Ø 5) in the pre-drilled holes and lay the frame loosely on the reference batten (d).



**Do not screw the Ø5 screw into the reference batten.
Remove the screws before installing the photovoltaic modules.**

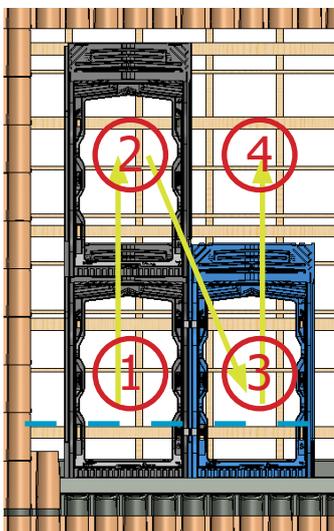
Place the next frame above the previously positioned frame and carefully align the frames vertically. (Use a plumb line to mark it out.)

You can adjust the vertical spacing between the frames according to the length of the modules being installed. To do this, use one of the three designated slots on each side of the frame.

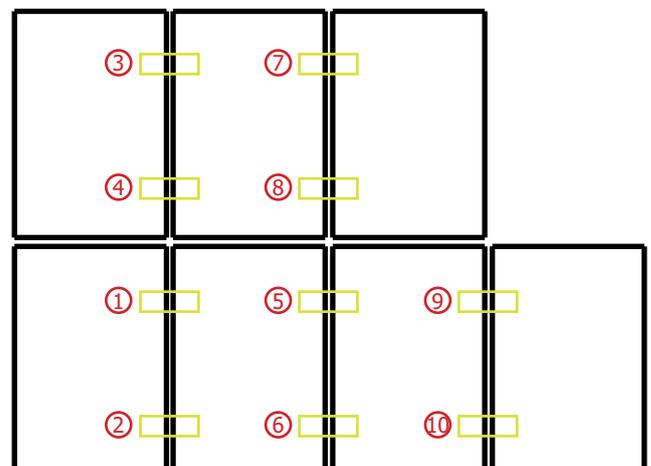


Fit another frame above the first row. Align it with the reference batten as described on page 8.

The mid brackets must be mounted in the sequence shown. The fixed opening on the top right.

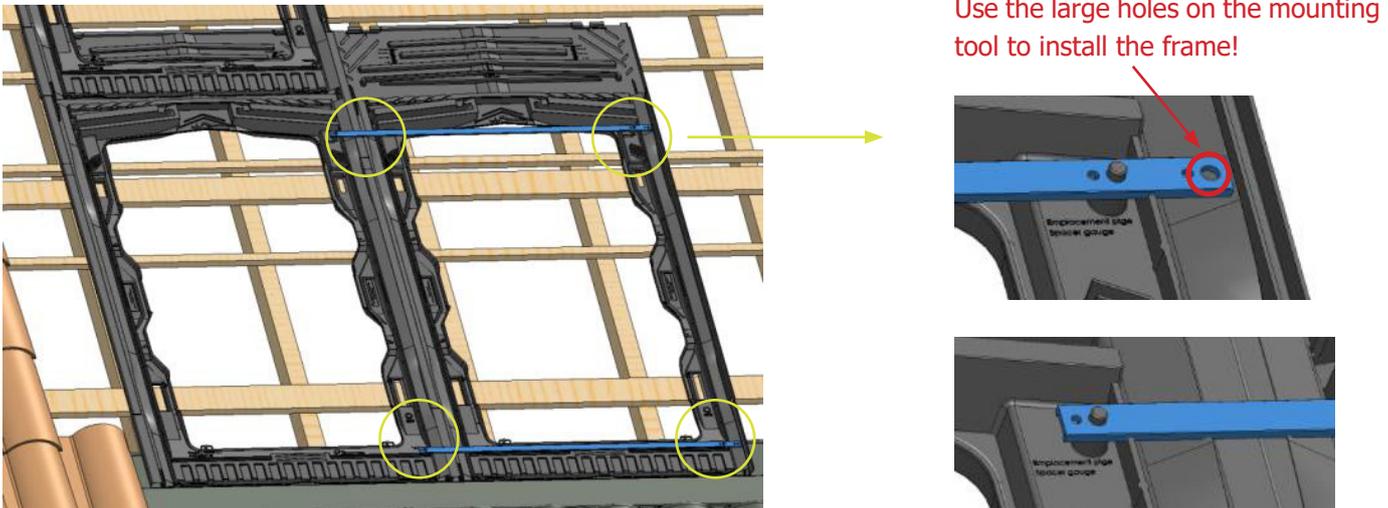


Support batten as reference (d)* below



3.5 Installation – mid bracket

Fit two mounting tools in the upper and lower sections between the both of the front frames. To assemble the system at least two mounting tools are needed.

