

GSE **IN-ROOF SYSTEM**TM

PORTRAIT & PORTRAIT EVOLUTION Installation manual - 100mm battens

V 1.2



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1. Kit presentation

1.1 Presentation of the GSE IN-ROOF SYSTEM™

GSE IN-ROOF SYSTEM PORTRAIT allows modules to be installed **on all types of roofing (slates, flat interlocking tiles, slight-curve tiles, deep-curve tiles)**, on new buildings or renovations.

It can be installed in **portrait format** on both small installations (less than 3 kWp) and large roofs.

GSE IN-ROOF SYSTEM PORTRAIT must be installed on the wooden or metallic substructure of the buildings and mounted on specific battens, adapted to climatic conditions. It can be mounted on slopes between **12° and 50°**.

Before installing the **GSE IN-ROOF SYSTEM PORTRAIT**, we strongly recommend that you join us on our **CONNECTOR** platform, created to help installers make their project a success.

- Watch our training videos.
- Use the configurator for your project to obtain the PV field dimensions and full material list



TRAINING



TOOLS AND CALCULATION



HELP CENTER



DOCUMENTATIONS

1.2 Kit components

MOUNTING FRAMES



HALF FRAMES



FRAMES

MOUNTING CLAMPS



Self-drilling
wood screws
6.5 x 60
or 6.5 x 45*



End clamp +
EPDM foam



Middle clamp
+ EPDM foam



Edge wedges
(L/R)

TOP & LATERAL CONNECTIONS



Flashing
Hook**



Lateral
Flashing



Pre-compressed
foam



Top Flashing



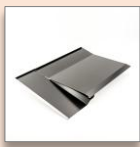
Attach angle



Aluminium
Pop Rivet



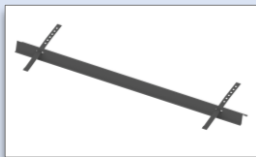
Top Flashing
Junction



Corner
Flashing



Flexalu
330MM™
or eq.



Tile Support & Long
Hooks

(except for slates and
flat tiles)

OPTION 1

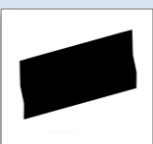
OPTION 2

BOTTOM CONNECTION



Waterproofing
strip certified

OPTION 1



Bottom Rigid
flashing

OPTION 2



Bottom Semi-
rigid flashing

OPTION 3

* A 60 mm length screw is adapted to an installation with vertical counter battens and horizontal support battens. In case of a different installation principle, it is the responsibility of the installer to use a screw with adapted length.

** Nails / screws for fixing the flashing hook not sourced by GSE Integration

1.3 Tools required for installation

SCREWDRIVER



DRILL BITS WOOD AND
METAL OF 10MM



HEX BIT 8MM



Adjustable tightening torque mandatory

AVIATION SNIP



RIVET GUN



HAMMER



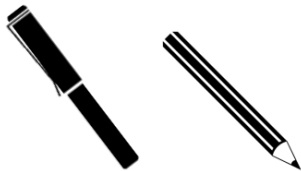
MEASURING TAPE



CHALK LINE

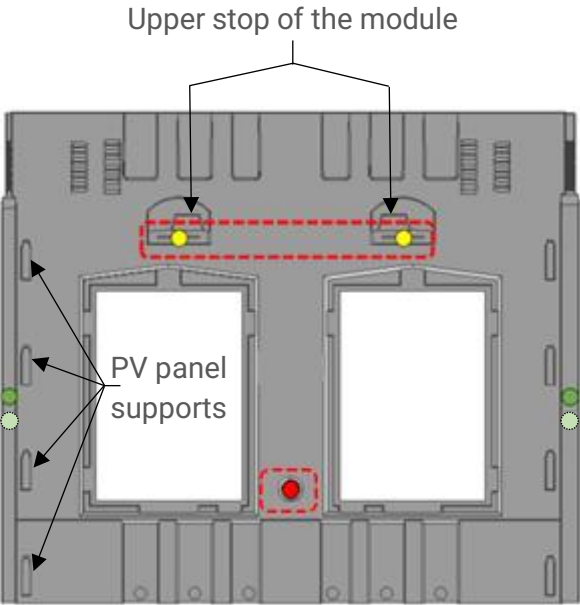


MARKING ACCESSORIES



White marker, pencil, etc.

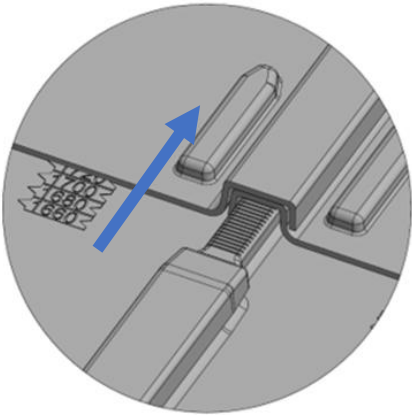
1.4 GSE PORTRAIT Evolution (Half-frame)



- Frame fixing point
(**already placed, without pre-drilling**)
- Frame fixing point
(**already pre-drilled at 10mm**)
- Clamp fixing point (4 & 8 clamps) (**lateral interlocking needing a 10mm pre-drilling**)

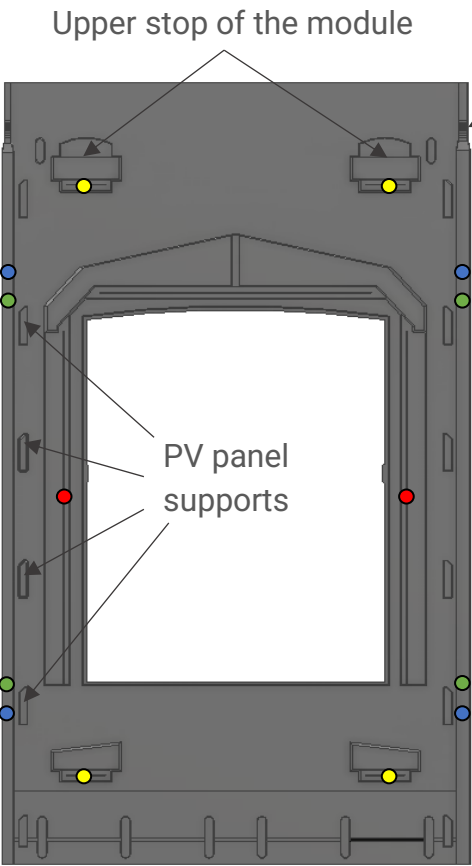
HALF-PORTRAIT FRAME REFERENCES – MODULES SIZES

Overlapping area graduation

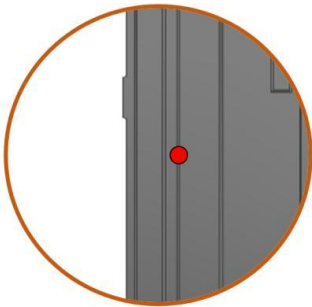


		PV module dimensions				
		Height			Width	
	Réf.	Min. tolerated	Min. suggested	Max.	Min. suggested	Max.
PORTRAIT Version 2022	DPo_1650_995	1570	1610	1800	991	995
	DPo_1650_1070	1570	1610	1800	1066	1070
	DPo_1650_1100	1570	1610	1800	1096	1100
	DPo_1650_1135	1570	1610	1800	1131	1135
	DPo_1650_1140	1570	1610	1800	1136	1140
	DPo_1650_1145	1570	1610	1800	1141	1145
	DPo_1650_1160	1570	1610	1800	1156	1160
	DPo_1840_995	1760	1800	1990	991	995
	DPo_1840_1020	1760	1800	1990	1016	1020
	DPo_1840_1030	1760	1800	1990	1026	1030
	DPo_1840_1040	1760	1800	1990	1036	1040
	DPo_1840_1045	1760	1800	1990	1041	1045
	DPo_1840_1050	1760	1800	1990	1046	1050
	DPo_1840_1070	1760	1800	1990	1066	1070
	DPo_1840_1090	1760	1800	1990	1086	1090
	DPo_1840_1100	1760	1800	1990	1096	1100
	DPo_1840_1135	1760	1800	1990	1131	1135
	DPo_2030_995	1950	1990	2180	991	995
	DPo_2030_1040	1950	1990	2180	1036	1040
	DPo_2030_1050	1950	1990	2180	1046	1050
	DPo_2030_1055	1950	1990	2180	1051	1055
	DPo_2030_1135	1950	1990	2180	1131	1135
	DPo_2030_1305	1950	1990	2180	1301	1305

1.5 GSE PORTRAIT (Full frame)

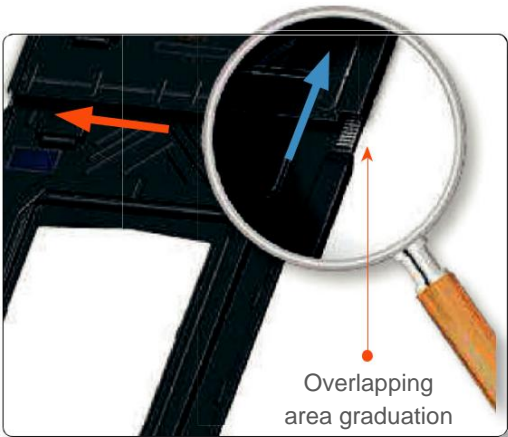


Overlapping graduation



- Frame fixing point (without pre-drilling)
- Frame fixing point (pre-drilling 10mm)
- Clamp fixing point (8 clamps) (pre-drilling 10mm)
- Clamp fixing point (4 & 8 clamps) (pre-drilling 10mm)

PORTRAIT FRAME REFERENCES – MODULES SIZES



Overlapping area graduation

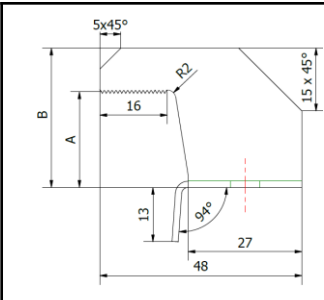
Height Tolerance

Width Tolerance

		PV module dimensions						
		Height			Width			
		Min. tolerated	Min. suggested	Max.	Min. suggested	Max.		
PORTRAIT	Version 2020	Réf.	1710_995	1630	1670	1780	991	995
	1710_1000	1630	1670	1780	996	1000		
	1710_1005	1630	1670	1780	1001	1005		
	1710_1010	1630	1670	1780	1006	1010		
	1710_1020	1630	1670	1780	1016	1020		
	1710_1025	1630	1670	1780	1021	1025		
	1710_1030	1630	1670	1780	1026	1030		
	1710_1040	1630	1670	1780	1036	1040		
	1710_1045	1630	1670	1780	1041	1045		
	1710_1050	1630	1670	1780	1046	1050		
	1710_1055	1630	1670	1780	1051	1055		
	1710_1060	1630	1670	1780	1056	1060		

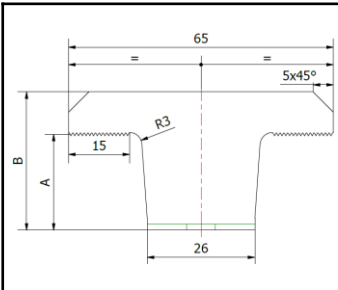
1.6 GSE Clamps

END CLAMPS



Description	A (mm)	B (mm)
End Clamp H16	17,8	27,8
End Clamp H19	20,8	30,8
End Clamp H21	22,8	32,8
End Clamp H23	24,8	34,8

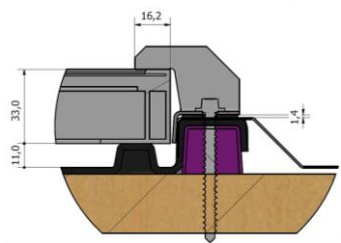
MIDDLE CLAMPS



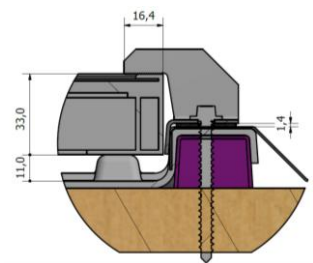
Description	A (mm)	B (mm)
Middle Clamp H16	18,6	28,6
Middle Clamp H19	21,6	31,6
Middle Clamp H21	23,6	33,6
Middle Clamp H23	25,6	35,6

CORRELATION CLAMPS / MODULES THICKNESS

Full Frames (2020)



Half Frames (2022)



Clamps size	Module thickness (mm)		
	GSE In-Roof V2012	GSE In-Roof V2012 - P33	GSE In-Roof V2020 & V2022
H16	35-37 mm	32-34 mm	30-32 mm
H19	38-39 mm	35-36 mm	33-34 mm
H21	40-41 mm	37-38 mm	35-36 mm
H23	42-44 mm	39-41 mm	37-39 mm

INFO: You can find the full correlation table on our **CONNECTOR** tool in the documentation tab.

To access it, log on to <https://connector-gseintegration.com/auth/login/>

2. Site preparation

The installer must proceed to a measurement work beforehand, in order to guarantee the durability and performance of the PV array installed. Climatic conditions of the project (ie. wind and snow¹) and PV array layout should be considered according to current regulations (Eurocodes and NV65-regels (NL)).

This data will help to check if the system is suitable for the project conditions. The thickness of the support battens must be adapted to the roof battens to ensure the junction with the roof covering is watertight.

2.1 Climatic Conditions

2.1.1 Germany



²Da die Erdbebensicherheit des GSE In-Roof System™ bereits für ganz Frankreich bestätigt wurde, wird hier nicht weiter darauf eingegangen.

2.1.2 The Netherlands

Windgebieden Nederland

In Nederland worden volgens de NEN 6702 3 windgebieden onderscheiden. De voorgaande overspanningstabellen geven de maximale overspanningen en oversteeklengtes weer voor de weergegeven productgroepen bij de verschillende windgebieden. Een overzicht;

Indeling windgebieden volgens NEN 6702:

- Windgebied III

Provincies Drenthe, Overijssel, Gelderland, Utrecht, Noord-Brabant en Limburg.
- Windgebied II

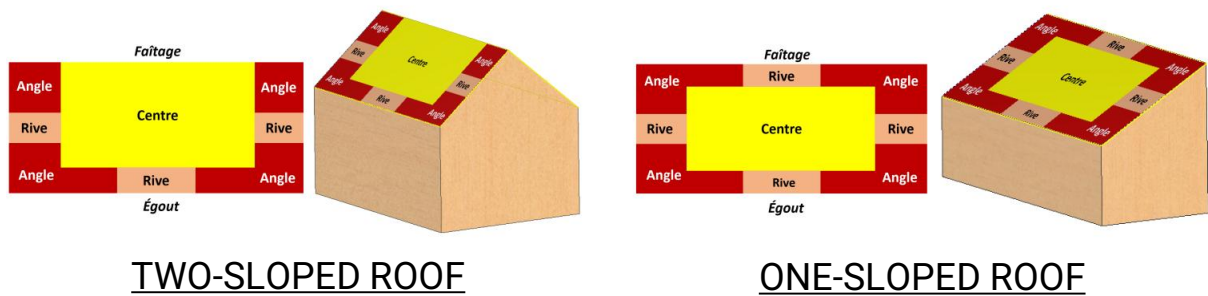
Provincies Groningen, Friesland, Flevoland, Zuid-Holland, Zeeland en Noord-Holland ten zuiden van de lijn Volendam-Heemskerk excl. de Waddeneilanden.
- Windgebied I

Provincie Noord-Holland ten noorden van de lijn Volendam-Heemskerk en de Waddeneilanden.



2.2 Position of the PV array on the roof

The location of the PV array has an influence on the wind load value whether it is in the centre, on the edge or in the corner of the roof. The worst case should be taken into account.



¹The seismic resistance of the GSE In-Roof System is validated on the whole European territory. This criterion is not to be taken into account.

2.3 Defining wind pressure of the project & number of clamps per module

2.3.1 Germany

To calculate the wind load on the PV array, you need to priorly know the following parameters:

- Location of the project
 - Altitude
 - Type of terrain
 - Distance from the shoreline
- Ridge height
 - Roof pitch
 - Roof zone (Centre, Edge, Corner)

Ideally, climatic load (and especially wind load) should be calculated for each project, but you can refer to the table below which gathers information compatible for most project.

Höhe (m)	Bereich	Cp	Zone 1		Zone 2		Zone 3		Zone 4	
			Normal	im Wind	Normal	im Wind	Normal	im Wind	Normal	im Wind
10	Dachmitte	1	500	675	600	780	750	938	900	1080
	Rand	1,7	850	1148	1020	1326	1275	1594	1530	1836
	Ecke	2,4	1200	1620	1440	1872	1800	2250	2160	2592
15	Dachmitte	1	550	743	660	858	825	1031	990	1188
	Rand	1,7	935	1262	1122	1459	1403	1753	1683	2020
	Ecke	2,4	1320	1782	1584	2059	1980	2475	2376	2851
20	Dachmitte	1	594	802	713	926	891	1113	1069	1283
	Rand	1,7	1009	1363	1211	1575	1514	1893	1817	2180
	Ecke	2,4	1425	1924	1710	2223	2138	2672	2565	3078

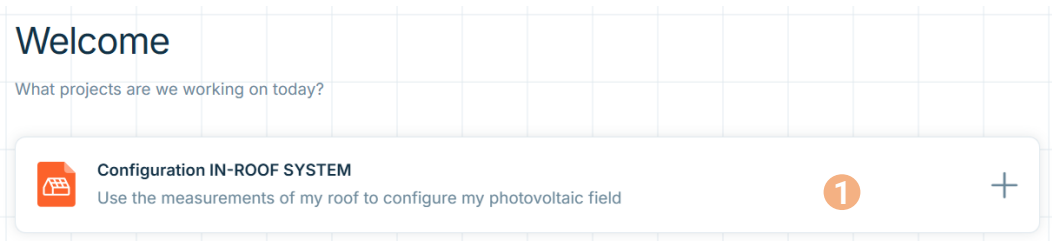
2.3.2 The Netherlands

To dimension your installation, it is mandatory to calculate the number of clamps needed on the PV array using our Calculation Note SPA NL. You need to priorly know the following parameters:

- Location of the project
 - Terrain category
 - Wind Zone
 - Roof length and roof width
- Top ridge height
 - Roof pitch
 - Roof type and dwelling type
 - Roof zone (Centre, Edge, Corner)

You will find the Calculation Note inside our Connector tool :

- <https://connector-gseintegration.com/configurator?type=inroof>
- Create a new project clicking on “Configuration IN-ROOF SYSTEM”




- Choose “Netherlands” as Installation site Country
- Clic on “To consult”
- Clic on “Download the calculation note”

Wind zones



Installation site Country




 **Wind zones**

The characteristics of your project require points of attention regarding the wind resistance of the infrastructure.

[To consult](#) **3**

Use the map above to determine the wind zone in which your project is located.
Use the calculation note below and enter the wind zone to determine the number of clamps required for your installation to comply with the regulations.

 The installation is guaranteed by GSE Intégration if it complies with the recommendations in the calculation note.

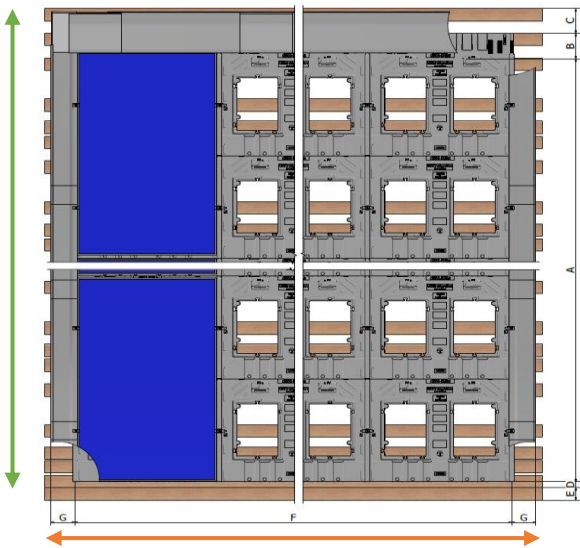
[Download the calculation note](#) **4**

2.4 Calculating the size of the PV array

INFO: Use our CONNECTOR tool available on our web site at <https://connector-gseintegration.com/auth/login/> to determine the dimensions of your PV field.

2.4.1 PV Array Size Calculation Portrait Evolution - Half-Frames

The field size is calculated from the GSE plate reference used (refer to sections 1.4, 1.5 and 1.6 to determine the GSE plate compatible with the module):



Field height (mm) = (mm)
 $((\text{Ref. Height} + \text{Graduation} + 10) \times \text{Nb. Lines}) + 160 + 150 + 50 + 100^2 (\text{Ref. Height} + \text{Graduation})$

$A + B + C + D + E$

Field width (mm) = (mm)

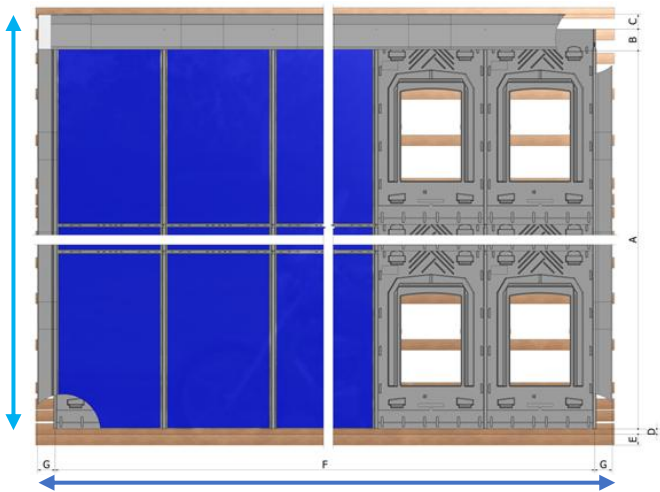
$((\text{Ref. width} + 40) \times \text{Nb. Columns}) + (2 \times 170)$

$F + 2 \times G$

²If installed in the middle of the roof, add a board to equalise with curve height (see 3.4).

Demi-Plaques GSE In-Roof v.2022 - PORTRAIT																				
Hauteur Réf	1650	1650	1650	1650	1650	1650	1650	1840	1840	1840	1840	1840	1840	1840	1840	1840	1840	2030	2030	2030
Largeur Réf	995	1070	1100	1135	1140	1145	1160	995	1020	1030	1040	1045	1050	1070	1090	1100	1135	995	1050	1055

2.4.2 PV Array Size Calculation Portrait – Full Frames



Field height (mm) = (mm)
 $((\text{Ref. Height} + \text{Graduation} + 10) \times \text{Nb. Lines}) + 160 + 150 + 50 + 100^2.$

$A + B + C + D + E$

Field width (mm) = (mm)
 $((\text{Width Ref.} + 36.5) \times \text{Nb. Columns}) + (2 \times 170)$

$F + 2 \times G$

²If installed in the middle of the roof, add a plank to compensate for the curvature of the tile (see 3.3).

Plaques GSE - PORTRAIT																
Hauteur Réf	1580	1575	1575	1575	1640	1640	1686	1710	1710	1710	1710	1710	1710	1710	1710	1710
Largeur Réf	808	1046	1053	1082	992	1001	1016	995	1000	1005	1010	1020	1025	1030	1040	1055

3. Installation steps

3.1 Overall presentation of the GSE IN-ROOF SYSTEM PORTRAIT

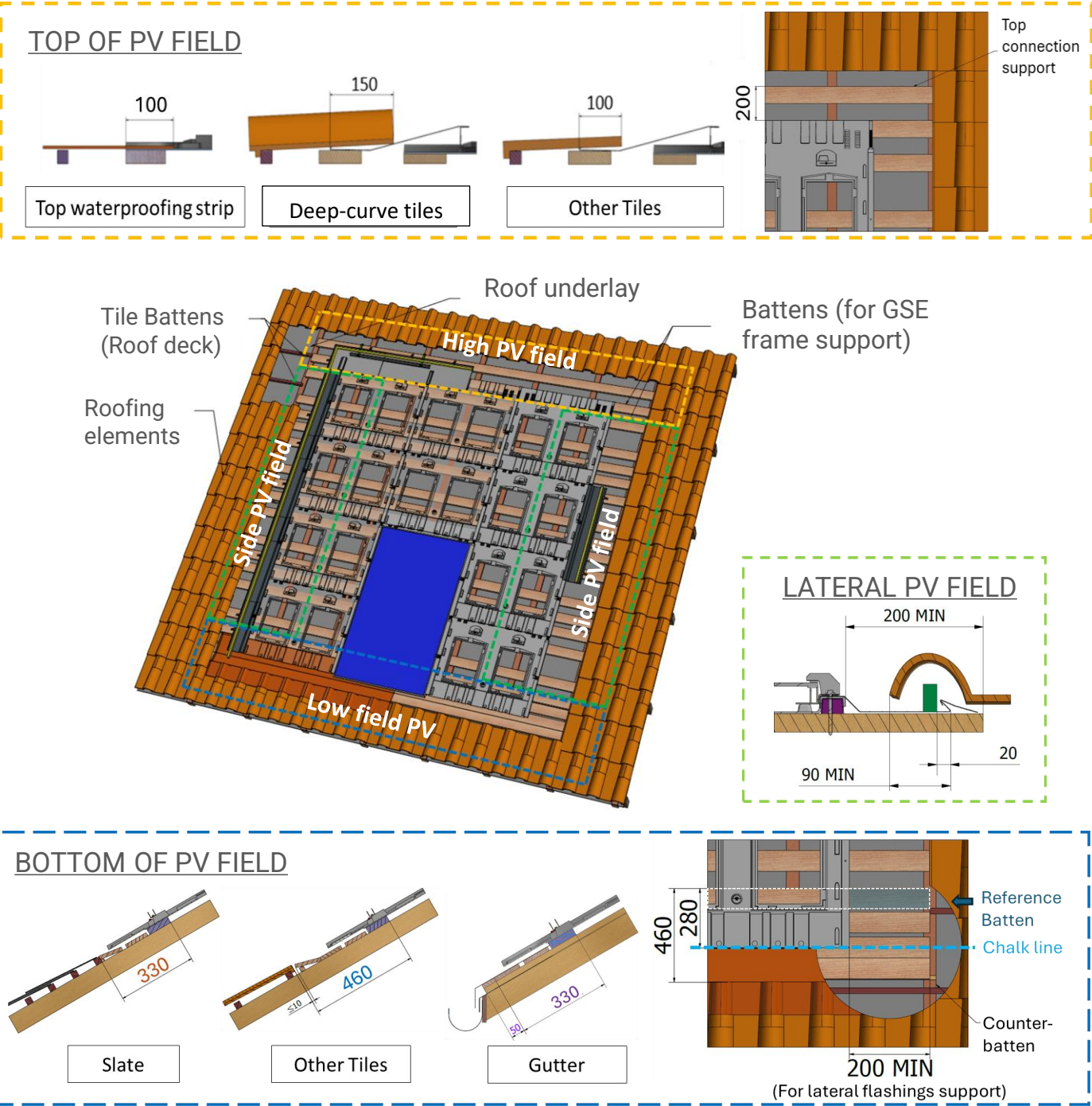
OVERALL PRESENTATION OF THE INSTALLATION STEPS OF THE KIT :

- 1/ Positioning of the support battens

2/ GSE frames installation

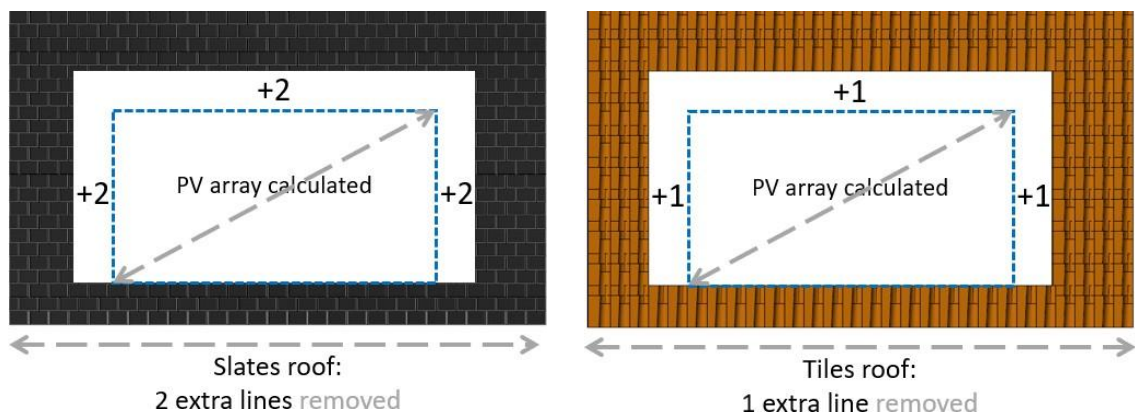
3/ Flashings installation
- 4/ PV modules installation

5/ Connection of the roof covering on top bottom and lateral PV field



3.2 Layout of support battens

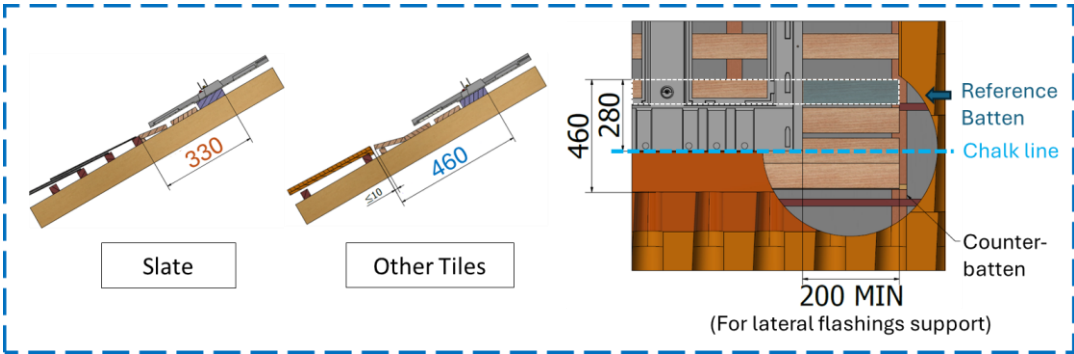
If the roof is covered, uncover the roof to the dimensions of the field calculated above, removing 1 or even 2 extra rows (for slate or flat tile roofing) from the sides and top:



WARNING: PRIOR TO STARTING ANY WORK, THE INSTALLER MUST ENSURE THAT THE FRAMEWORK IS FLAT AND THERE MUST BE A ROOF UNDERLAY ACCORDING TO THE BUILDING STANDARD BS 5534.

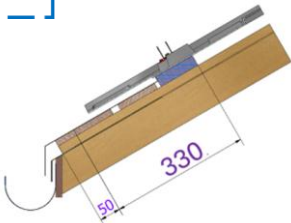
If not, check that the field dimensions calculated previously are compatible with the dimensions of the roof. Use the dimensions of the PV array to centre it horizontally and vertically on the roof, especially if it is installed in the middle of the roof.

- 1 Beforehand, determine the number of clamps (see section 2).
- 2 For **mid-roof installation**, position the **reference batten** (in blue below) of the 1st half-frame line in relation to the lower line of tiles/slates as shown in the diagrams below:



Batten fastening :
We recommend using 5x80 mm self-drilling wood screws.

For gutter installation, position the reference batten (in blue on the diagram) of the 1st half-plate line in relation to the gutter as shown in the adjacent diagram:



3 Position the other battens supporting the Portrait frames and half-frames in relation to the first reference batten:

- 1/ Battens for fixing clamps
- 2/ Battens for the frames' fixing points
- 3/ Battens for the frames' support & overlaps ¹
- 4/ Battens to offer a flat support of **18 mm thick** for the waterproofing strip.²
- 5/ Battens to support the top flashings or the top waterproofing strip

By following the lathing plans shown on the following pages.

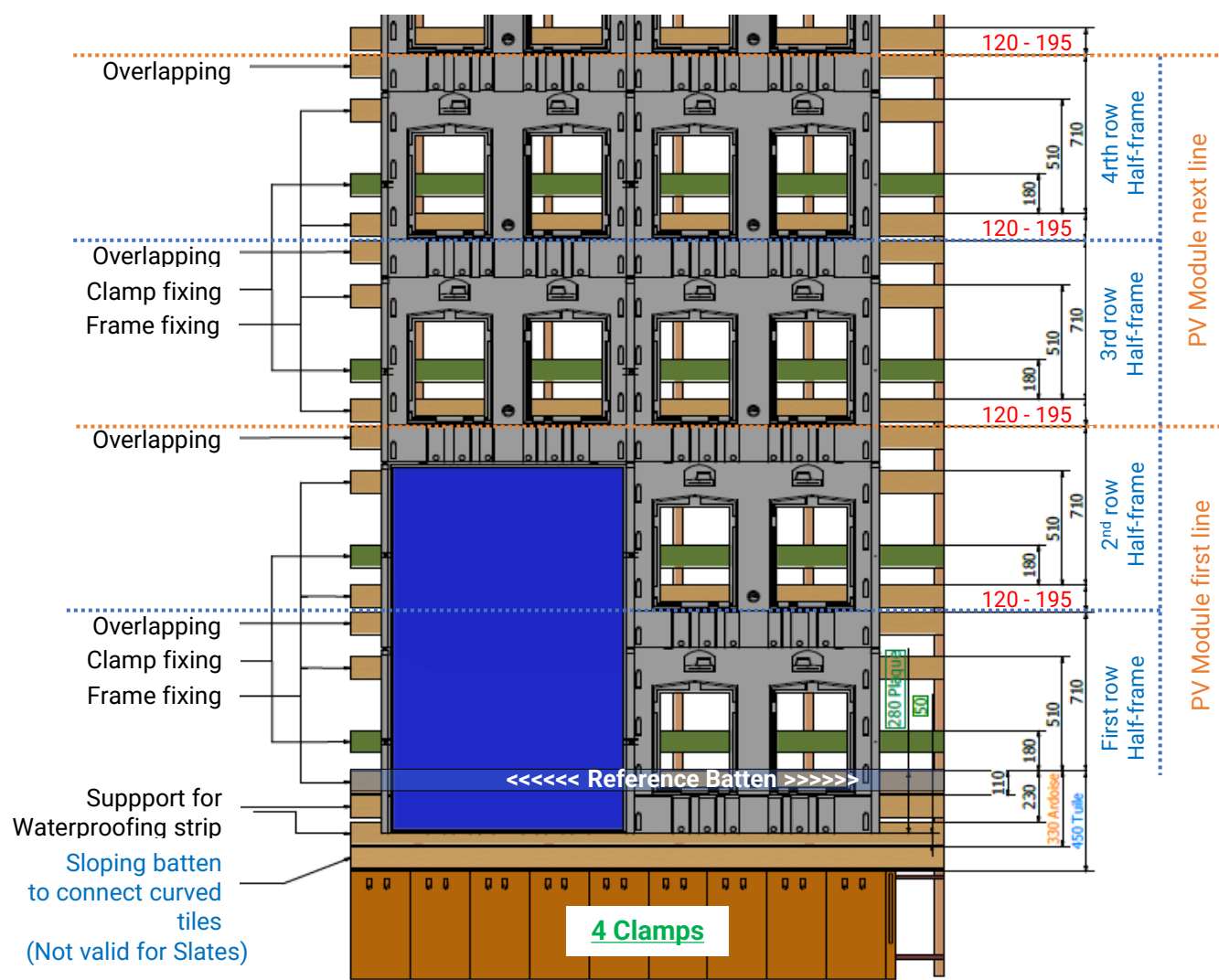
1 - As these elements have no role to play in the mechanical strength of the system, the width of the timbers may be different from the one needed for the clamps (of minimum 50mm). **Only the thickness must be the same.**

2 - The thickness of the battens supporting the bottom waterproofing strip must be max 18mm to avoid creating any extra thickness (via the waterproofing strip) below the first row of frame.