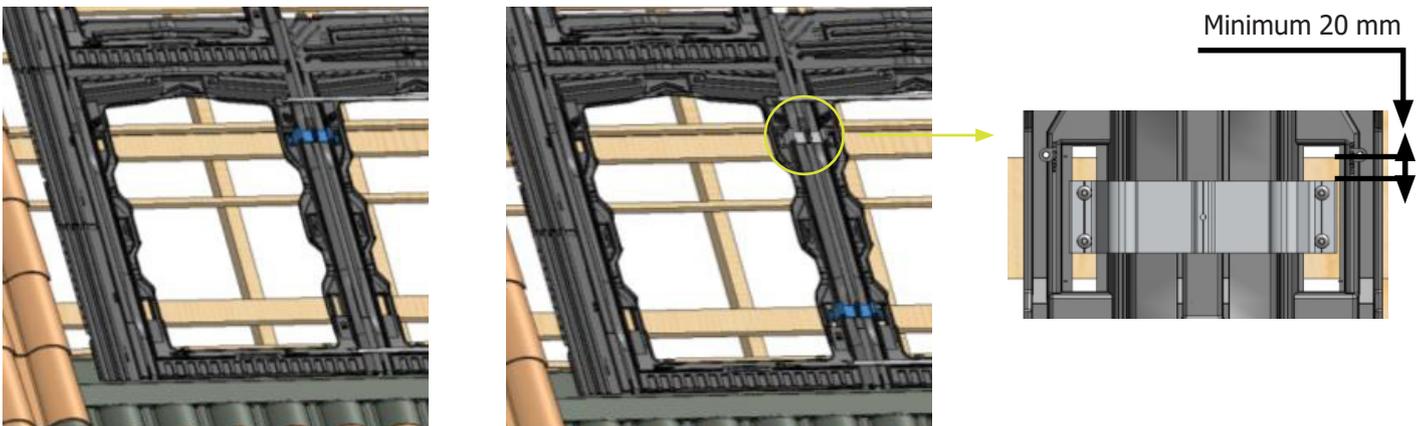


Use the large holes on the mounting tool to install the frame!



The use of mounting tools is mandatory for the assembly of the entire system. For assembly with cover strips a third mounting tool is required.

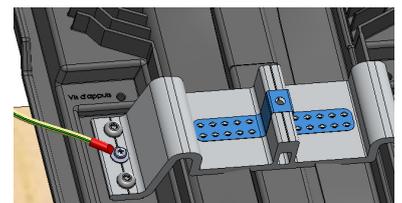
Position the back mid bracket for the mid clamp and fasten with 6x40 screws. Then position the front mid bracket for the mid clamp and fasten with 6x40 screws.



Minimum 20 mm

Proceed as described for the following rows.

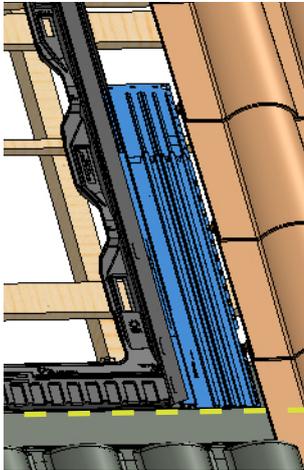
Module grounding is carried out via the mid brackets and earthing plate. Two PV modules can be grounded in this way at the same time. Only connect one mid bracket per PV module. Implement this type of connection for every two modules on each horizontal row (line).



The mounting tools may only be removed after all 4 (or 6) mid brackets have been installed.

3.6 Installation – flashings

Position the first flashing on the frame.