INFO: All our PORTRAIT and HALF-PORTRAIT battening plans are available on our CONNECTOR tool in the documentation tab.

To access it, log on to <https://connector-gseintegration.com/auth/login/>

BATTENING PLAN FOR PORTRAIT EVOLUTION HALF-FRAMES OF
REFERENCE HEIGHT 1650 MM WITH 4 CLAMPS

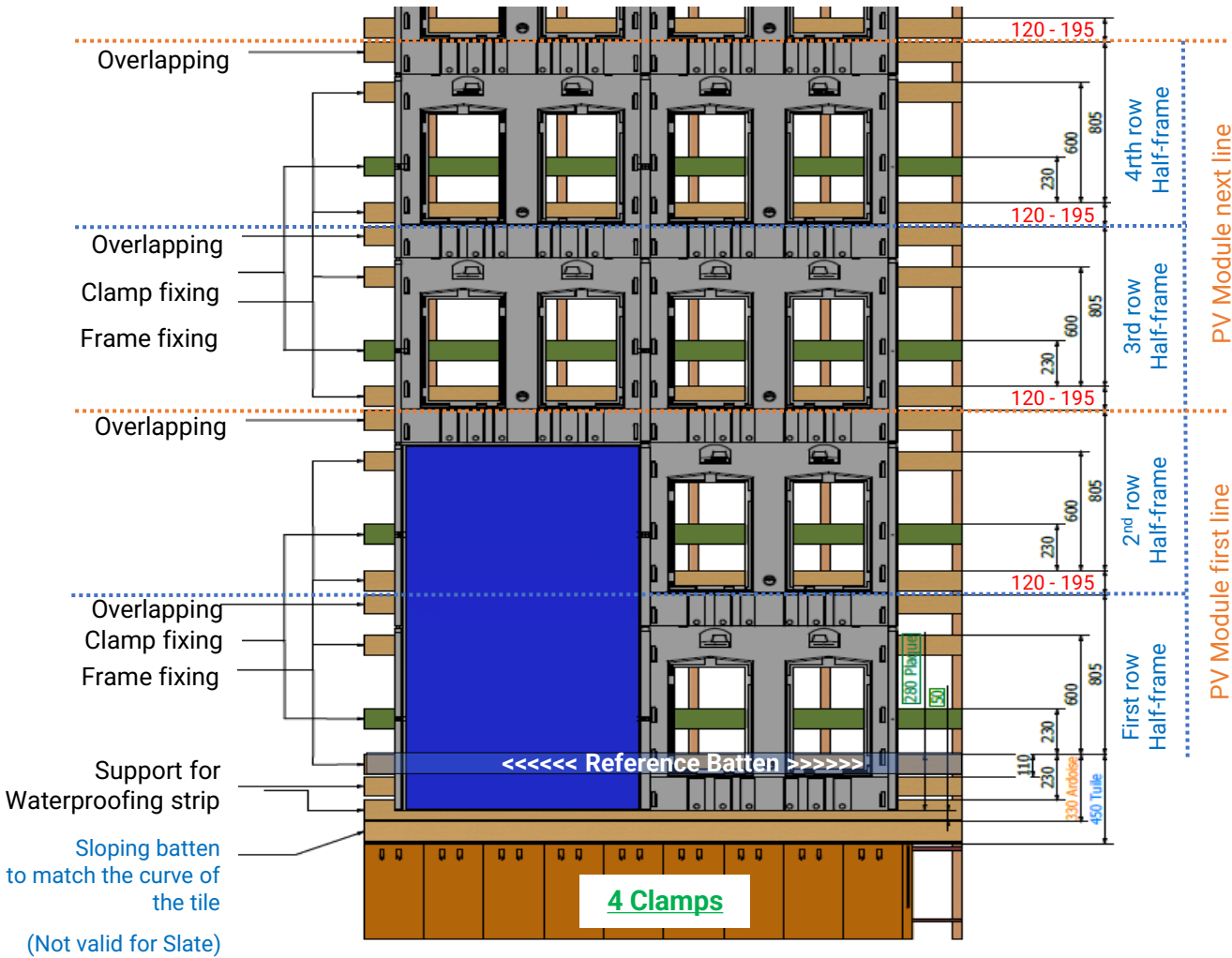


Define the **line spacing annotated in red** in the plan above (**between 120 and 195mm**) in relation to the length of PV module to be installed (and therefore the adjustment required between the half-frames).

Please refer to the adjacent table:

PV Panel Length	First row	Next Rows	Half-frame adjustment
≤1650	450 (or 330) + 710	120 + 710	0
1660	450 (or 330) + 710	125 + 710	5
1670	450 (or 330) + 710	130 + 710	10
1680	450 (or 330) + 710	135 + 710	15
1690	450 (or 330) + 710	140 + 710	20
1700	450 (or 330) + 710	145 + 710	25
1710	450 (or 330) + 710	150 + 710	30
1720	450 (or 330) + 710	155 + 710	35
1730	450 (or 330) + 710	160 + 710	40
1740	450 (or 330) + 710	165 + 710	45
1750	450 (or 330) + 710	170 + 710	50
1760	450 (or 330) + 710	175 + 710	55
1770	450 (or 330) + 710	180 + 710	60
1780	450 (or 330) + 710	185 + 710	65
1790	450 (or 330) + 710	190 + 710	70
1800	450 (or 330) + 710	195 + 710	75

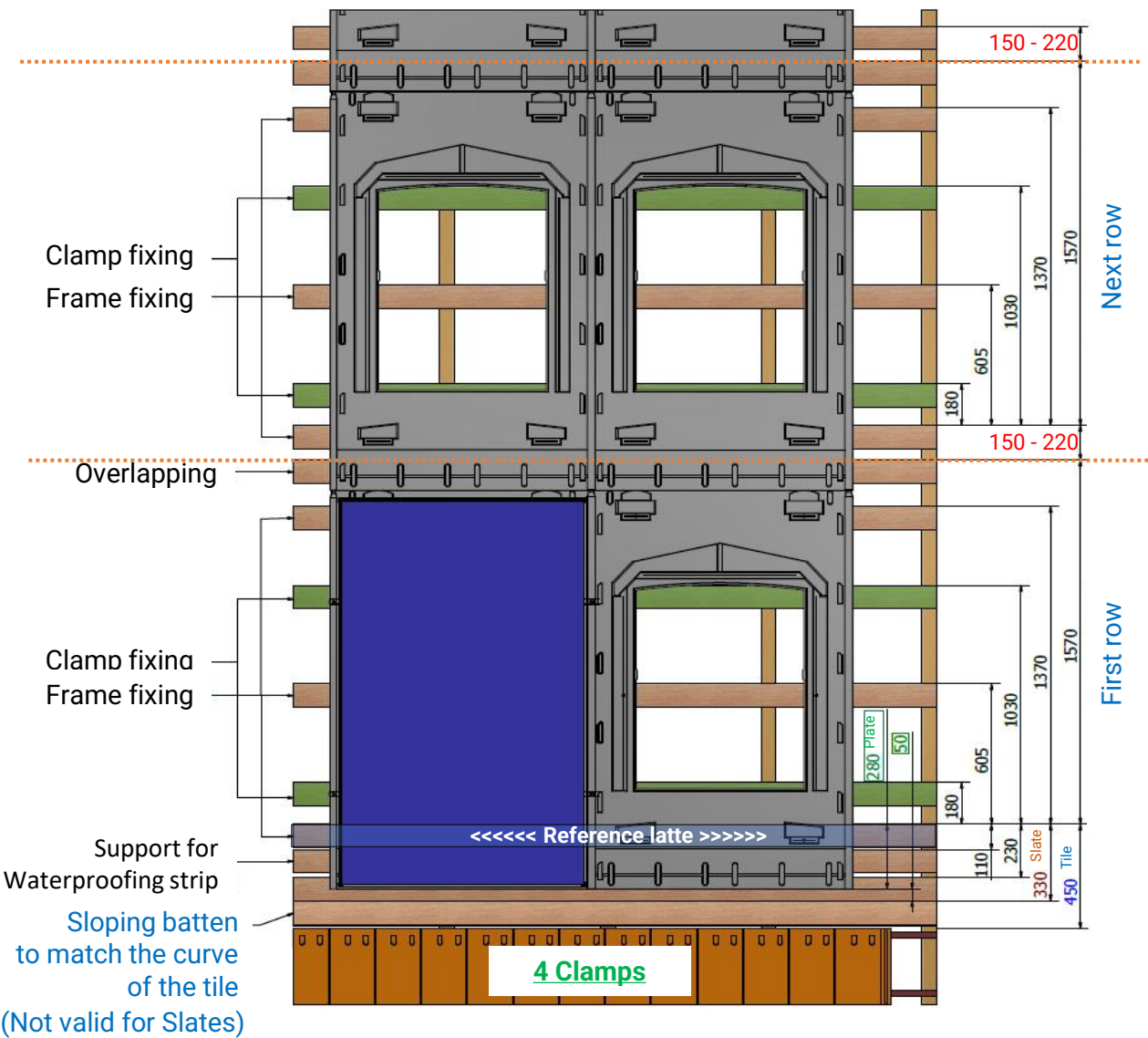
BATTENING PLAN FOR PORTRAIT EVOLUTION HALF-FRAMES OF
REFERENCE HEIGHT 1840 MM WITH 4 CLAMPS



Define the **line spacing annotated in red** in the plan above (**between 120 and 195mm**) in relation to the length of PV module to be installed (and therefore the adjustment required between the half-frames).
Please refer to the adjacent table:

Panel Length	First row	Next rows	Half-frame adjustment
≤1840	450 (or 330) + 805	120 + 805	0
1850	450 (or 330) + 805	125 + 805	5
1860	450 (or 330) + 805	130 + 805	10
1870	450 (or 330) + 805	135 + 805	15
1880	450 (or 330) + 805	140 + 805	20
1890	450 (or 330) + 805	145 + 805	25
1900	450 (or 330) + 805	150 + 805	30
1910	450 (or 330) + 805	155 + 805	35
1920	450 (or 330) + 805	160 + 805	40
1930	450 (or 330) + 805	165 + 805	45
1940	450 (or 330) + 805	170 + 805	50
1950	450 (or 330) + 805	175 + 805	55
1960	450 (or 330) + 805	180 + 805	60
1970	450 (or 330) + 805	185 + 805	65
1980	450 (or 330) + 805	190 + 805	70
1990	450 (or 330) + 805	195 + 805	75

**BATTENING PLAN FOR PORTRAIT FULL FRAMES OF REFERENCE
HEIGHT 1710MM WITH 4 CLAMPS**



Define the **line spacing annotated in red** in the plan above (**between 150 and 220mm**) in relation to the length of PV module to be installed (and therefore the adjustment required between the half-plates).

Please refer to the adjacent table:

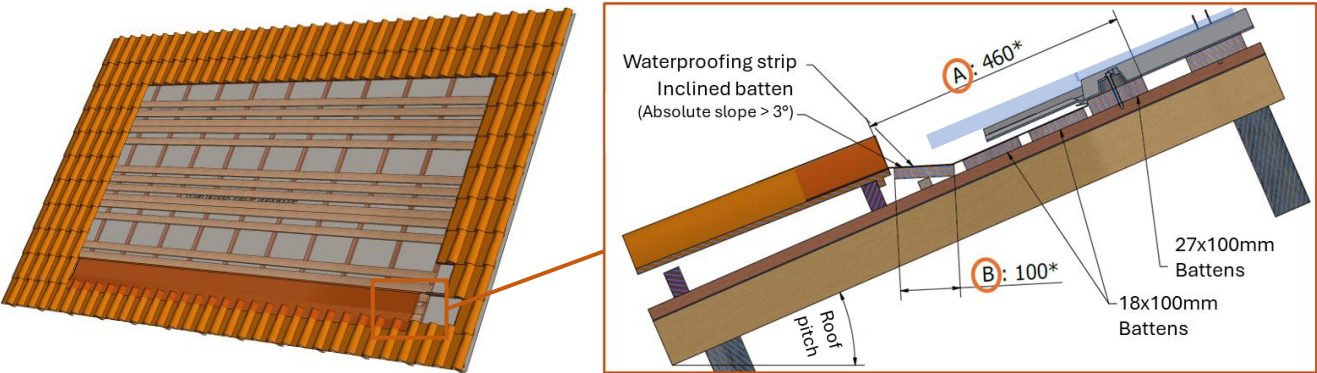
Panel Length	First row	Next rows	Adjustment
≤1710	450 (or 330) + 1570	150 + 1570	0
1720	450 (or 330) + 1570	160 + 1570	10
1730	450 (or 330) + 1570	170 + 1570	20
1740	450 (or 330) + 1570	180 + 1570	30
1750	450 (or 330) + 1570	190 + 1570	40
1760	450 (or 330) + 1570	200 + 1570	50
1770	450 (or 330) + 1570	210 + 1570	60
1780	450 (or 330) + 1570	220 + 1570	70

3.3 Installation of the bottom PV field connection

3.3.1 In the middle of the roof

3.3.1.1) Laying of the inclined batten (except on slate roofs)

The waterproofing strip is laid to connect the bottom of the PV field to the roofing elements. For roofs with mechanical tiles, flat tiles or steeply curved tiles, a "chanlatte" type batten is laid to take up the curvature of the tile and provide a flat support for the waterproofing strip.

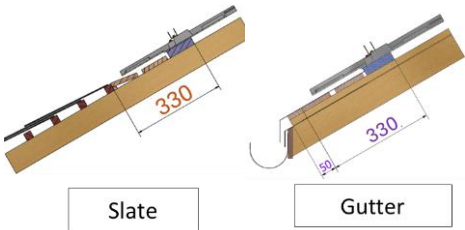


The width of the inclined batten is determined by the slope of the roof (as it must not create a counter-slope) and by definition determines the necessary distance between the reference batten and the row of tiles at the bottom of the PV field. **It should be no more than 18mm thick.**

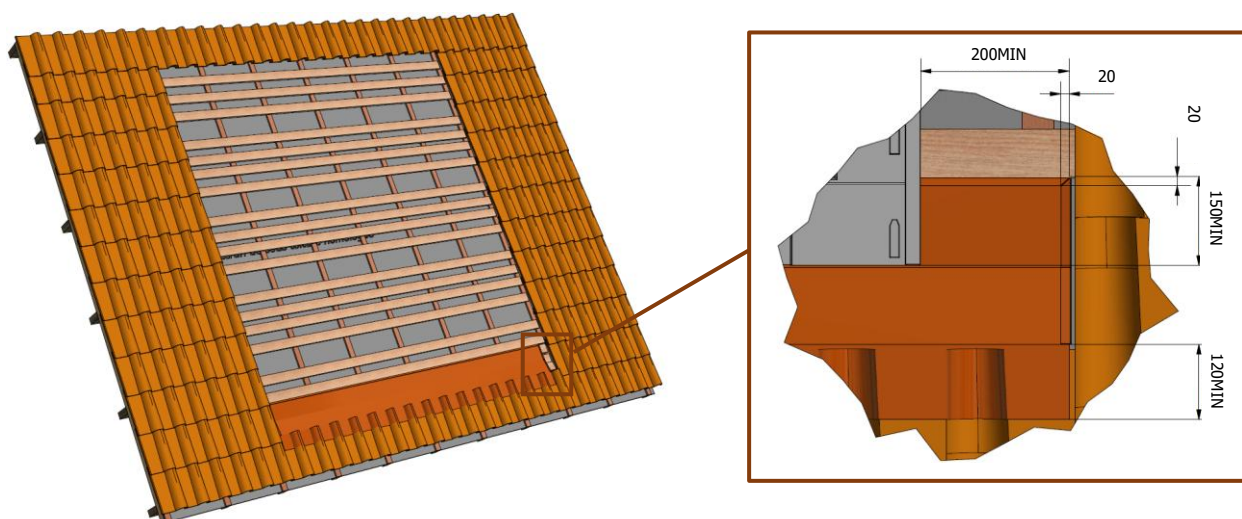
Roof pitch		MIN width of inclined batten	MIN distance Reference batten / Tiles	Sealing strip width MIN
(°)	(%)	DIMENSION B (mm)	DIMENSION A (mm)	(mm)
12 à 19	21 à 35	200	540	560
20 à 23	36 à 43	130	460	500
24 à 50	44 à 50	100	460	500

If the tiles are laid with strong curves, the inclined batten is laid flush with the currents. In the case of very steeply curved tiles, it may be advisable to chamfer the top of the tile curve.

There is no need of a sloping batten for slate or gutter installations.



For all bottom PV field connections in the middle of the roof:



3.3.1.2) OPTION 1 – Installation of the bottom waterproofing strip *Installation possible on any roofing elements*

PLEASE NOTE:

- IT IS ESSENTIAL TO FIT A WATERPROOFING STRIP OF THE CORRECT WIDTH FOR THE ROOFING.
- THE INCLINED BATTEN AND THE BATTENS SUPPORTING THE WATERPROOFING STRIP MUST BE AT LEAST 5MM THICKER THAN THE BATTENS SUPPORTING THE FRAMES. THE USE OF AN 18MM THICK COUNTERPLATE IS IDEAL IN MOST CASES.

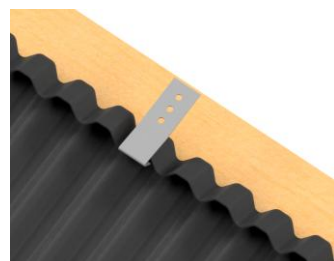
❶ Cut the sealing strip to the correct length of the PV array, adding 20cm on either side of the array (see diagram above).

❷ Fold the top and sides **by around 20 mm** to prevent any water rising up.

❸ Remove the plastic film strip and stick it to the support battens in accordance to the manufacturer instruction.

On wet battens, don't hesitate to hold it at its upper lip, using fixing hooks.

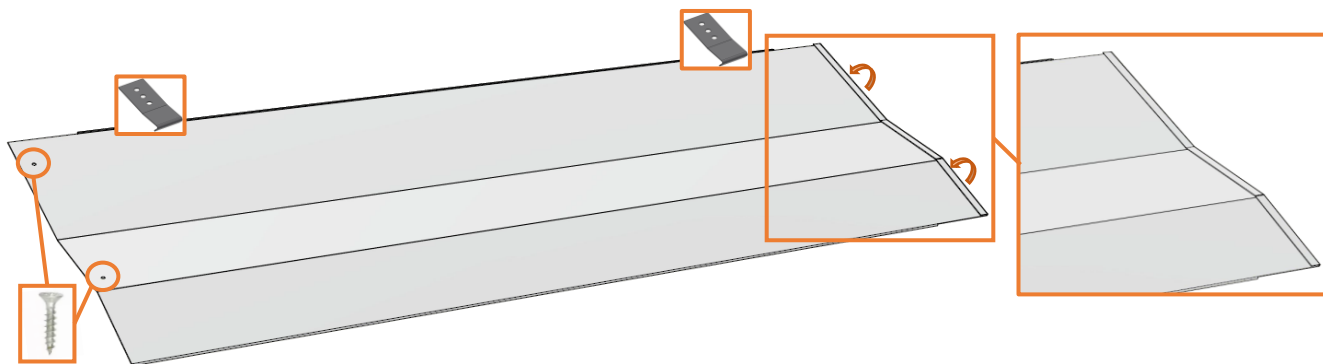
❹ Stick it to the tiles. Make sure you press it firmly into place so that it follows the shape of the tile in accordance to the manufacturer instruction.



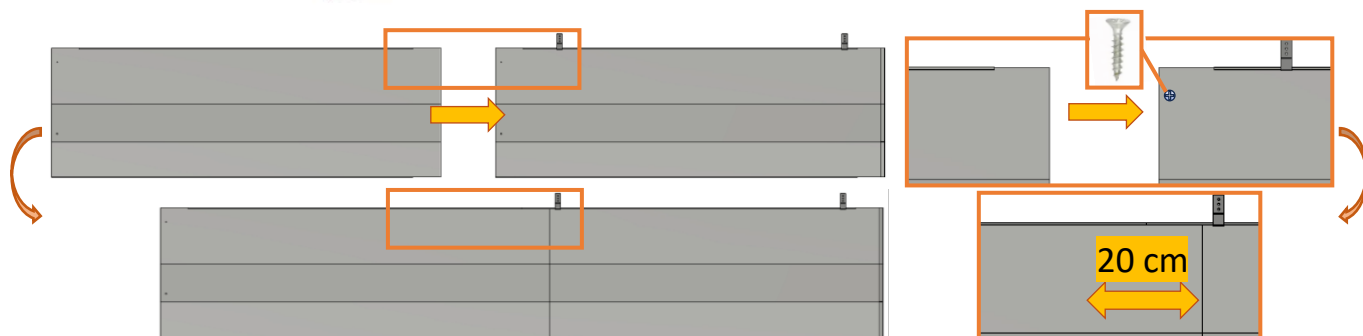
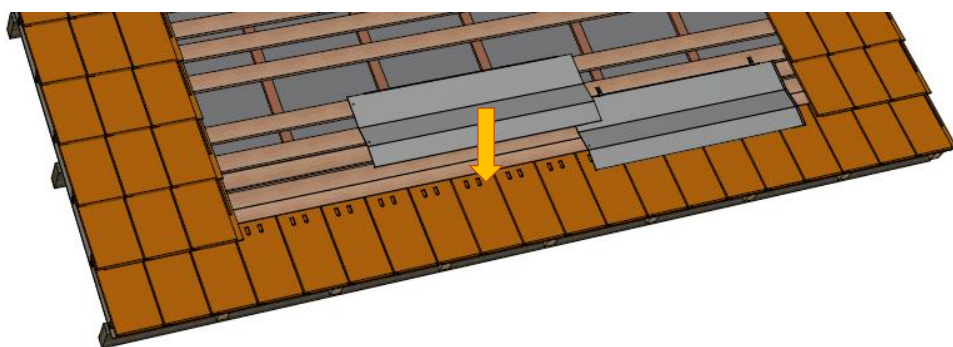
3.3.1.3) OPTION 2 - Installation of the bottom rigid flashing

Installation possible on slates, flat tiles and flat mechanical tiles

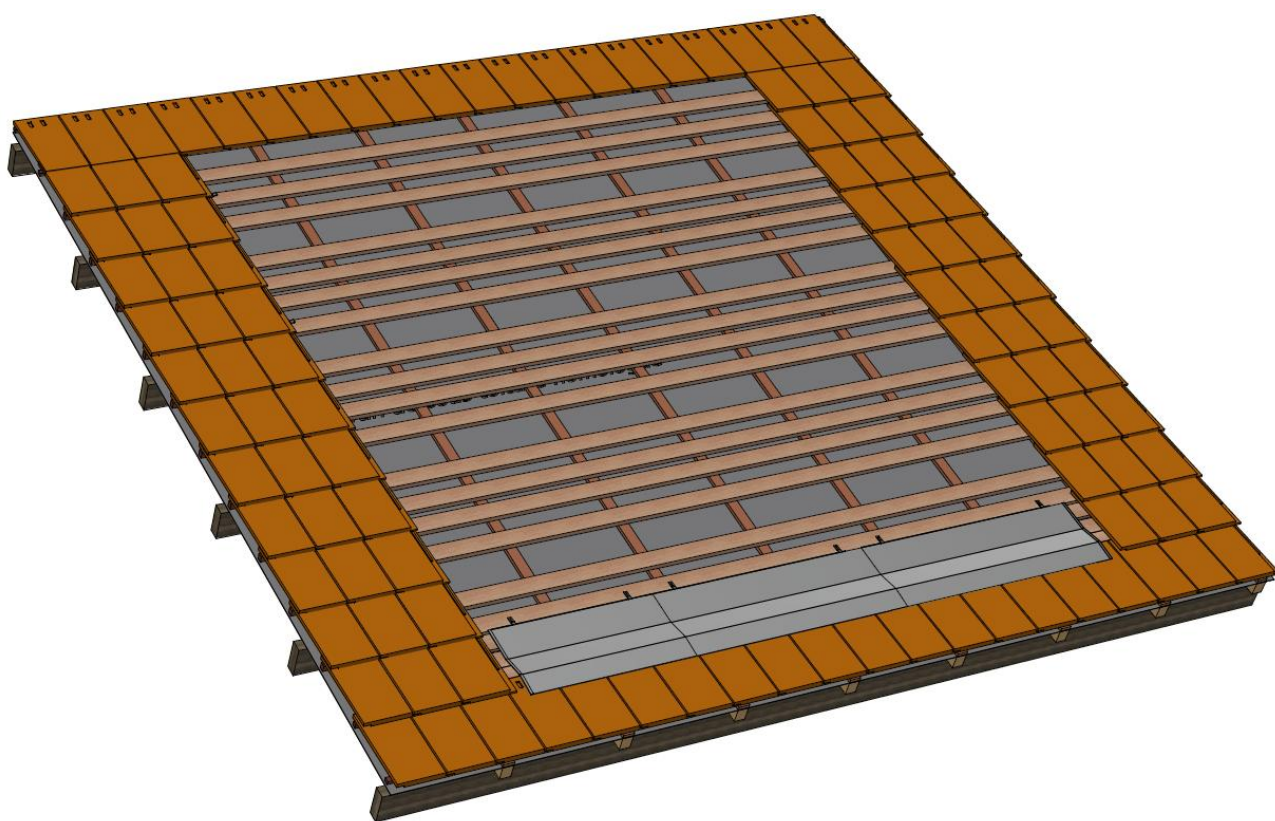
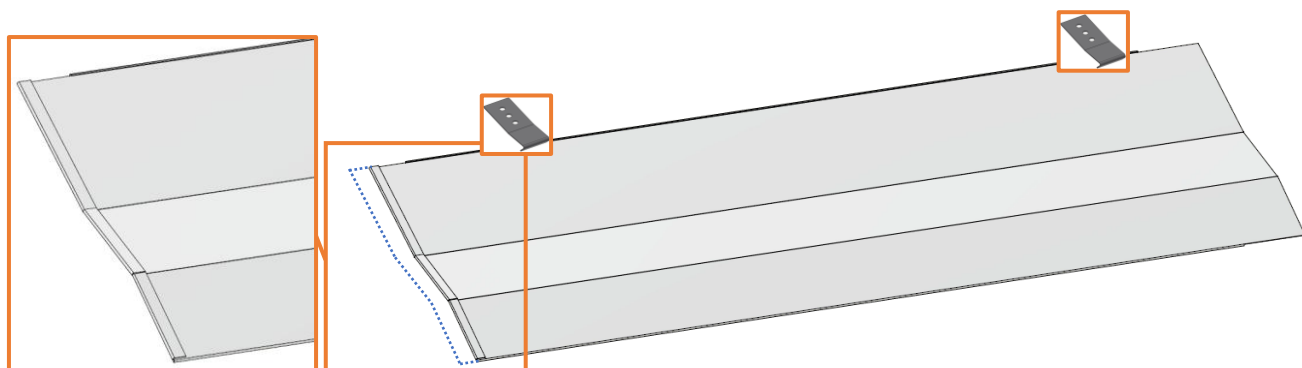
- 1 Make the right angle of the rigid flashing. Bend the 2cm overhang cut with flat-nose pliers to create a clamp to act as a lateral water barrier. Flatten the clip so that it is not completely stuck to the flat part of the flashing, but is raised by 2mm-3mm.



- 2 Position the right angle created earlier at the lower right end of the PV field, and fix it using 2 fixing screws to the support battens. Position the flashings from right to left. Place the flashings on the sloping batten, securing them at their 2 left-hand side fixing points. Place the flaps side by side until the top clips touch. The overlap between 2 flashings is then **20cm**.

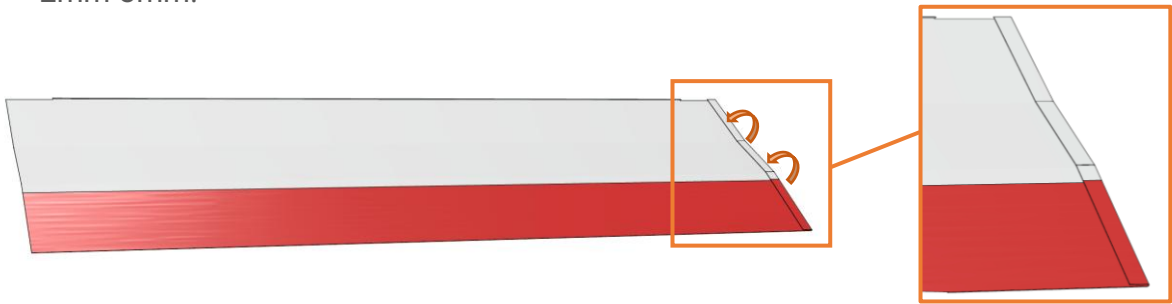


- 3 Create the left-hand corner. To do this, cut the flashing at the left end of the field to the required length. Make a 2cm fold at the side to create a lateral water barrier.

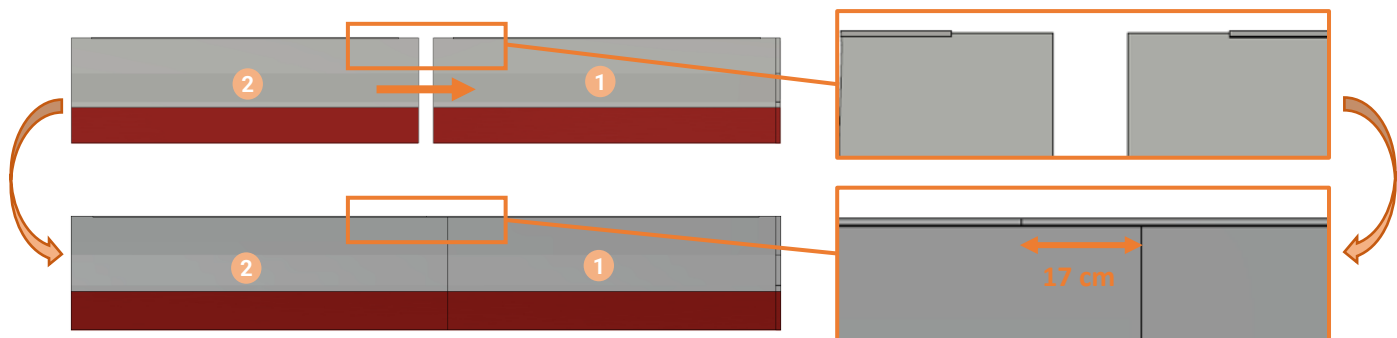
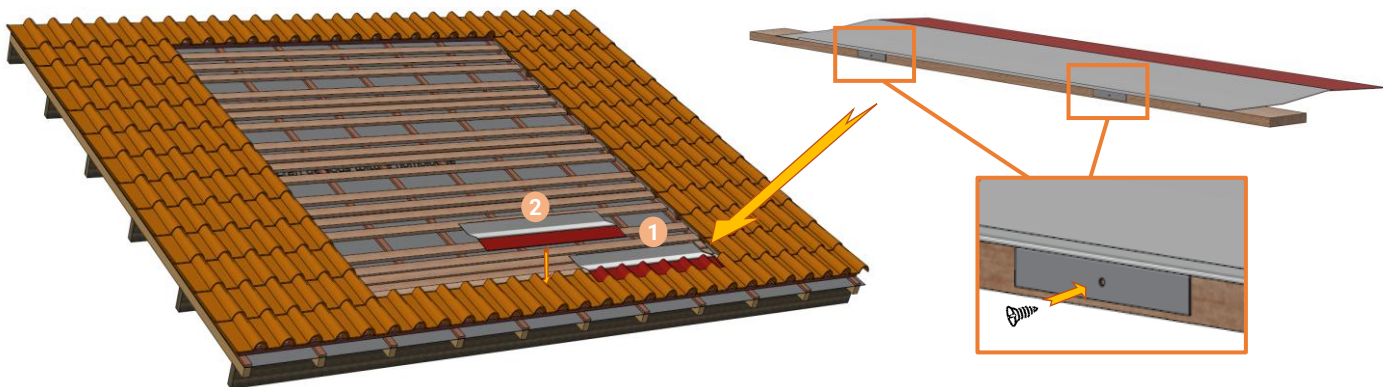


Installation on all roofing elements (except very curved tiles)

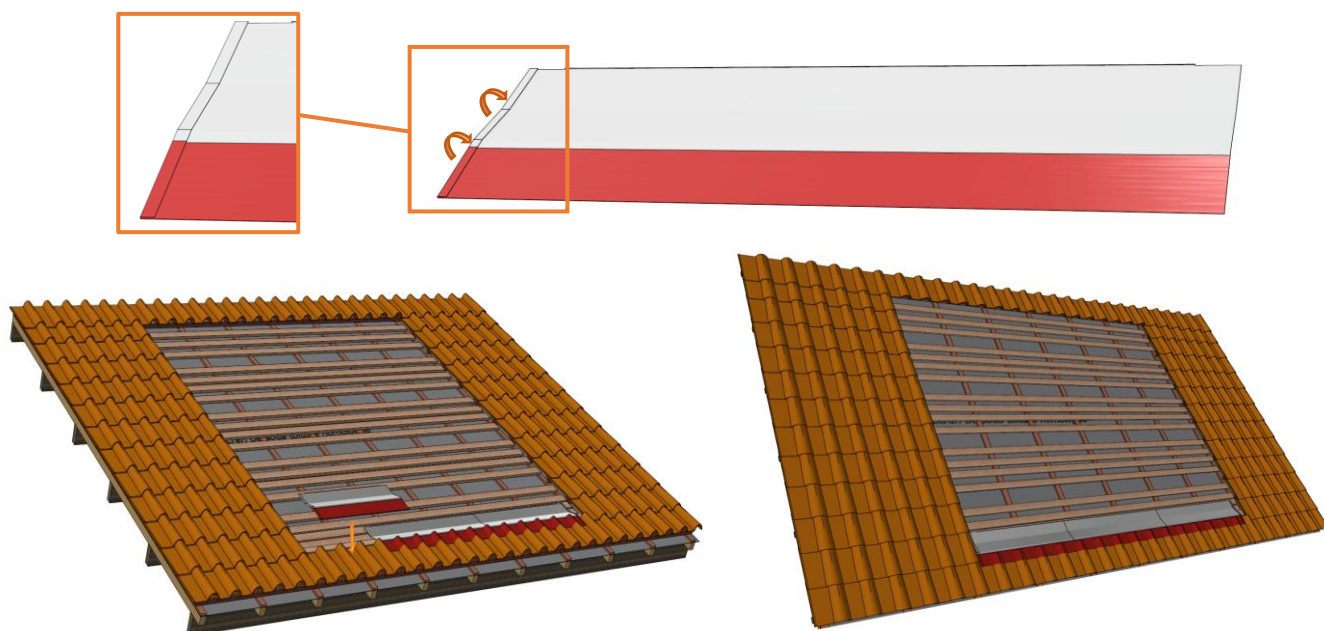
- 1 Make the right angle of the semi-rigid flashing. Bend the right-hand edge of the flashing (2cm) with folding pliers to create a clamp and a lateral water barrier. Flatten the clamp so that it is not completely stuck to the flat part of the flashing, but at 2mm-3mm.



- 2** Position the right angle created earlier at the lower right end of the PV field. Position the semi-rigid flashing from right to left, fixing them to the thickness of the support battens at their fixing lugs. Place the flashings side by side until the top clips touch, then stick the flexible parts together. The overlap between 2 flashings is 170 mm.