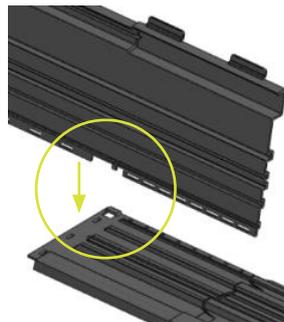
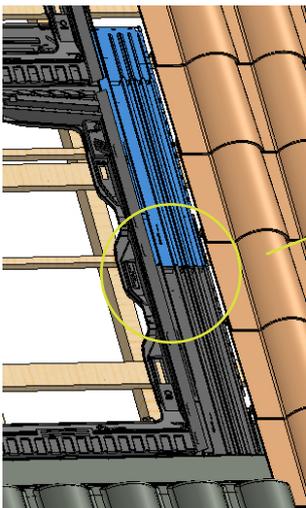
Always install the flashings from bottom to top. The top flashing must always overlap the flashing underneath to ensure proper water drainage.



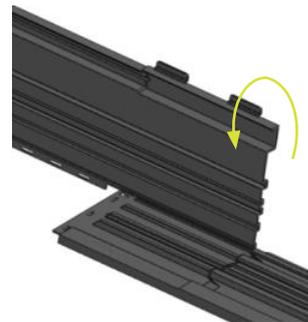
Recommendation: in addition, a side seal can be fitted on the flashing (seal against snow). Install as described on page 12.

If necessary, cut the flashing that overhangs the frame at the front edge of the photovoltaic field.

Attach the other parts by mounting them and clicking them into place

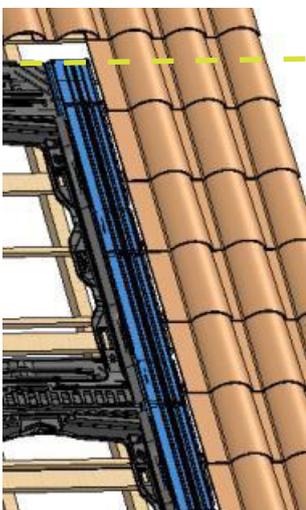


Align the fittings of the second flashing with the first.

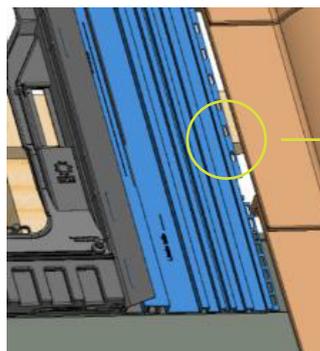


Rotate the second flashing and click it into place.

Align the last flashing with the top of the frame. Place the tongues of the flashing under the flexible metal part of the frame.



If necessary, cut the flashing that overhangs the frame at the top edge of the photovoltaic field.