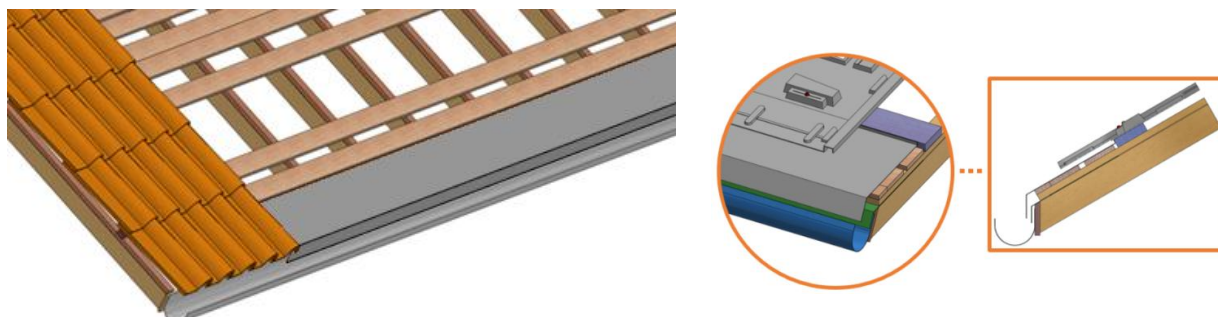
- 3 Create the left-hand corner. To do this, cut the flashing at the left end of the field to the required length. Make a 2cm fold at the left side to create a lateral water barrier.



- 4 Remove the plastic film under the waterproofing strip, and stick it to the tile. It's highly recommended to use a roller to smooth the product on the tile.

3.3.2 Connection to the gutter

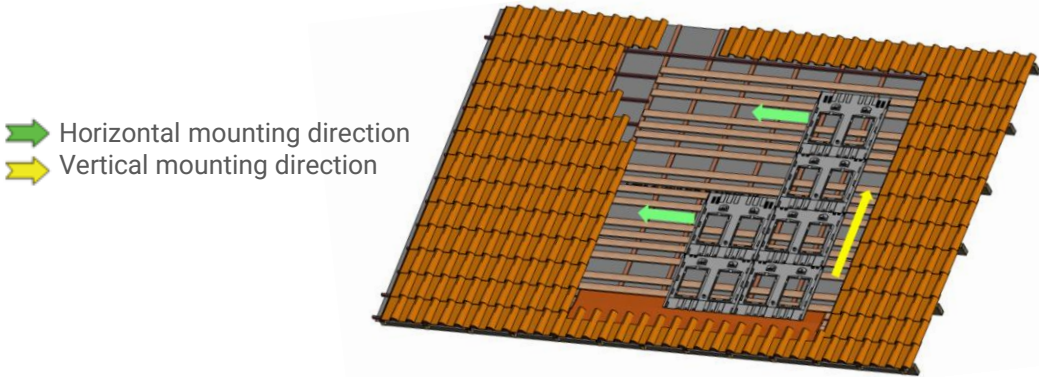
For installation right up to the lower edge of the roof, we recommend that the PV field-gutter connection is made using 2 drip flashings: 1 drip flashing for the PV field and a 2^{ème} drip flashing for the roof membrane. This is to allow the condensation water created on the roof membrane to drain into the gutter.



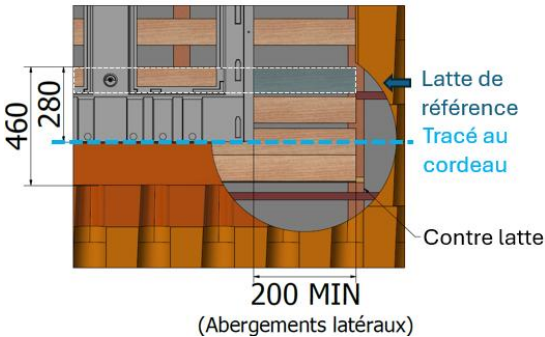
3.4 GSE Portrait half-frames and frames installation

3.4.1 Installation of Portrait Evolution half-frames

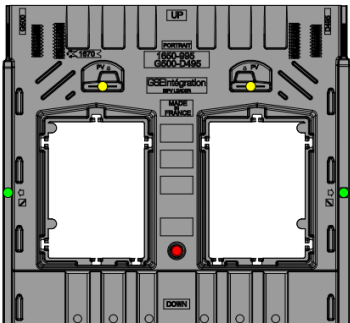
Portrait half-frames are laid line by line, from right to left and from bottom to top.



- 1
- Position the 1st frame at the bottom right of the PV field. Position it **vertically in relation to the reference batten** (the bottom of the frame must be 280mm from the top of the reference batten). Position it **horizontally 20cm from the edge of the batten** and/or from the **minimum 9cm overlap of the tiles on the flashing** (which will be placed on the frame's corrugation in the next step). Make sure it is straight.

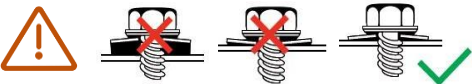


- 2
- Fix the 1st frame at its 3 fixing points: its central fixing point (red) and the 2 other pre-drilled fixing points (yellow).



- 3
- Assemble the other half-frames of the 1st line of the frame array horizontally, using the external lug of the Portrait half-frames. Fix them at their 3 fixing points.

You can align the bottom of the first row to a chalk line, positioning it at 280 mm from the reference batten. To do this, make sure the sealing strip is stable and fixed.



Be careful not to press the screws too far into the

- 4
- Assemble the half-frames of the upper lines to the correct graduation according to the length of PV module to be installed. Fix them at their 3 fixing points.

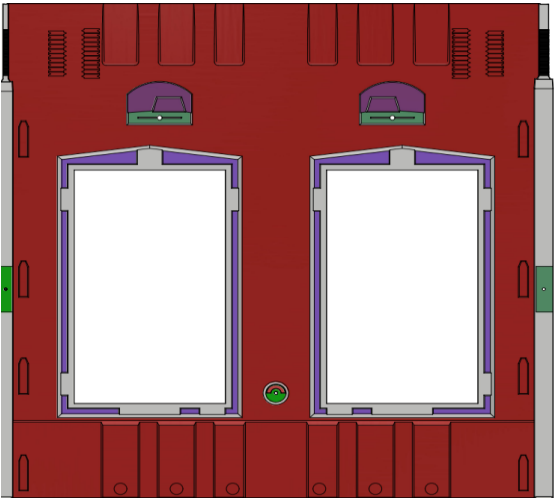


CAUTION: THE SCREW LENGTH CAN BE REDUCED TO 45MM FOR THE FRAME FIXING POINTS IF, AND ONLY IF, THE SUBSTRUCTURE DOES NOT INCLUDE COUNTER-BATTENS.



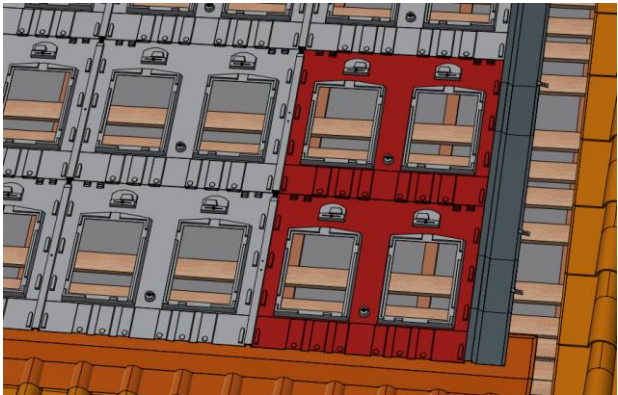
Reminder: It is forbidden to drill in the drainage areas and on the high points of the GSE half-frame, as this could damage the integration of the photovoltaic system and its watertightness.

Refer to drawings p.7 and 31 for frame fixing locations.



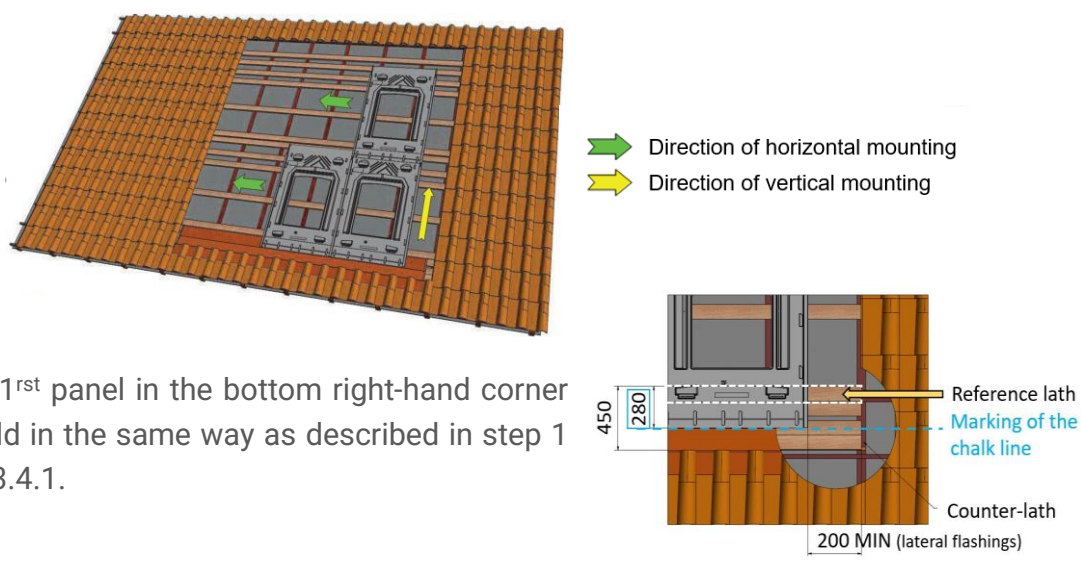
- Outflow zone
Drilling prohibited
- Highest zones
Drilling prohibited
- Fastening zones
Drilling authorised

**Never pierce
water run-off areas**



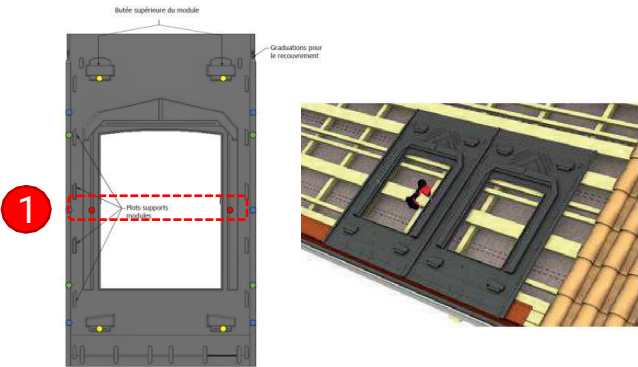
3.4.2 Installation of Portrait Full frames

Like half-frames, Portrait frames are laid line by line, from right to left and from bottom to top.



- 1
- Position the 1st panel in the bottom right-hand corner of the PV field in the same way as described in step 1 of paragraph 3.4.1.

Fix the 1st frame at its 2 central fixing points (red), by screwing the screws directly into the frame (without pre-drilling).



CAUTION: THE SCREW LENGTH CAN BE REDUCED TO 40MM AT THE PLATE FIXING POINTS IF, AND ONLY IF, THE SUBSTRUCTURE DOES NOT INCLUDE COUNTER-BATTENS. OTHERWISE, YOU MUST USE THE STANDARD GSE SCREW LENGTH OF 60MM WITH THE IN-ROOF SYSTEM.

- 3
- Assemble the other frames of the 1st line of the frame array by fitting the right-hand corrugations onto the left-hand corrugations and fixing them at their central fixing points. Adjust the second line of plates to the correct graduation, depending on the length of PV module to be installed (graduation annotated on the frame every 5mm up to 40mm, from 40mm measure with a measuring tape the additional adjustment required, up to 100mm).

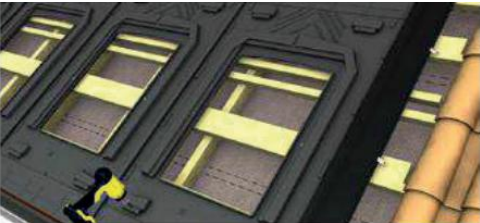


Be careful not to press the screws too far into the frame

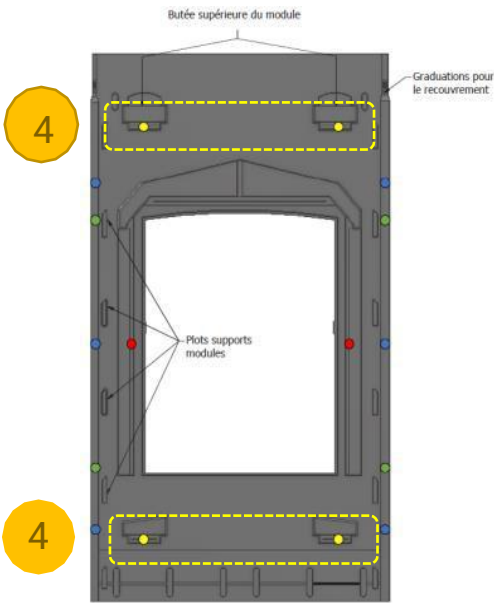
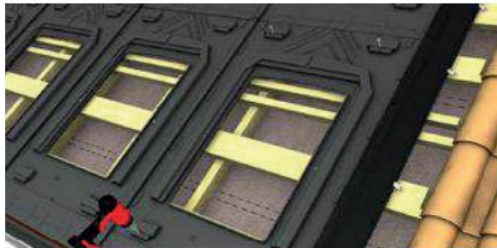
4 Pre-drill the remaining 4 fixing points of the GSE frame with a 10 mm drill bit (the v.2022 half-frames are already pre-drilled to 10 mm on the support pads).

TIP: It is possible to pre-drill the yellow points in the frame before fitting it to the roof. The frames should be drilled individually (do not drill several frames at the same time).

Pre-drill



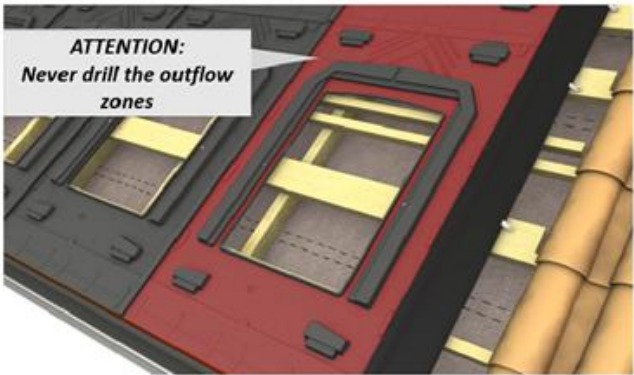
Screw



The screw length can be reduced to 45mm at the plate fixing points if and only if the substructure does not include counter-battens.

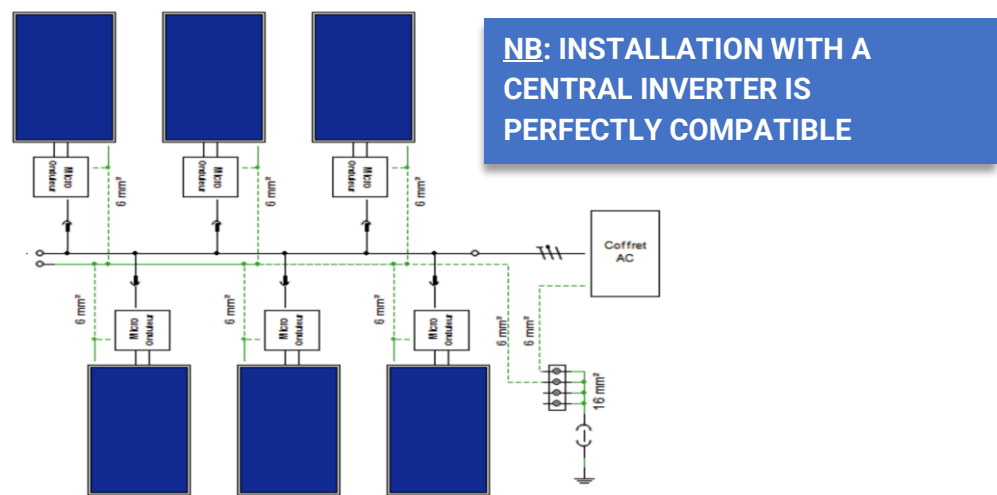


Reminder: It is forbidden to drill in the drainage areas and on the high points of the GSE frame, as this could damage the integration of the photovoltaic system and its watertightness.



3.5 OPTIONAL STEP - Installation of the microinverters and their cabling

EXAMPLE OF AN ELECTRICAL DIAGRAM FOR AN INSTALLATION WITH MICROINVERTERS :



- 1 If using micro-inverters, attach them to a batten in the centre holes of the Portrait Evolution half-frame.



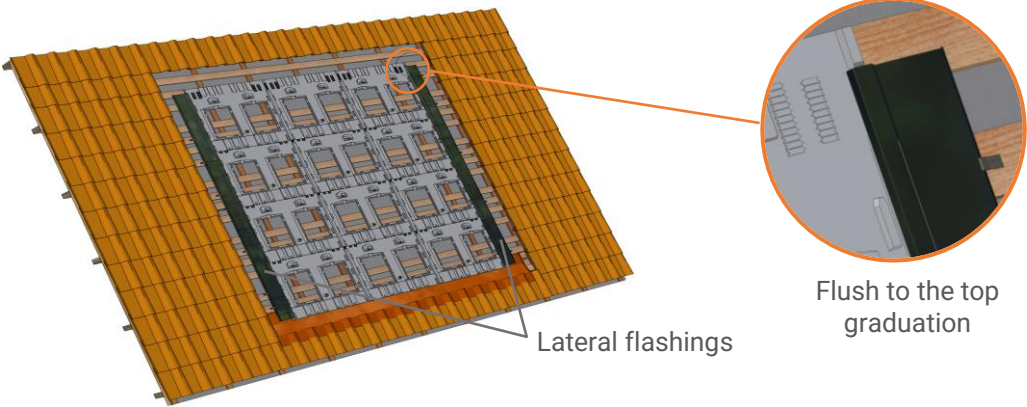
- 2 Connect them together using connection cables, which you will need to run under the half-frames.



CAUTION: REFER TO THE INVERTER INSTALLATION MANUAL AND ENSURE THAT THE INSTALLATION COMPLIES WITH THE MANUFACTURER'S RECOMMENDATIONS.

✓ Validated compatibility with all microinverters and optimisers on the market

3.6 Lateral flashings installation

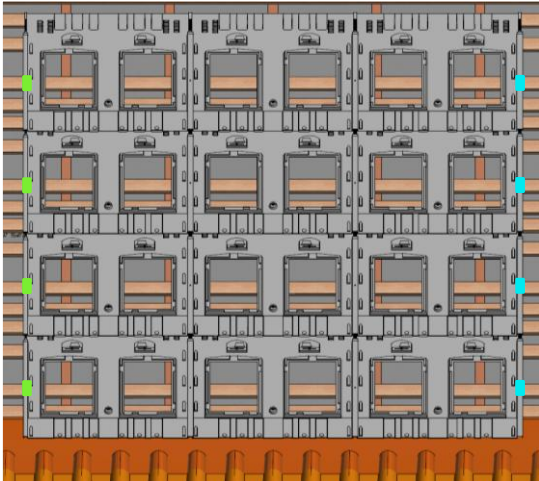
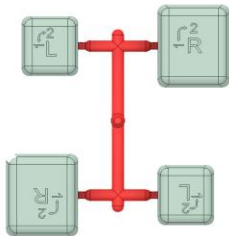


WARNING: BEFORE INSTALLING THE LATERAL FLASHINGS, MAKE SURE TO PLACE THE WEDGES AT THE ARRAY ENDS, UNDER THE CORRUGATIONS, WHERE THE END CLAMPS ARE LOCATED.

- 1 Place the wedges under the corrugations at the ends of the PV field (which are not interlocked with another corrugation), where the clamps will be.

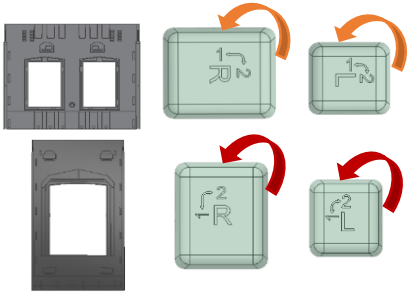
→ Position the **R (Right)** wedges under the corrugations at the right-hand end of the PV field.

→ Position the **L (Left)** wedges under the corrugations at the left end of the PV field.



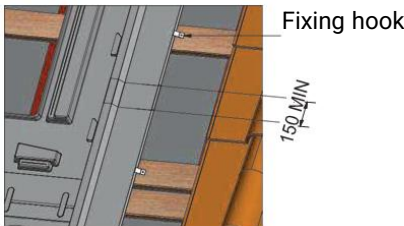
→ Turn the wedges **to position 1** to clip them into the corrugations of the Portrait Evolution Half-Frames.

→ Turn the wedges **to position 2** to clip them into the corrugations of the Portrait Full Frames.

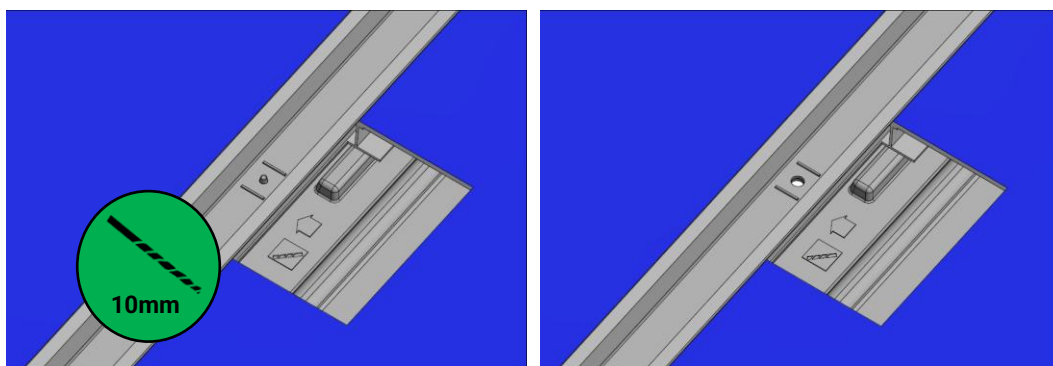
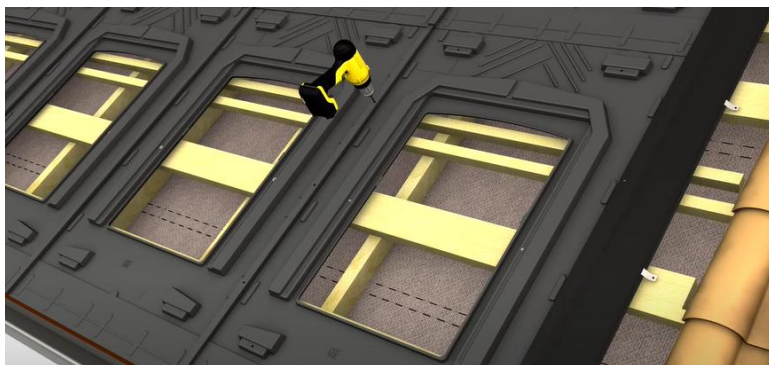


For Portrait Full Frames: Mark the position of the wedges on the inside surface of the frame so that they can be located after the lateral flashings have been positioned.

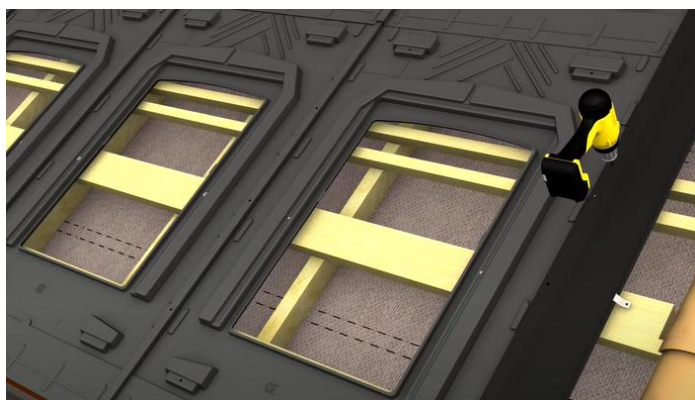
- 2 Position the lateral flashings from the bottom end of the first row of frames, up to the last graduation of the top edge row of frames. There should be a minimum overlap of 150mm between two pieces of lateral flashings. Each shall be held in place by at least 2 fixing hooks.



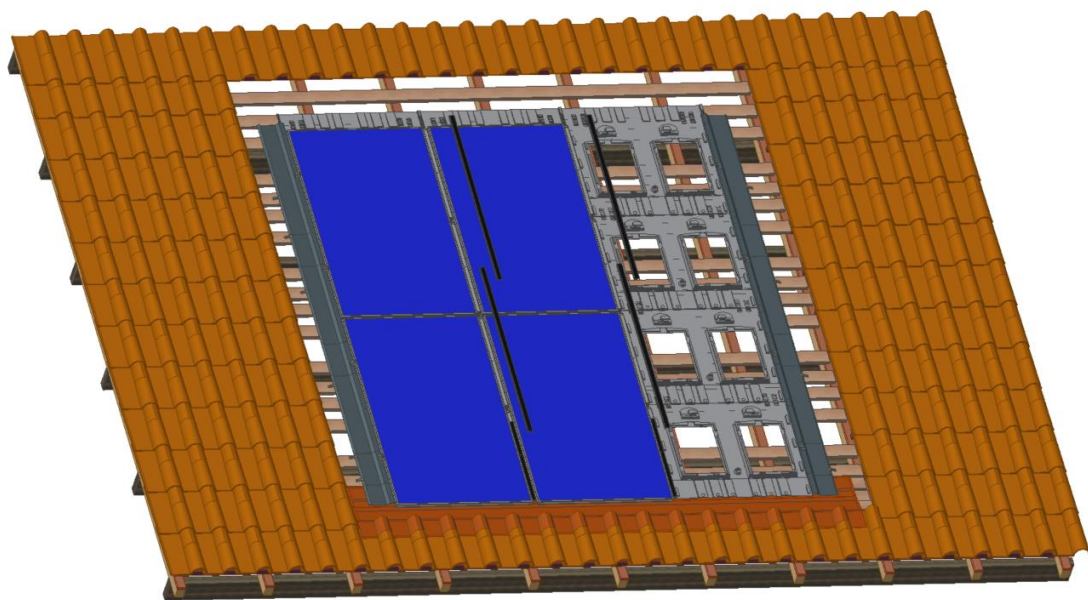
- 4 Use a 10 mm drill bit to pre-drill the fixing points for the clamps.



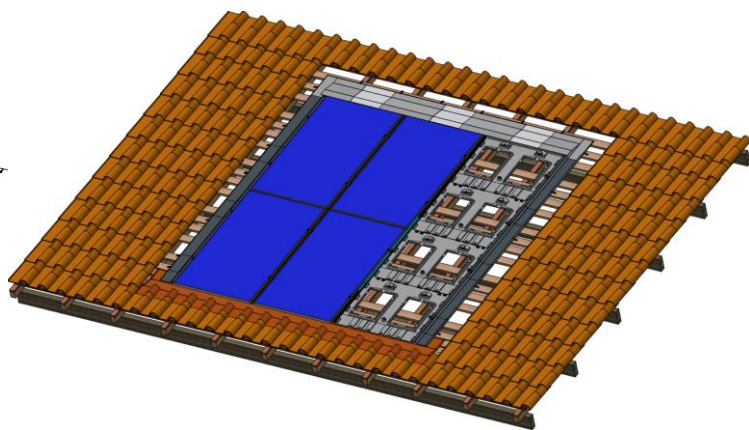
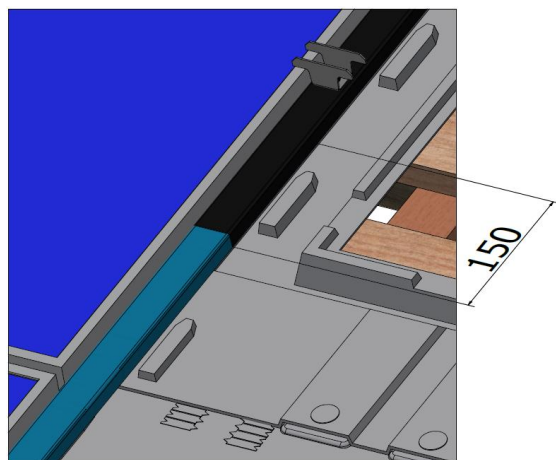
- 5 For end clamps, pre-drill through the flashing, the frame corrugation and the wedge.



3.7 OPTIONAL STEP - Intermodule flashings installation

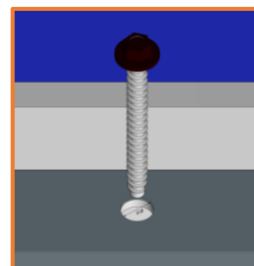


Place the **inter-column flashings** from bottom to top on the corrugations of the frames, so that the overlap between 2 flashings is at least 150mm.



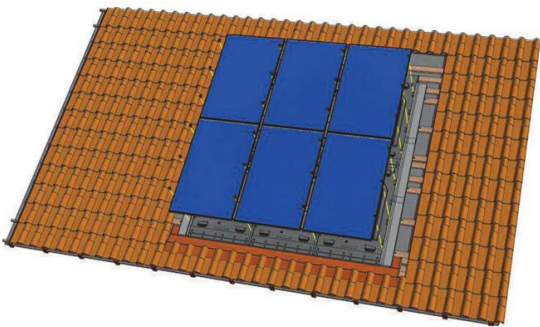
You can add a sewing screw to the corrugations to hold them in position. To do this, make sure:

- To not position it on an overlap between 2 intermodule flashings
- Use a 10mm drill bit to pre-drill the location of the sewing screw



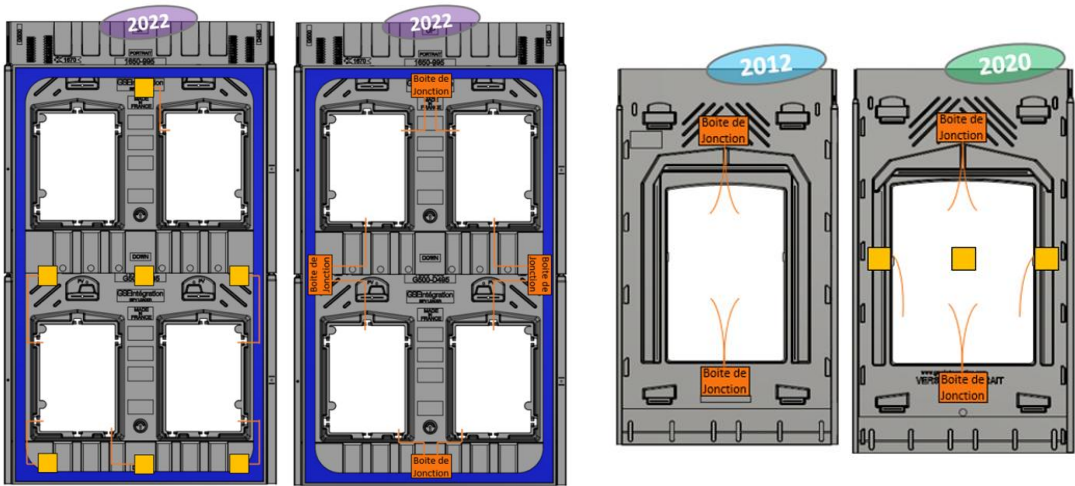
3.8 PV modules installation

3.8.1 Laying the modules on the frame's support pads

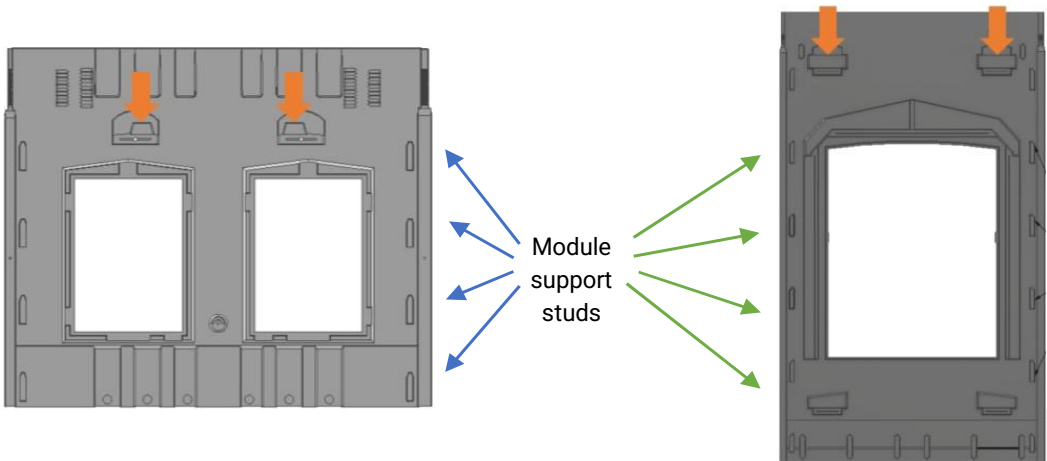


Position the module so that the cables from the junction box pass through the space provided.

TIP: Some module manufacturers allow portrait installation with the single junction box facing downwards; please refer to the manufacturer's instructions.



- 1 Position the modules so that they rest on the support pads and abut the top protrusions (orange arrows).

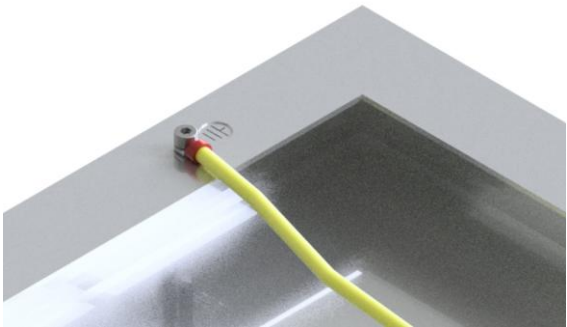




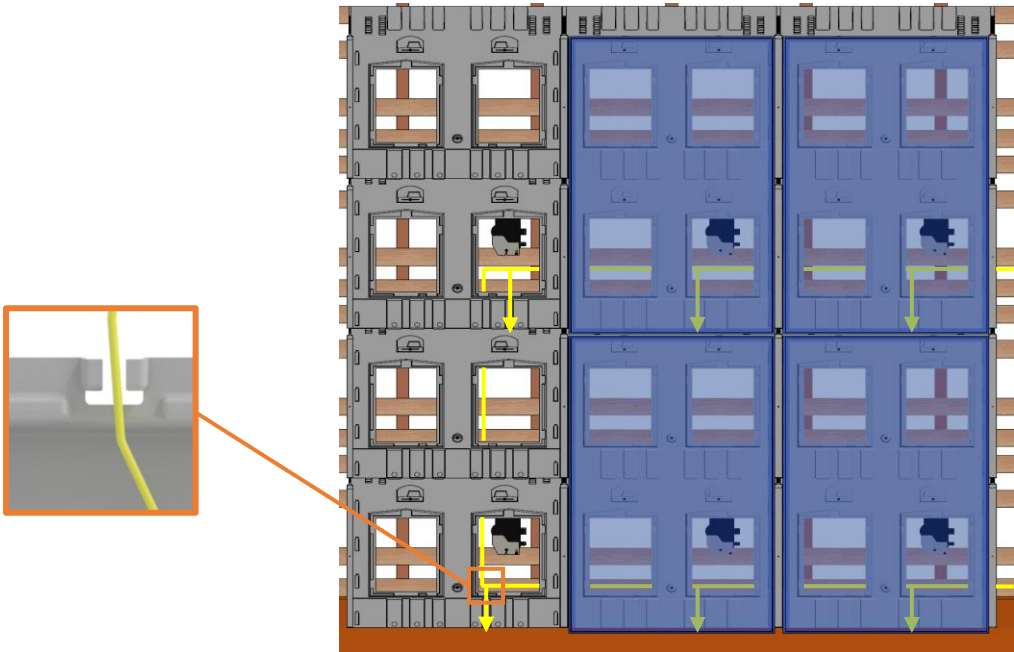
WARNING: ALWAYS ENSURE THAT THE MODULES ARE CENTRED IN THE FRAMES. THE FRAME OF THE PV MODULE MUST COME UP AGAINST THE TOP PADS OF THE FRAME TO PREVENT SLIPPING.