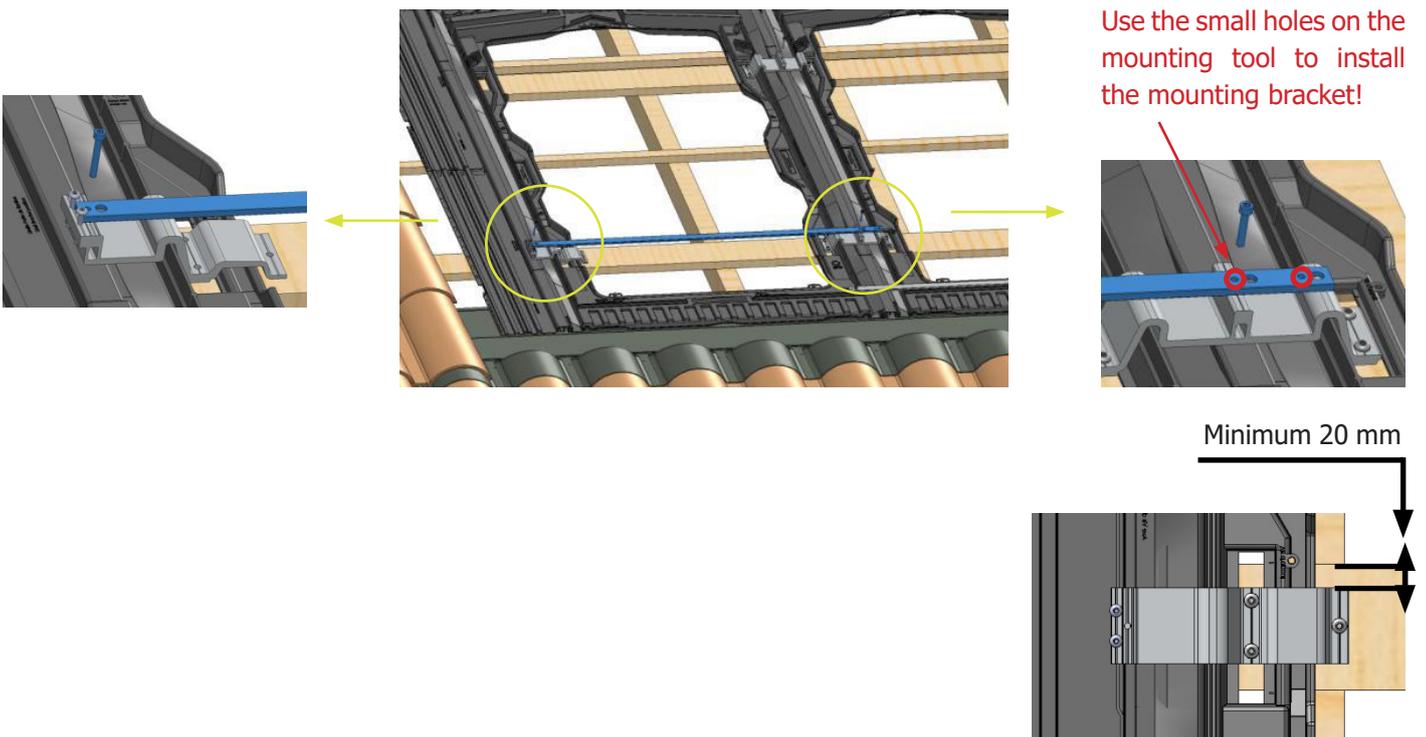


Position a stainless-steel round head screw 5x30 at each flashing overlap. Gently tighten.

Proceed as described on the other side.

3.7 Installation – end bracket

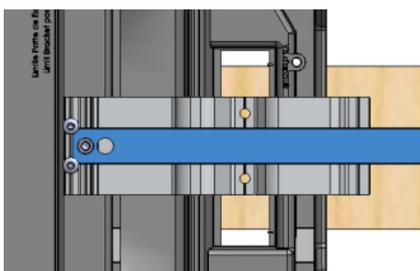
Attach one side of the mounting tool to the mid bracket for the mid clamp using an M6 screw. Tighten by just a few turns. To mount, position an end bracket for an end clamp in the designated holes in the frame. Attach the other side of the mounting tool to the end bracket for the end clamp using an M6 screw. Tighten by just a few turns. Align the end bracket for the end clamp using the mounting tool and fasten the end bracket with the stainless-steel 6x40 screws.



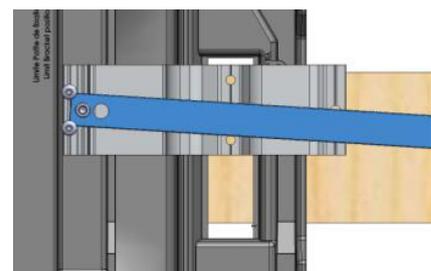
Remove both screws and the mounting tool. Proceed as described for the following rows.



A mounting tool must be used to install the end brackets.