2 Wiring and Grounding

- **Ground** each module frame and the microinverters via the slot provided or via a grounding clamp. Please refer to the manufacturers' installation instructions.

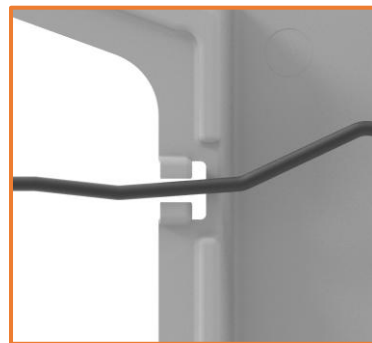


Make sure you run the earthing cables under the half-frames, using the clips in the central windows.



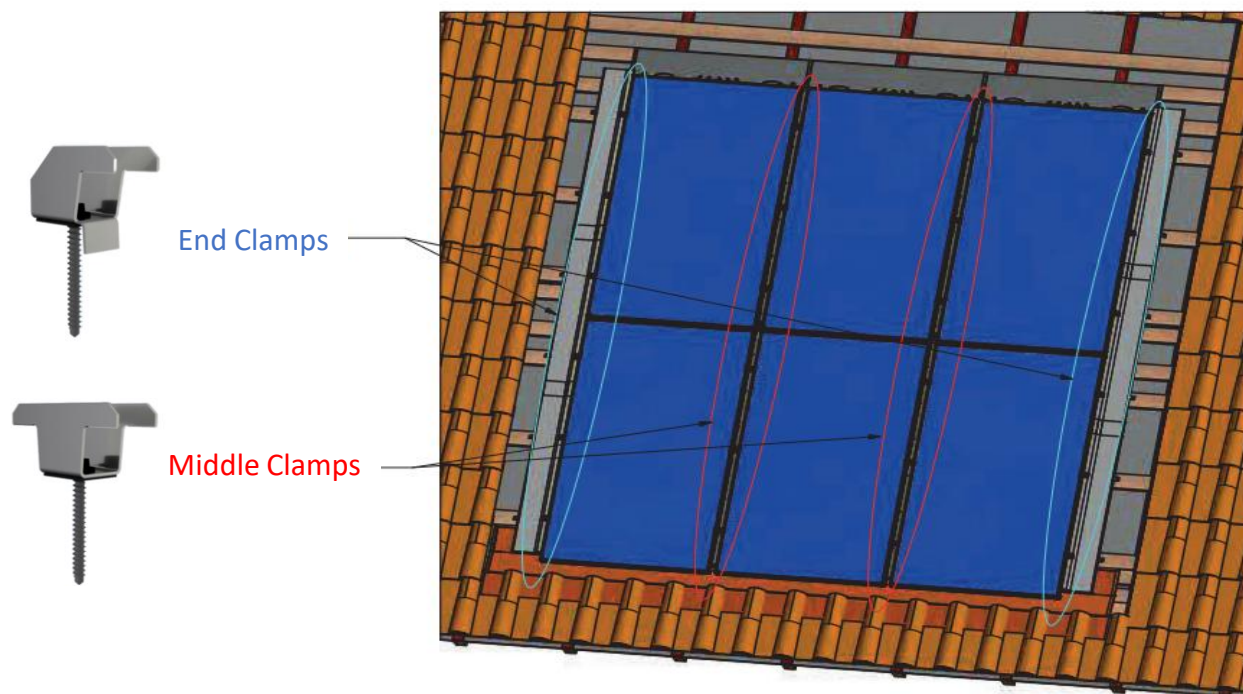
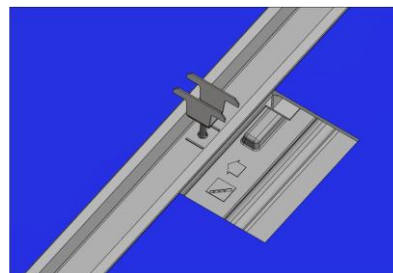
CAUTION: WHEN SETTING UP THE CABLES, TAKE CARE NOT TO CREATE ANY INDUCTION LOOPS, IN ACCORDANCE WITH UTE C15-712 GUIDES.

- To **connect the PV modules to each other or to the microinverters** installed in one of the central windows of a Portrait frame, be sure to pass the cables under the frames via the clips in the central windows.



3.8.2 Fixing the clamps

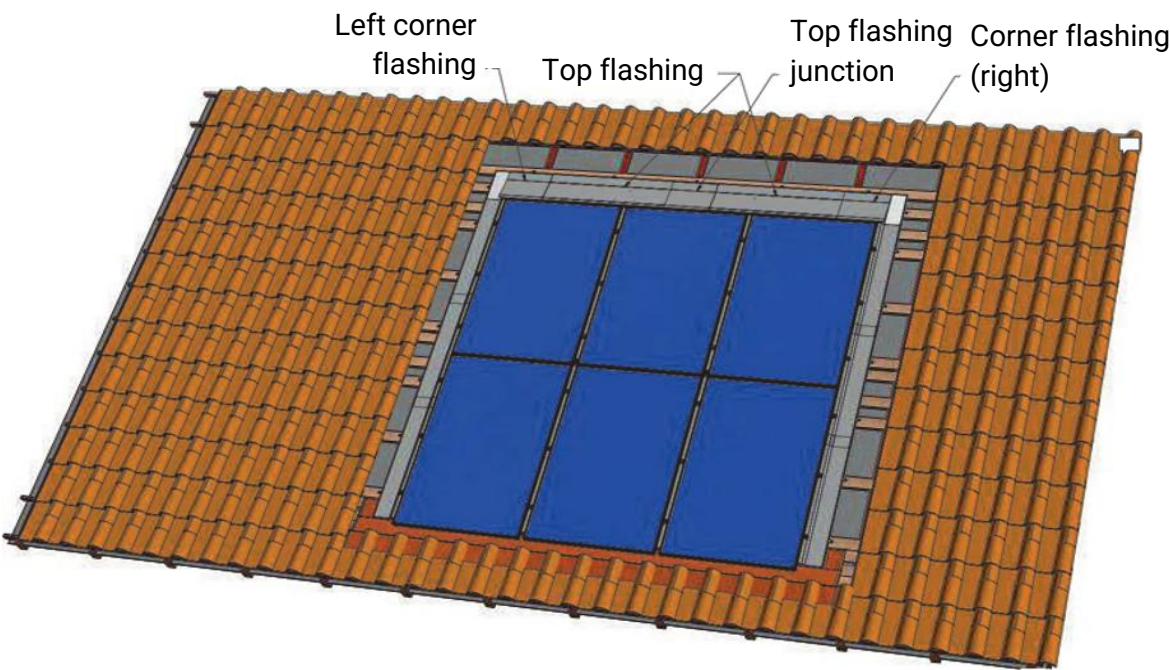
- 3 Fix the PV modules by screwing the clamps into the pre-drilled holes (with watertight GSE screws).



DO NOT USE AN IMPACT SCREWDRIVER TO FASTEN THE CLAMPS. IT IS IMPERATIVE TO USE A NORMAL SCREWDRIVER TO ENSURE THAT THE CLAMPS STAY IN PLACE OVER TIME.

3.9 Installation of the top PV field connection

3.9.1) OPTION 1 - Top flashings installation



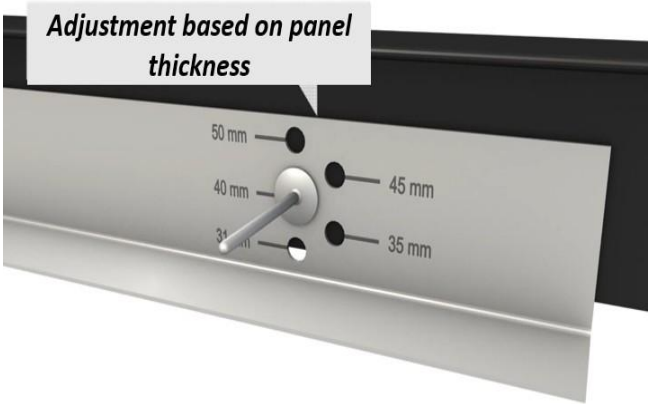
WARNING: THE TOP FLASHING PIECE IS DESIGNED WITH A SLOPE OF 14° TO ALLOW WATER FLOW ABOVE THE UPPER ROW OF MODULES. IT IS THEREFORE, ESSENTIAL FOR THE INSTALLER TO ENSURE THAT THE ROOF SLOPE IS SUFFICIENT TO PREVENT WATER RETENTION ACCORDING TO THE REGULATION.

IN BORDERLINE CASES, WE RECOMMEND THAT YOU EITHER USE A THICKER SUPPORT LATH TO DECREASE THE COUNTER-SLOPE OR TO REPLACE THE TOP FLASHINGS WITH A FLEXIBLE FLASHING STRIP (SEE PAGE 34).

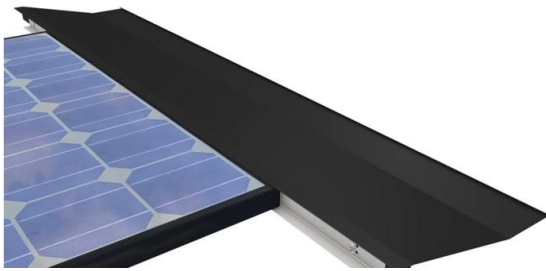
- 1
- Join the top flashings and the attach angle using pop rivets, taking care that you adjust the module frame thickness.



Pop riveting



- 2 Position the assembly so that the module frame thickness fits in between the attach angle and the top flashing.

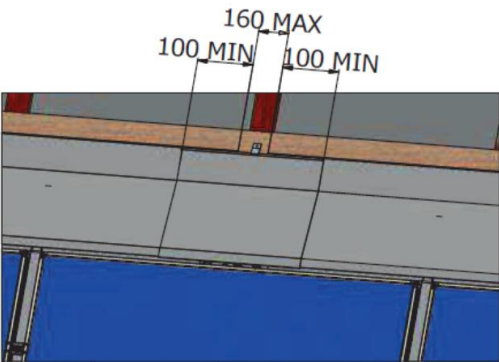
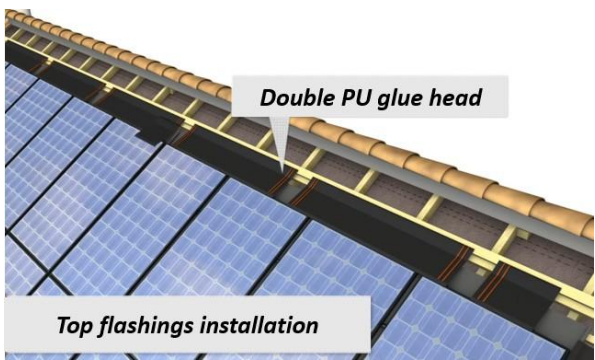


Make cuts on the attach angle at the position of the GSE panel corrugations.

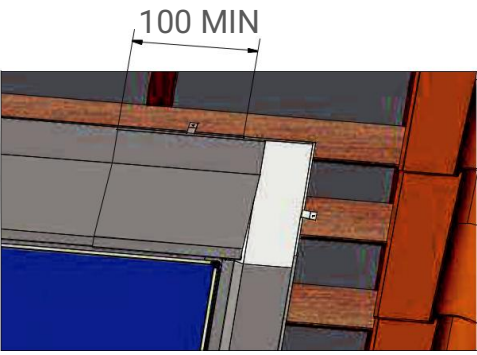
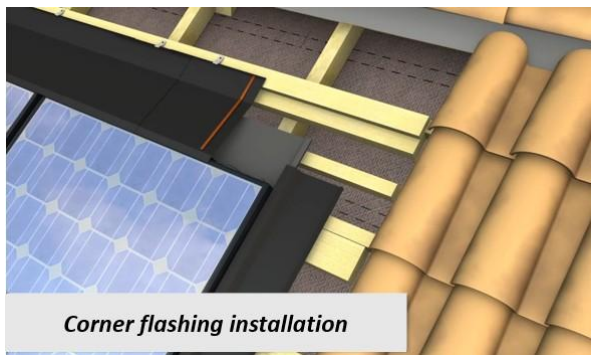


Cut on the attach angle

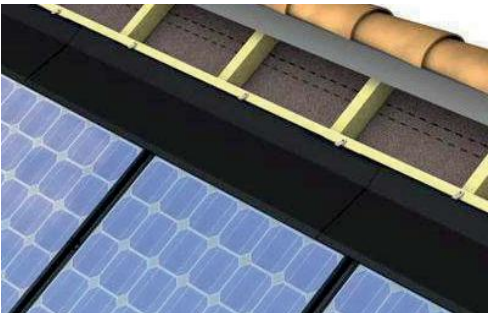
- 3 Place the top junction flashing, having applied beforehand two PU glue joints on the covered top flashing area. The connecting piece must overlap with the top flashing with at least 100 mm. The gap between the top flashings should not exceed 160 mm.



- 4 In the same way, place the corner flashings, having applied beforehand a PU glue joint on the overlapping zone of the top flashing. (Overlapping at least 100mm)



- 5 Fix all flashings to the battens using flashing hooks (at least 2 per piece).





SPECIFIC CASE: if a gap is observed between the module and the corner flashing, cut it in order to adapt it to the thickness of the module.

Module thickness	30-34 mm	35-39mm	40 and +
Frames 2012	Incompatible*	Needed cut	No cut needed
Frames 2020	Needed cut	No cut needed	Incompatible*
Half-frames 2022	Needed cut	No cut needed	Incompatible*

* Laying of a waterproofing strip on top of the PV field

GSE frames - PORTRAIT																			
	Frames v.2012							Frames v.2020											
Height Ref	1580	1575	1575	1575	1640	1640	1686	1710	1710	1710	1710	1710	1710	1710	1710	1710	1710	1710	
Width Ref	808	1046	1053	1082	992	1001	1016	995	1000	1005	1010	1020	1025	1030	1040	1045	1050	1055	

Half-Frames GSE In-Roof v.2022 - PORTRAIT																					
Height Ref	1650	1650	1650	1650	1650	1650	1650	1840	1840	1840	1840	1840	1840	1840	1840	1840	1840	2030	2030	2030	2030
Width Ref	995	1070	1100	1135	1140	1145	1160	995	1020	1030	1040	1045	1050	1070	1090	1100	1135	995	1050	1055	1135

Follow the 4 steps below to cut the corner flashings

1

2

3

4

Cut the corner flashing in two distinct pieces

Once the height adjusted, drill the overlapped pieces with a 4,5mm drill bit

Assemble the pieces with a rivet

Once the adjustment of both corner flashings is done, install them as described in steps 4 & 5, page 38.

3.9.2) OPTION 2 – Top sealing strip & Tile support installation

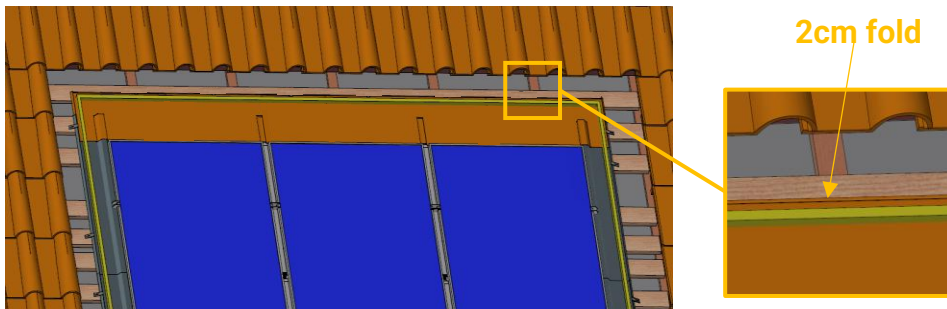
3.9.2.1 Top waterproofing strip installation

It is possible to use a flexible waterproofing strip of minimum 300mm width to connect the PV field to the roof at the top.

To do this, make sure to fold the strip at the top and sides over a distance of 2cm, to prevent any water rising up.

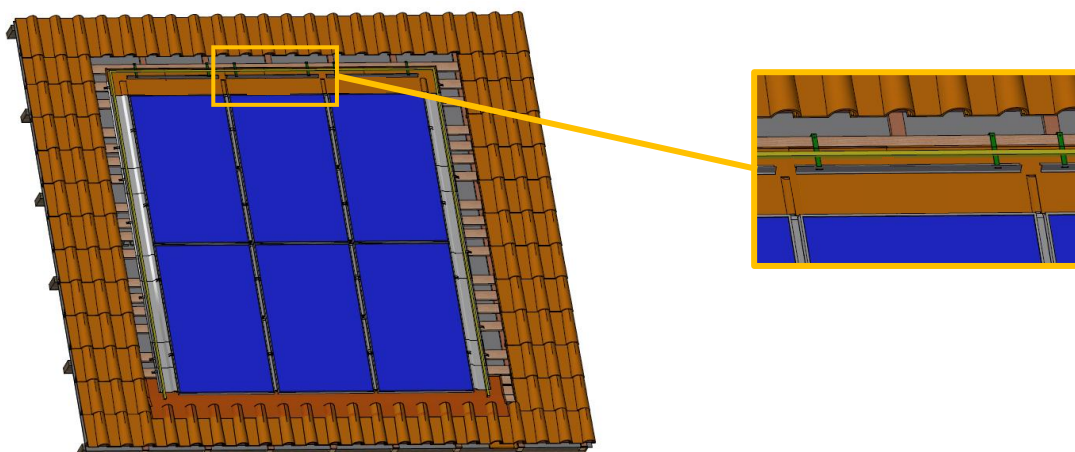
Remove the plastic film from the small butyl strip and stick it to the top battens. Remove the plastic film from the wide butyl strip and stick it to the frames. Smooth the waterproofing strip on the battens and the frames.