Correct



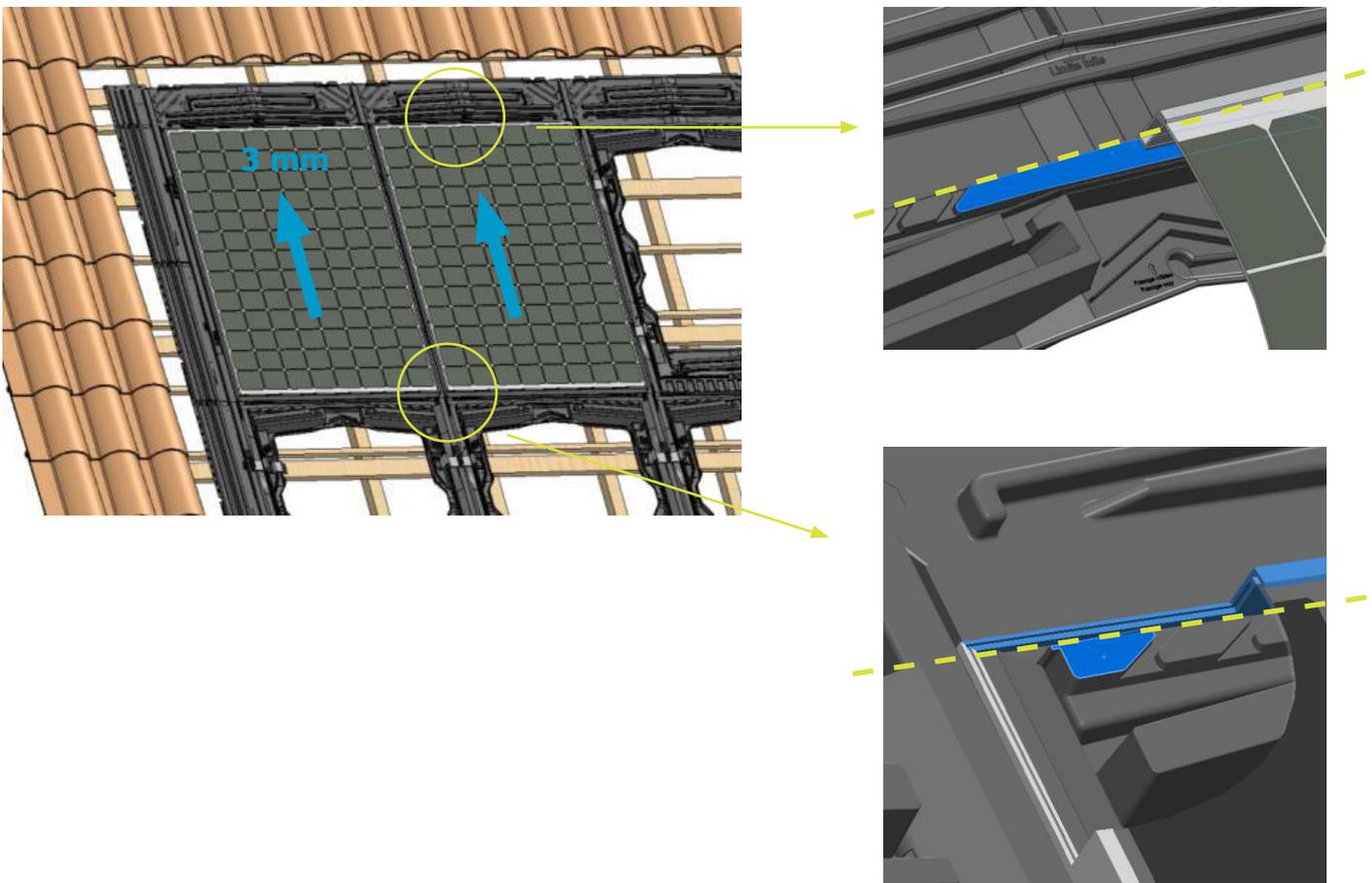
Incorrect

3.8 Module assembly

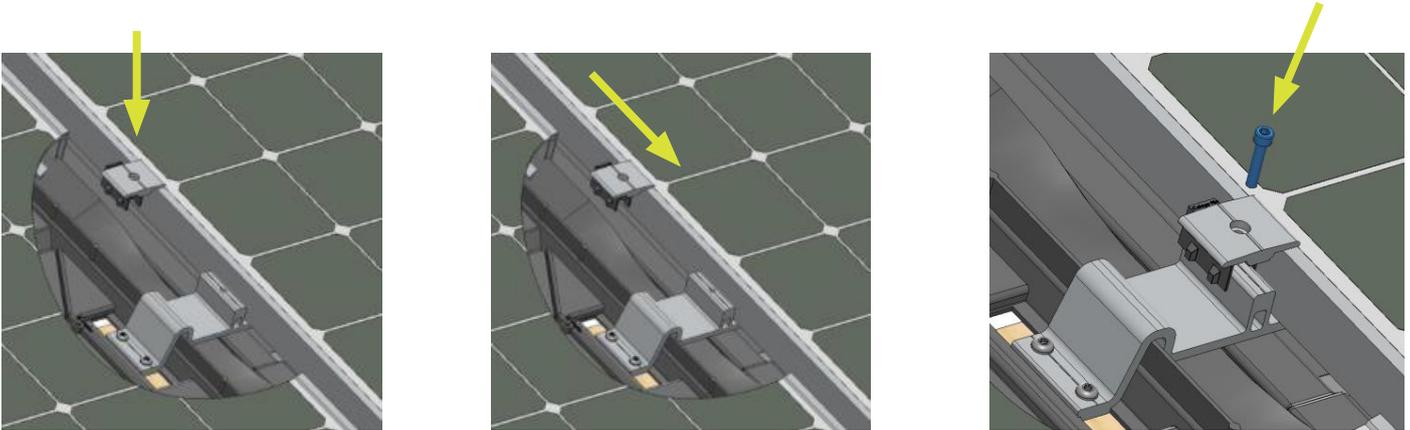
The PV connectors are attached and secured in the dry area at the top of the support battens. Observe the strain relief when installing PV connectors. In addition, you must also ensure that you do not touch or impair the roofing underlay.



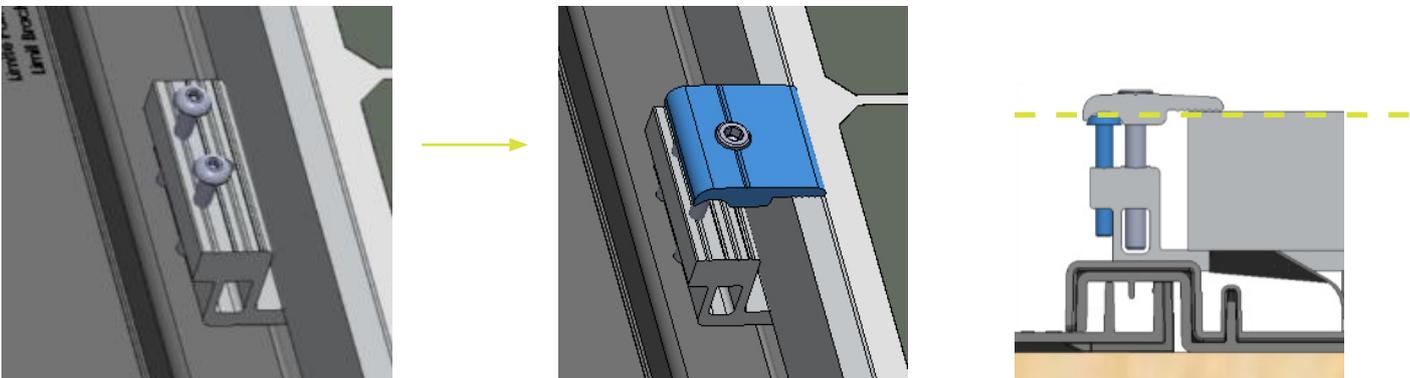
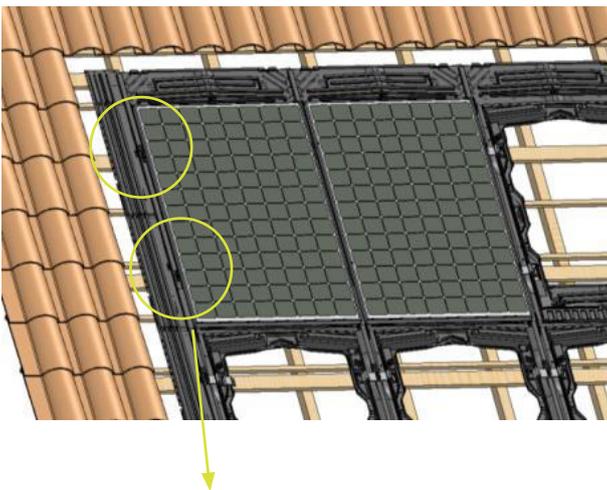
Position the photovoltaic modules and adjust them. For module frames with an overlap of ≥ 31 mm, move the module up by 3 mm.



Position the mid clamps with the plastic cap above the mid bracket between two modules.
Slide the module towards the anti-rotation device and tighten the screw (tightening torque 8.8 Nm).



Adjust the height of the securing screws on the end clamp EVO so that they are flush with the top of the module and tighten the screw (tightening torque 8.8 Nm).



Proceed as described for the following rows.

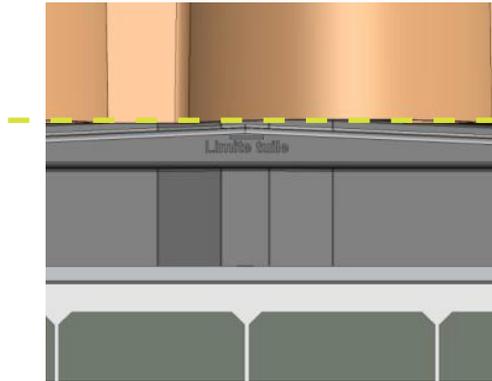
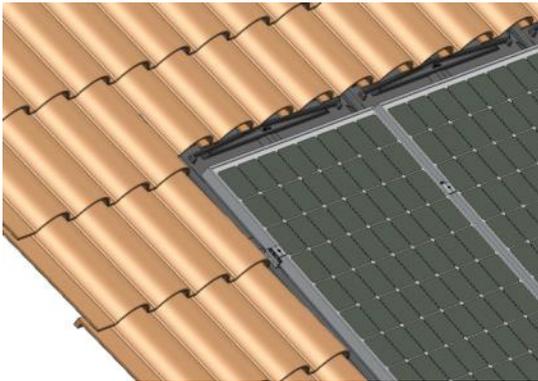
3.9 Reinstalling the tiles

Connecting with the roof tiles at the top:

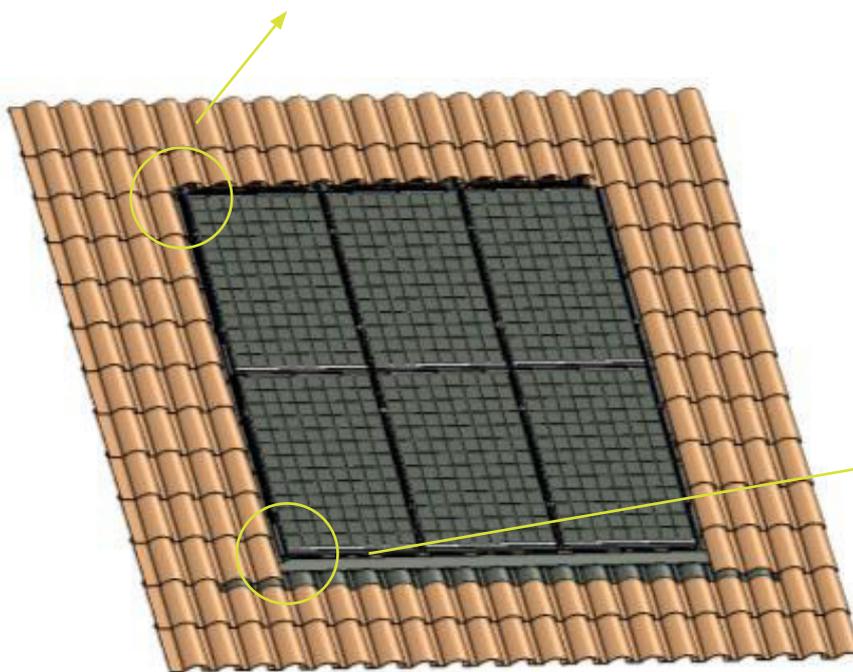
The bottom edge of the tiles must finish flush with the marking "Limite Tuile" (Tile Edge).

The roof tile must overlap the top of the frame by at least 150 mm.

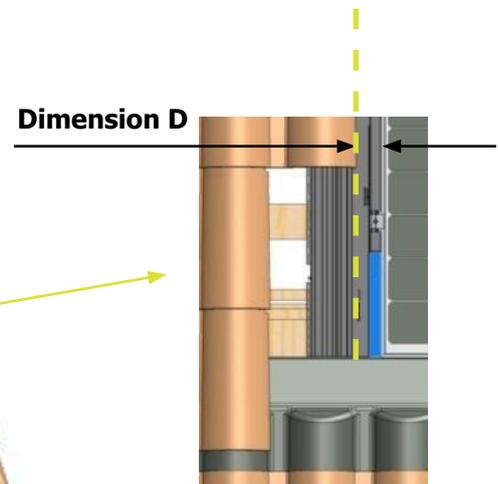
With rounded roof tiles, a self-adhesive foam strip must be applied to the upper flashing before replacing the roof tiles.



"Limite Tuile"
The roof tiles must stop at this line!



"Limite Tuile"
The roof tiles must stop at this line!



Connecting with the roof tiles at the sides:

The roof tiles must align with the marking "Limite Tuile" (Tile Edge). Dimension D must be a maximum of 40 mm.



Additional cover strips are required in certain circumstances.

If the module field height (eaves - ridge) is over 12 m a horizontal cover strip must be installed over the top module row. If the module field height is over 15 m additional vertical cover strips between the modules must be installed.

If the roof area above the PV system is over 2 m a horizontal cover strip must be installed over the top module row. The installation instructions for the cover strips are available separately as required.

4.1 Disassembly

Disassembly of the S:FLEX mounting system may only be carried out by trained specialist personnel. Observe the same safety instructions, standards and guidelines as provided for the installation. In general, disassembly is carried out in reverse order to the described installation.



Before disassembly, disconnect the PV modules from the mains network. Disconnect all of the PV modules' electrical cables (string lines and plug connectors) and remove them from the frame system.



Then remove the modules and store them safely. Improper disassembly can lead to damage to the modules.



Disassemble frame system and safely store all of the parts.
Any holes in the roof must be sealed by a specialist. The area of the roof from where modules are removed must be reroofed. To do this, support battens and roof connecting battens must be removed and the battens must be refitted.

4.2 Disposal

Aluminium and stainless-steel components can be recycled after disassembly. The plastic frame and flashings are also fully recyclable. The frame system must only be disposed of by a specialist waste management company. Observe the applicable national standards and guidelines.

5.1 User agreement for the S:FLEX in-roof system

We point out that the assembly system is sold as part of a purchase agreement.

Its installation/processing or acquisition by a third party is not carried out in the name of, or on behalf of, S:FLEX GmbH. Installation/processing of the system must be carried out by appropriately qualified personnel and strictly in accordance with the installation instructions.

The design and planning of the system must be undertaken using the S:FLEX Planning Software (Solar.Pro.Tool). S:FLEX GmbH is neither responsible for the project-specific structural analysis of the roof structure, nor for obtaining and documenting the approval of the roof manufacturer for use of the respective fastening system on the roof in question (in the terms of the warranty), nor for correct installation of the fastening system.

S:FLEX GmbH accepts no liability for faults and damage and/or a restricted or limited operational capability of the system which has resulted from incorrect installation and/or installation which was not undertaken in accordance with the installation instructions and/or the project report (Solar.Pro.Tool). In the case of incorrect installation, the buyer's right to assert claims for material defects shall expire.

The system warranty is only valid if all system components were acquired from S:FLEX GmbH.

5.2 Warranty / disclaimer

The information regarding dimensioning provided in these instructions is merely suggested values based on prior experience. Binding structural analyses for installation frames can be created using the S:FLEX planning software (Solar.Pro.Tool).

As an installation company, you are responsible for the correct execution of the installation. S:FLEX GmbH is not liable for the dimensional information contained in commercial system quotations.

As the installation company, you are responsible for the mechanical durability of the installed interface connections on the building envelope, in particular also for their watertightness. The components supplied by the company S:FLEX GmbH are designed for the expected loads and in accordance with the currently available technology.

In this context, you must provide the company S:FLEX GmbH with information about all general technical conditions in writing via the project data collection sheet (information about the supporting structure, snow load zone, building heights, wind loads, etc.).

S:FLEX GmbH is not liable if the installed components are not properly handled. Any use close to the sea needs to be clarified with S:FLEX GmbH directly on a case-by-case basis due to the increased risk of corrosion. Provided that the system is handled properly and dimensioned according to the structural conditions and normal environmental and ambient conditions, the company S:FLEX GmbH provides a warranty from transfer of risk to the warranty holder, which guarantees that the metallic components of the racks will remain free from defects with regard to material and workmanship for a period of 10 years. This warranty does not apply to wear parts. For additional information, please refer to the separate warranty provisions.

This applies within the context of the generally prevalent weather and environmental conditions.