Make sure to have a minimum overlap of 10cm under the tiles.



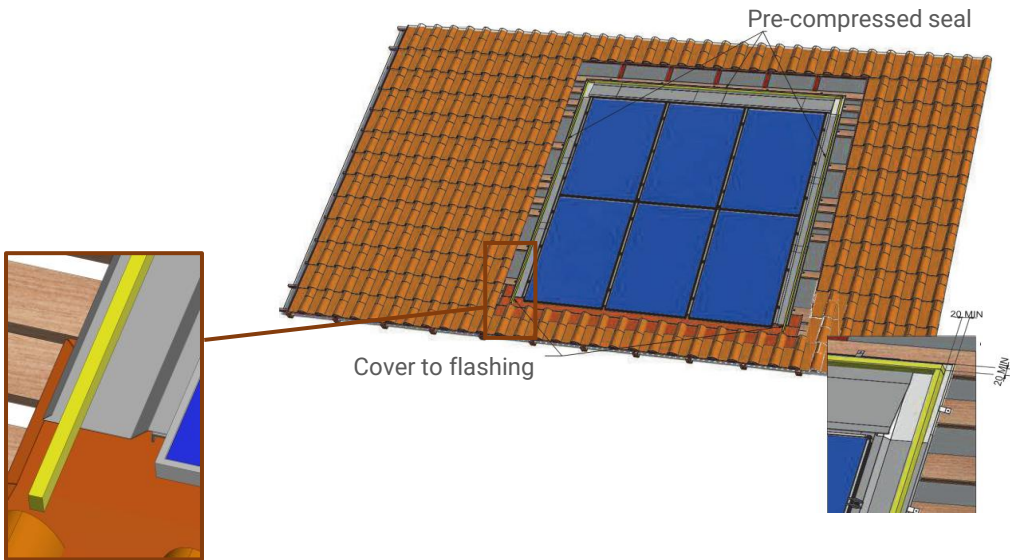
3.9.2.2 Tile support installation

For all tile installations (except slate) on a waterproofing strip, you can add a tile support to prevent the tiles from sagging on the strip. To do this, slide 2 long fixing hooks into the triangular supports and fix them with nails and/or screws to the top batten used to support the top connection.



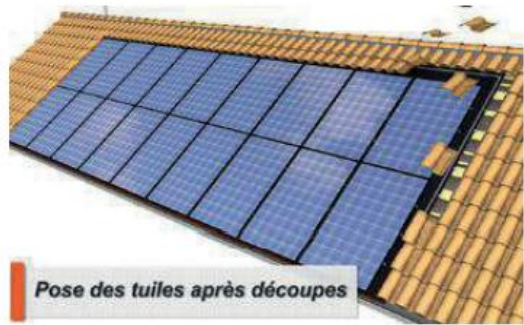
3.10 Connection to the roof covering

- 1
- Place the precompressed seal on the flashings all around the PV array on the lateral and upper flashings.



The seal must reach the bottom of the flexible flashing strip to prevent any potential infiltration of water or solid particles.

- 2
- Reposition the lateral and upper sections of the roofing elements to make a continuous and watertight connection with the roof.



It may be necessary to cut the tiles to ensure a compliant overlap between the elements, according to roofing regulation. These elements must be attached mechanically, as described in the roofing regulation.



Tiles cut for left-hand side connection

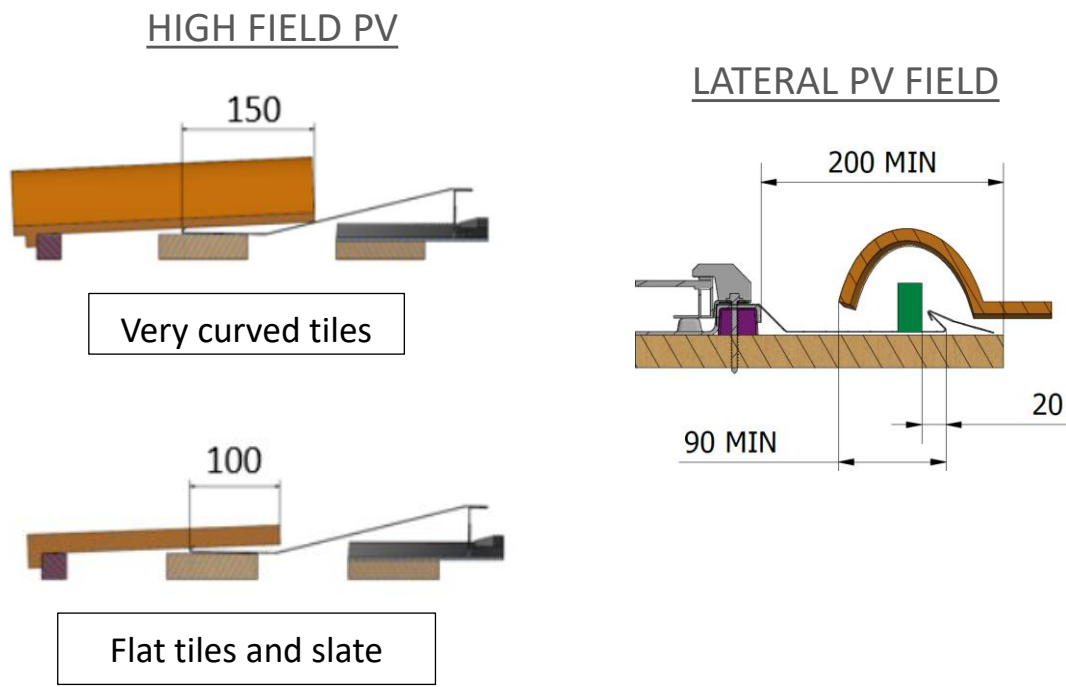


Tiles cut for top connetion



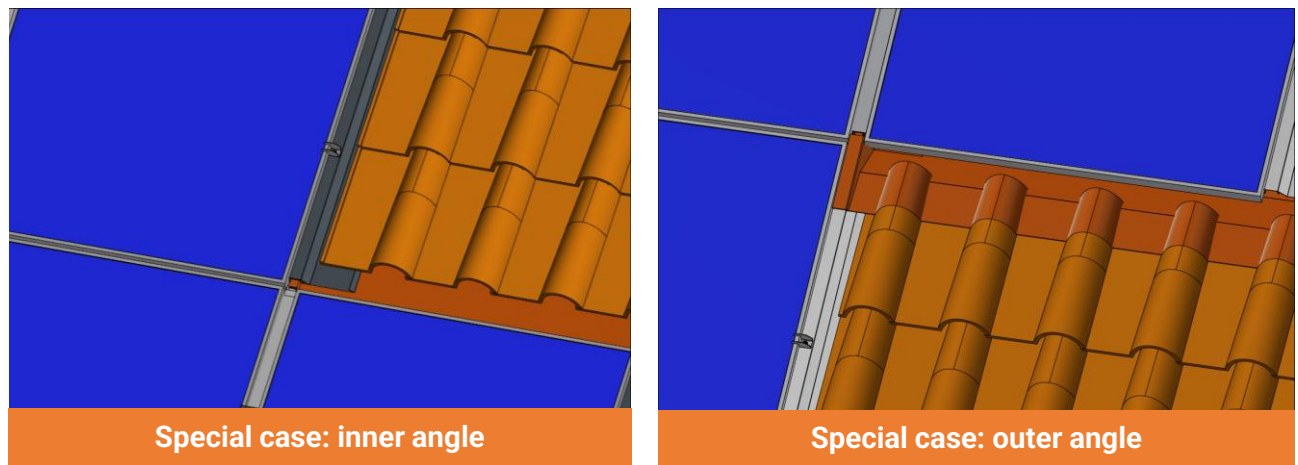
Double tiles or half tiles can be used for the side connection.

The roof tiles must rest on the flashings with enough overlap to meet the requirements of the roofing regulation.



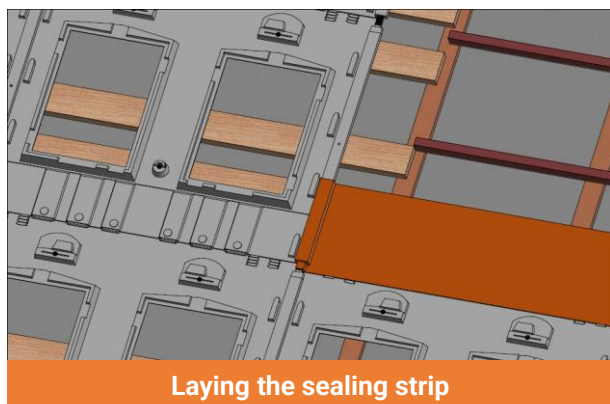
3.11 Specific case: PV array inner/outer angles

In the case of non-rectangular PV array, inner and outer angles must be connected to the roofing using a flexible flashing strip compliant with the building/roofing regulation.

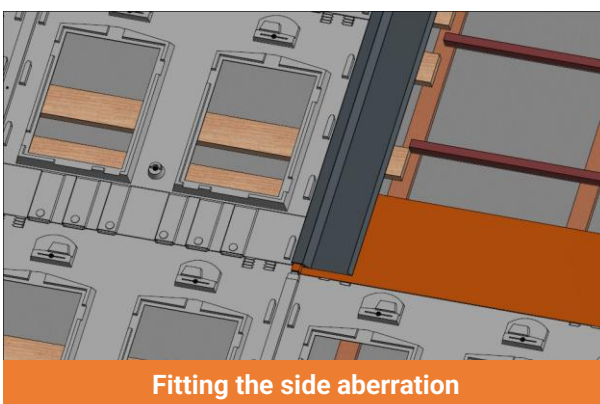


3.11.1 Inner angle ("L" shape)

Place the flashing strip by covering the lower-row frames up to the corrugation of the adjacent frame, then cover the strip with the lateral flashing.



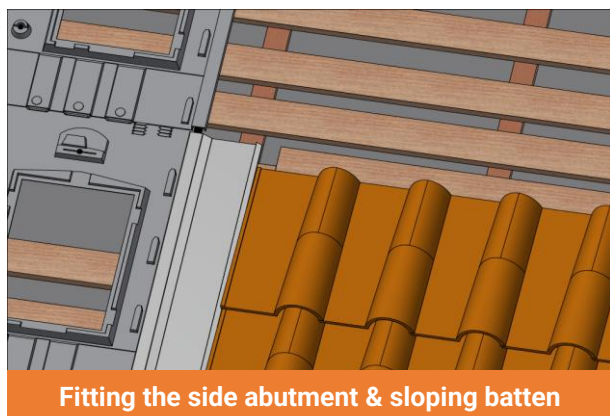
Laying the sealing strip



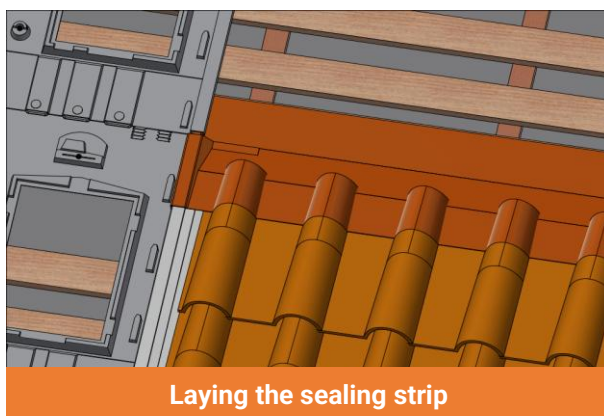
Fitting the side aberration

3.11.2 Outer angle ("T" shape)

Place the lateral flashing on the lower-row panel. Reposition the adjacent tiles to cover the lateral flashing, then place the flashing strip so that it overlaps with the last row of tiles, ensuring that there is a 2-cm fold in the upper section.

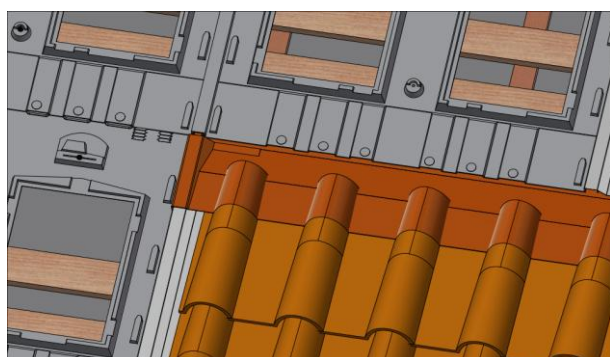


Fitting the side abutment & sloping batten



Laying the sealing strip

Place the half-frame on the sealing strip, following the installation instructions on page 31.



ATTENTION: Make sure you have the right spacing between the bottom of the plate and the tiles to allow the PV module to protrude.

Be sure to comply with the covering rules in the relevant DTU roofing standard and the recommendations in paragraph 3.2.2 of this document.

4. Maintenance and servicing

4.1 Verification



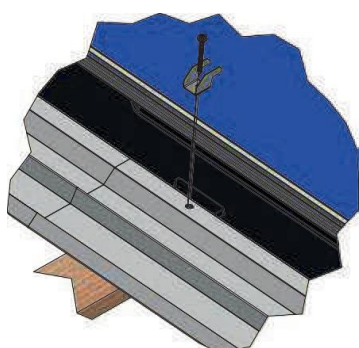
It is important to check once a year whether leaves and/or other foreign materials have got under the photovoltaic array or between the panels. You can use a compressed air blower to remove any items that have got under the photovoltaic array. Do not use solvents to clean the polypropylene frames.



For prevention, we also recommend that overall PV system installed is checked occasionally.

4.2 Module replacement

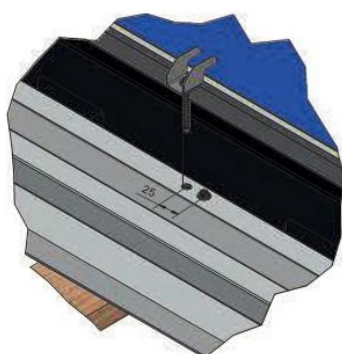
Disconnect the PV array from the AC box and proceed as follows:



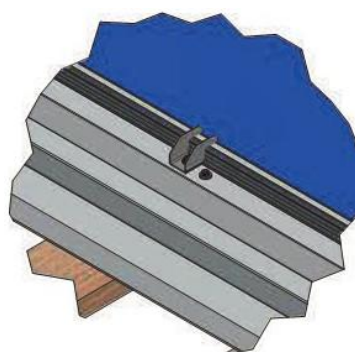
1. Unscrew the fixing clamp, remove the module and remove the edge wedges.



2. Screw one GSE screw at the location of old hole, having placed beforehand a new polypropylene edge wedges under the corrugation if it is located on an array edge.



3. Make a new 10 mm hole, 25 mm above the old position.



4. Place the module and attach the new assemblies (fixing clamp + EPDM foam + GSE screw).

5. Support and Contact

5.1 Training sessions

The GSE Integration team offers technical training sessions on the product with practical application on a demonstration model on your request and subject to the presence of a sufficient number of participants.

For further information, please contact your sales manager or distributor.



5.2 Technical assistance

TECHNICAL ASSISTANCE IS AVAILABLE
MONDAY TO FRIDAY
FROM 9H30 TO 18H

GSE
Intégration

5 rue Morand
93400 SAINT OUEN (France)
E-Mail: contact@gseintegration.com

6. Certifications and guarantees

6.1 Technical assessments

ETN n°A27T2021000B0

ALPES
CONTRÔLES

Technical Notice n°21-16/57 - "[Solar Roof](#)" product

CC
FAT
AVIS

MCS 012 - KIWA00041



6.2 Fire tests

BRoof T1



Broof T2



Broof T3



Broof T4



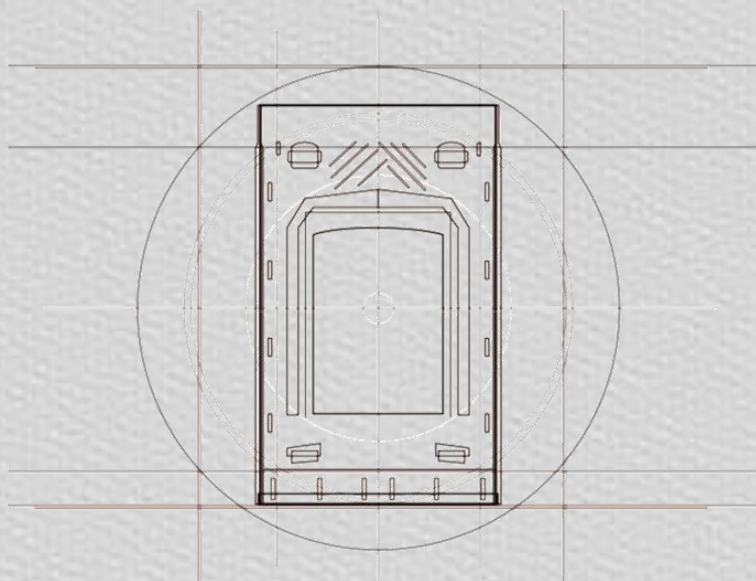
warringtonfire

6.3 Guarantees

Our systems are guaranteed for 10 years if they are installed in accordance with this manual and our certifications. Please refer to our General Terms and Conditions for more details, available on the Connector tool - 'document' section.

GSE

Intégration



GSE **IN-ROOF SYSTEM**™

*Photovoltaic panel mounting system
integrated into the roof*

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Your distributor: