

VENTILATED FACADE SYSTEM

OCTOBER / 2016

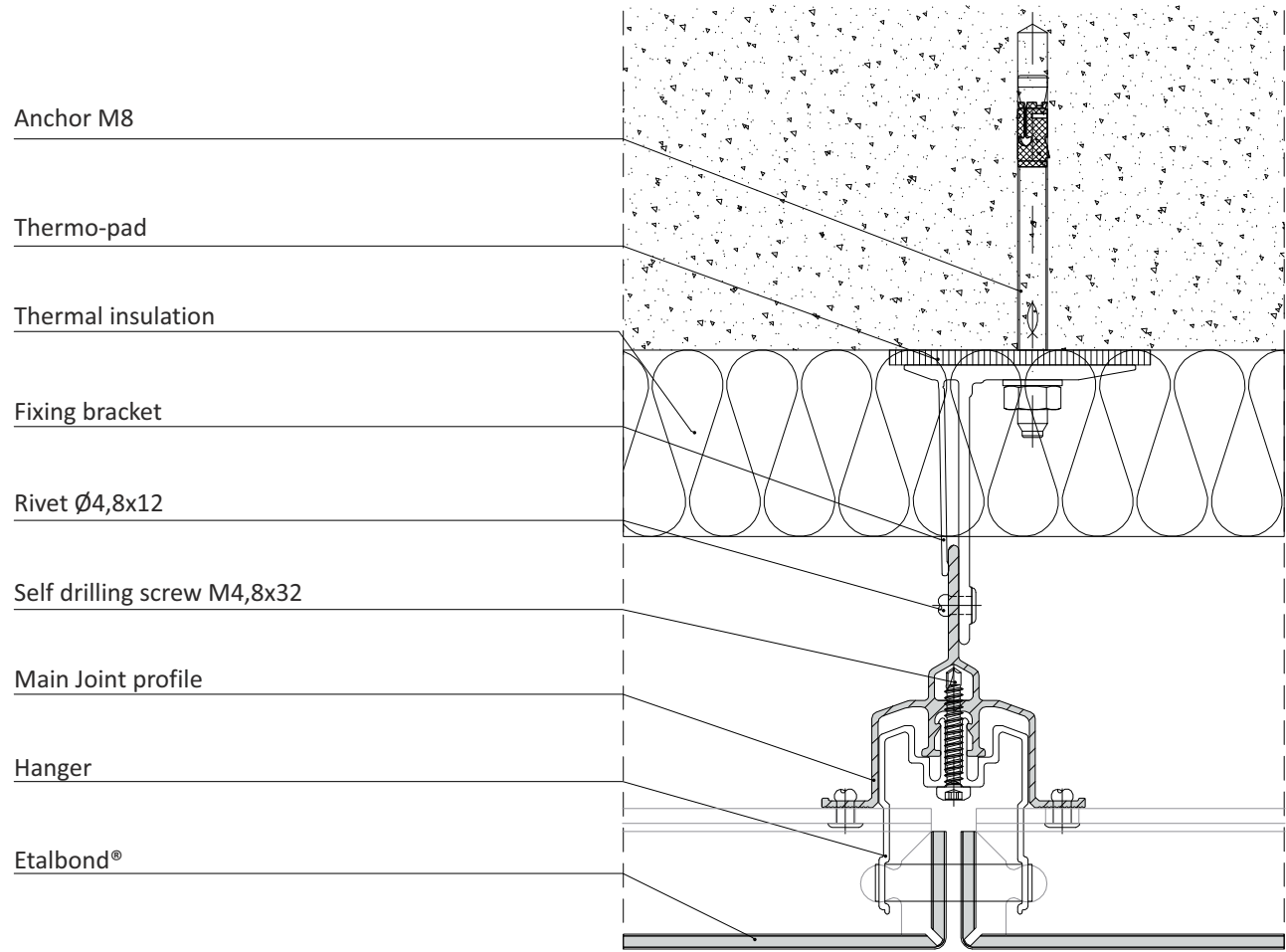
BRAVO

INSTALLATION GUIDE

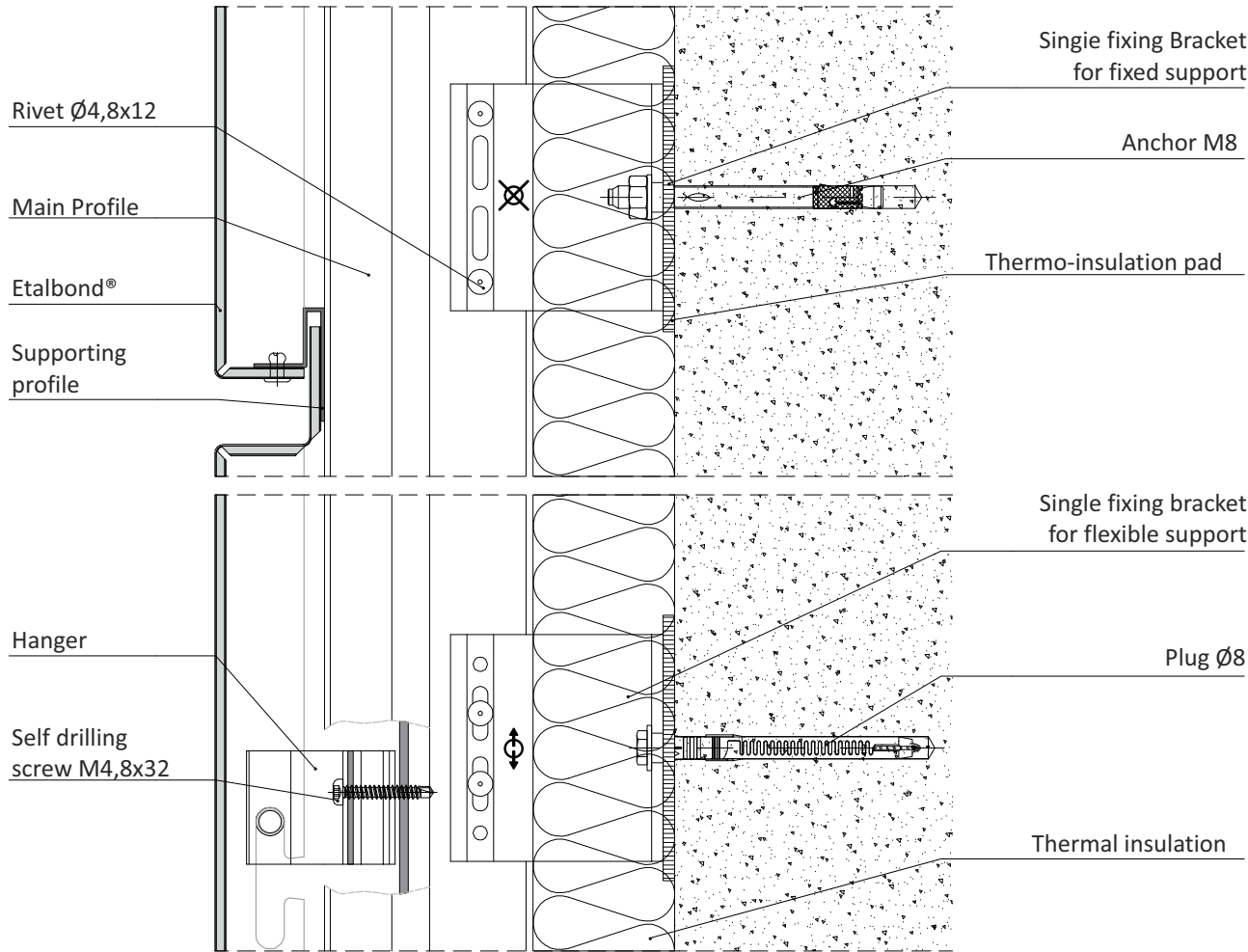
CONTENT

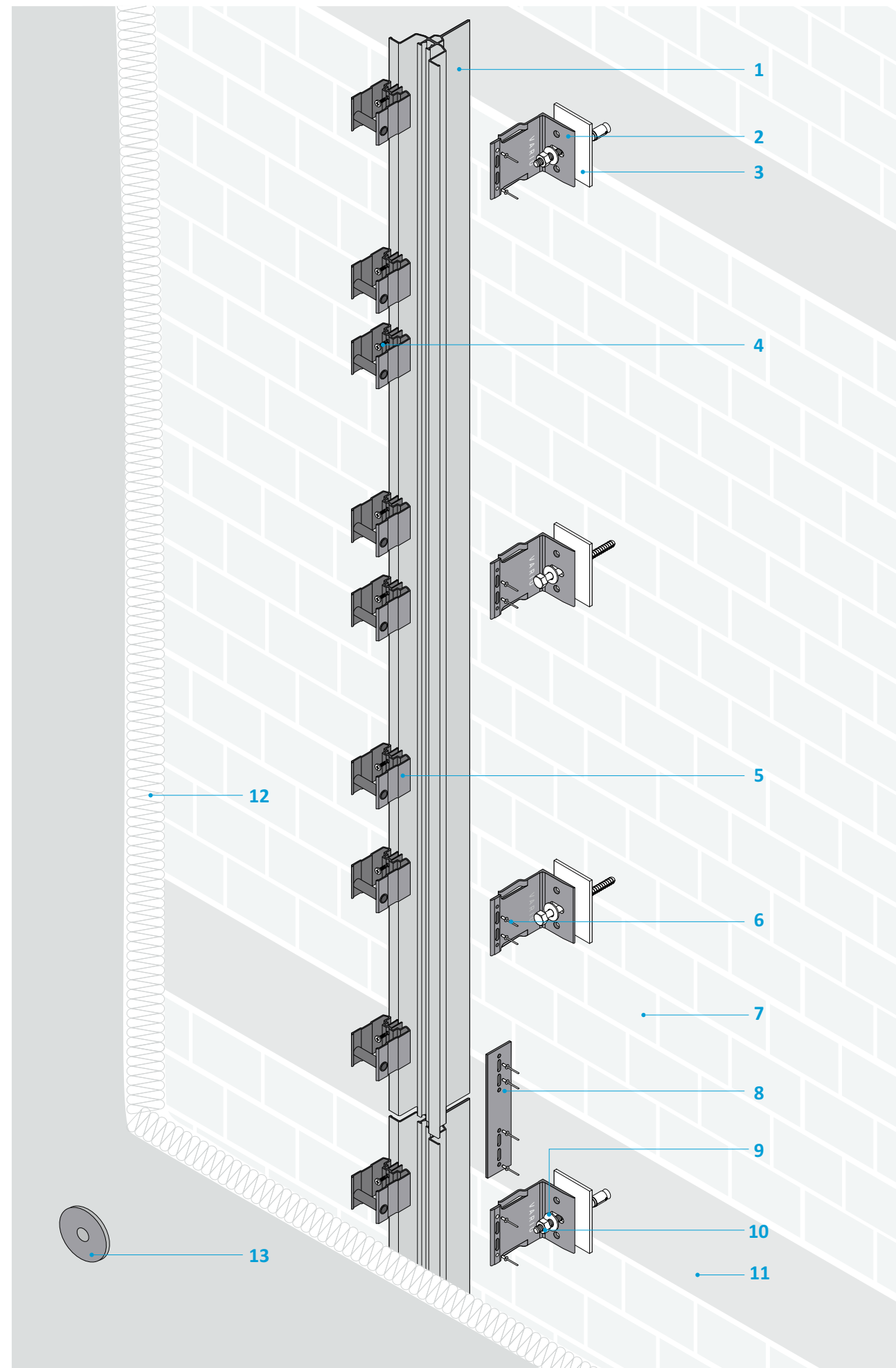
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SYSTEM BRAVO HORIZONTAL SECTION



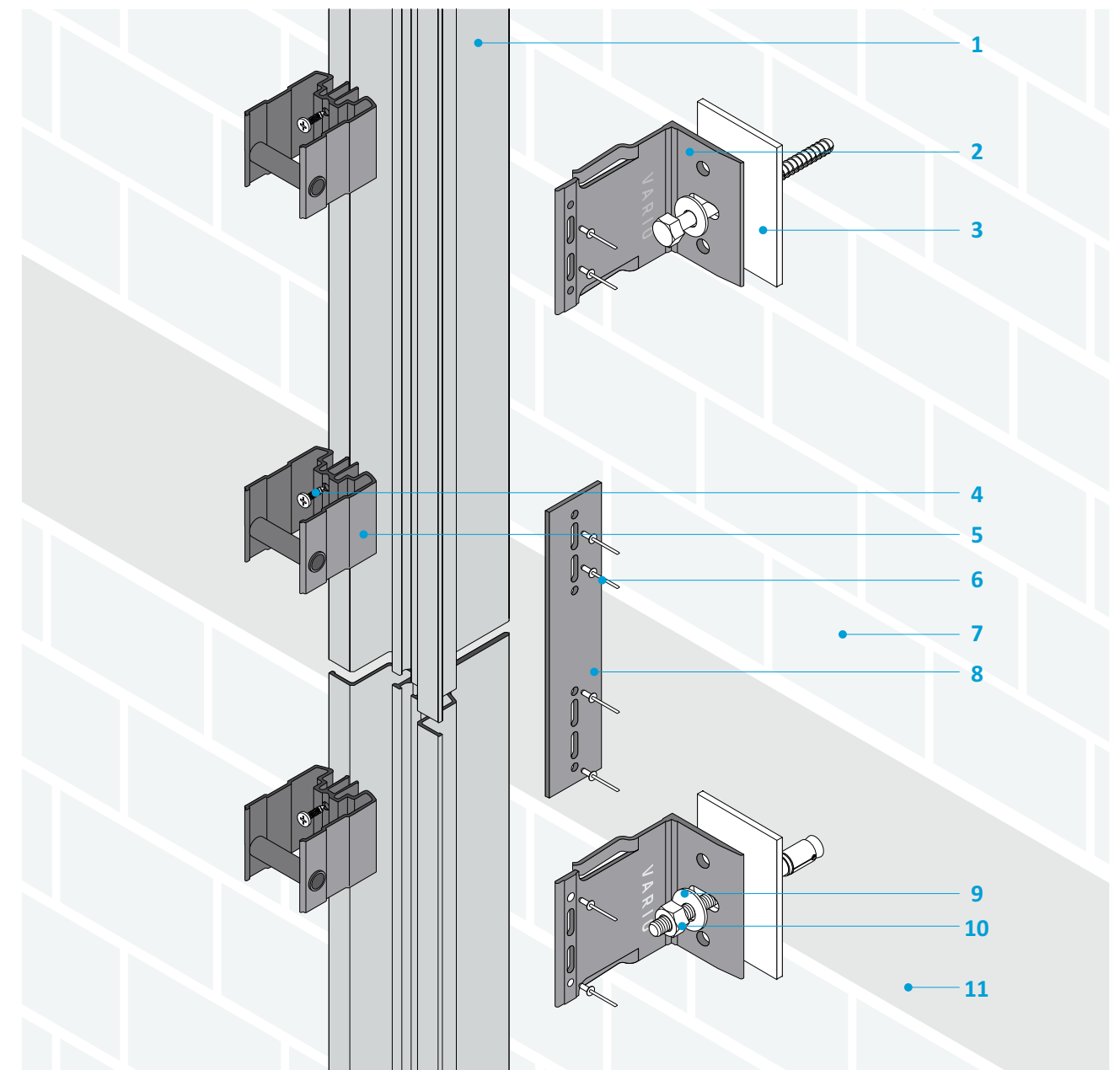
SYSTEM BRAVO VERTICAL SECTION





MAIN COMPONENTS AND ISTALLATION PLAN OF THE MAIN CONSTRUCTION

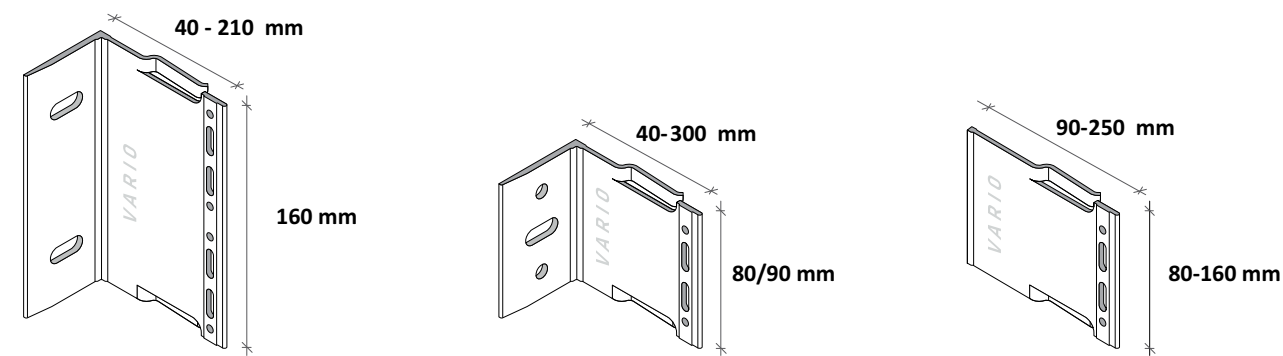
1. Main support profile
2. Wall brackets
3. Thermo-insulating pads
4. Self-drilling screw M4,8x32
5. Hanger
6. Rivet Ø4,8x12
7. Construction base - masonry / aerated concete
8. Joint profile
9. Washer
10. Anchor / Dubel M8
11. Substructure base - reinforced concrete
12. Thermo-insulating mineral wool
13. Plywood for mineral wool securing



SYSTEM PROFILES AND ACCESSORIES

The system is supplied with a full set of end profiles and accessories allowing for unique details execution, different finishes and transition to other facade materials.

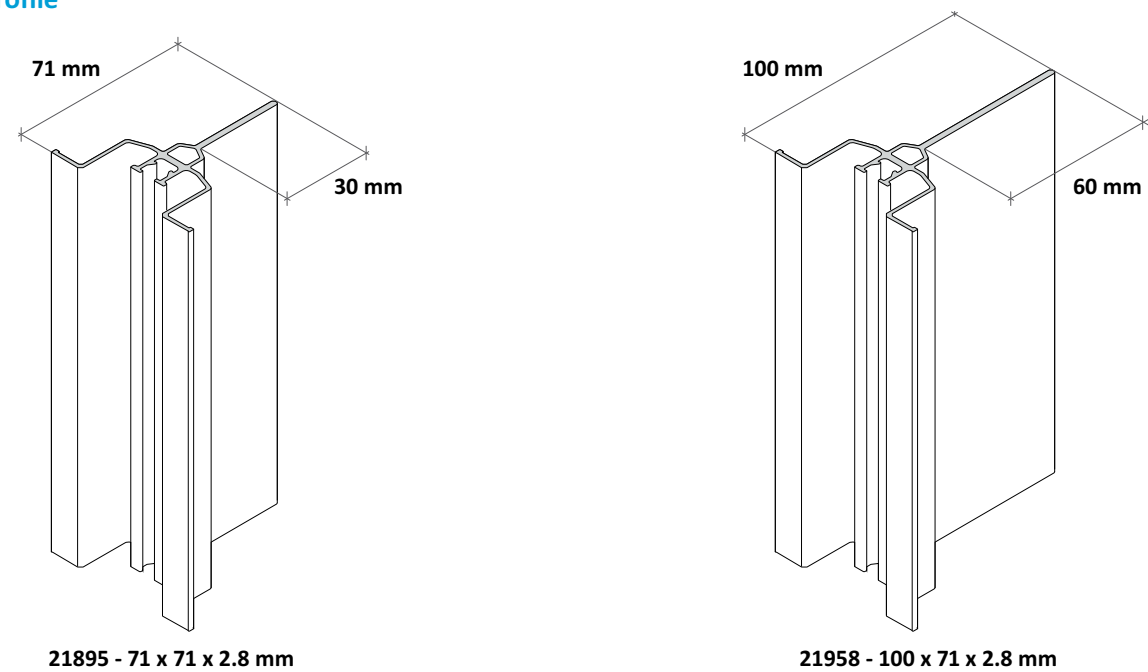
Fixing bracket



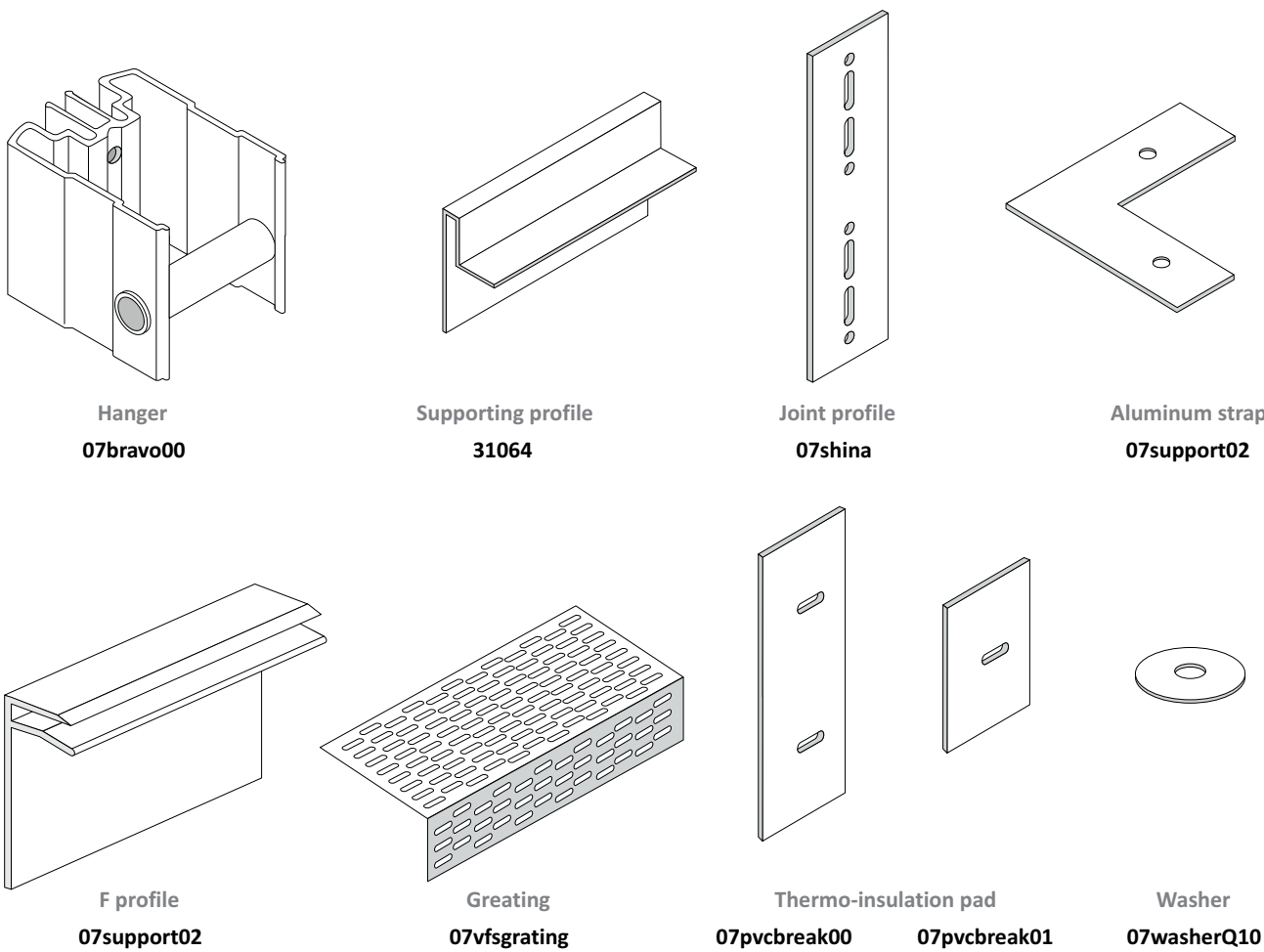
	Dimensions
07 vario Q72	40 mm
07 vario Q52	50 mm
07 vario Q82	75 mm
07 vario Q102	100 mm
07 vario Q172	125 mm
07 vario Q152	150 mm
07 vario Q182	180 mm
07 vario Q212	210 mm

Code	Dimensions
07 vario Q7	40 mm
07 vario Q5	50 mm
07 vario Q8	75 mm
07 vario Q10	100 mm
07 vario Q17	125 mm
07 vario Q15	150 mm
07 vario Q18	180 mm
07 vario Q21	210 mm

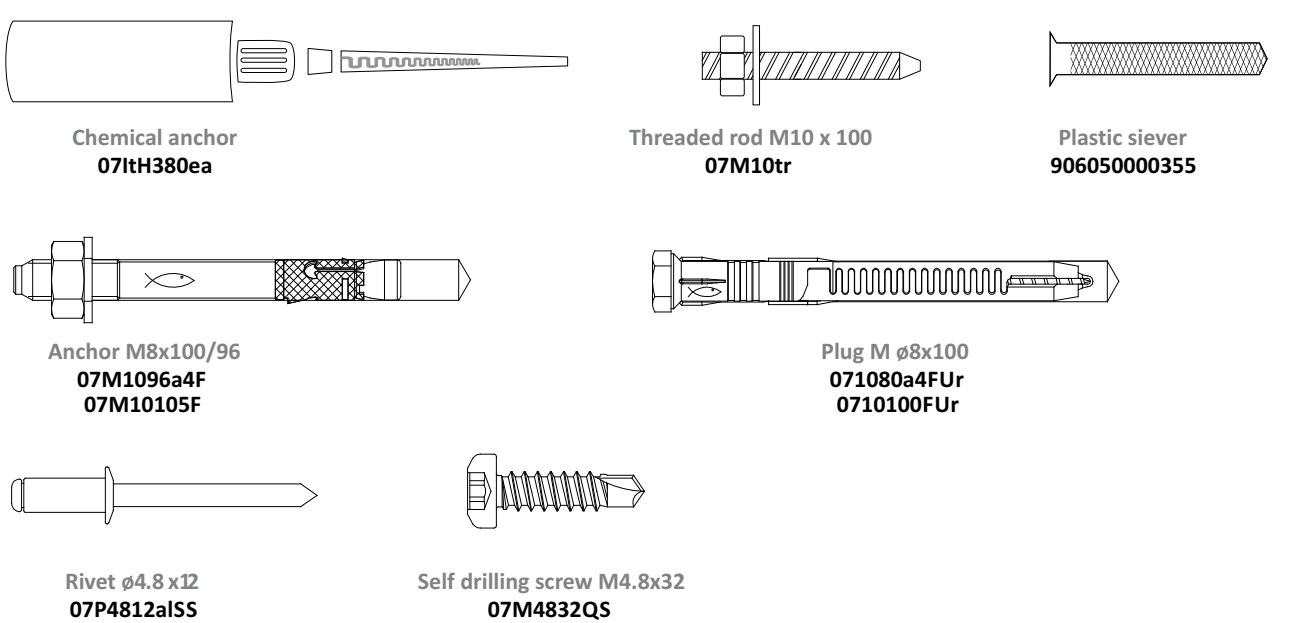
Main profile



Accessories



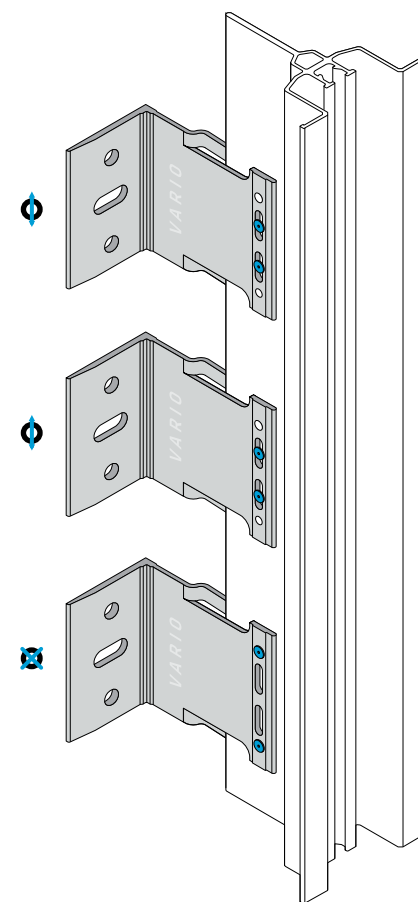
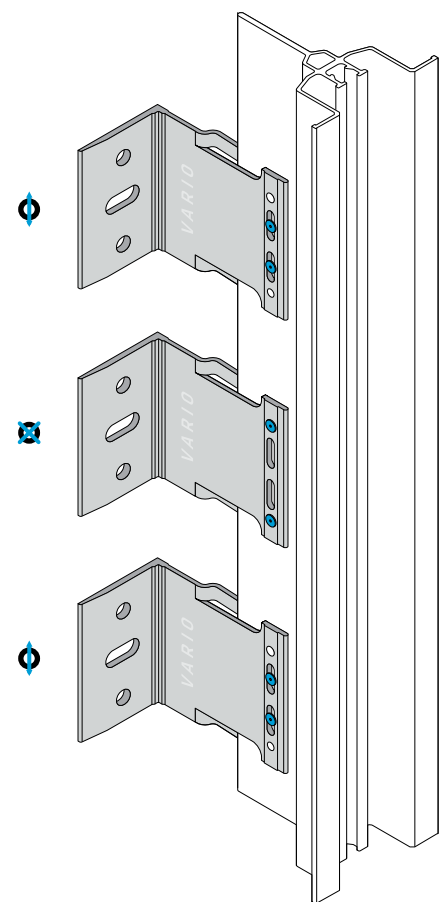
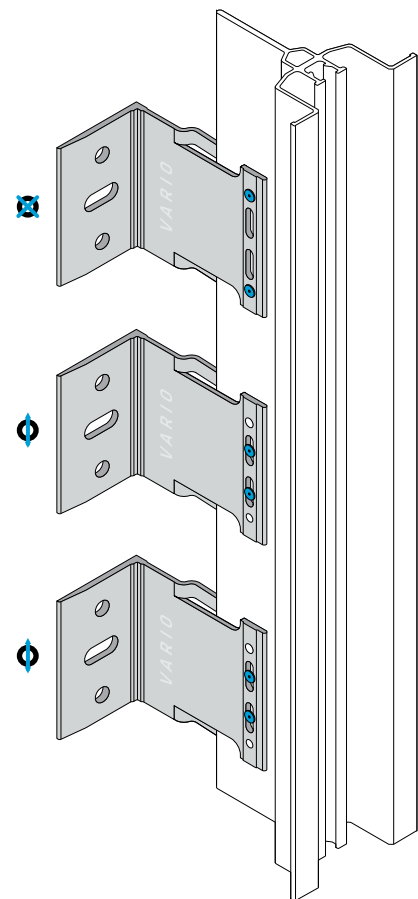
Fastening elements



STATIC SELECTION DIAGRAM

Static diagram selection is based on the results of the static analysis and the preferred variant for fixed support is mounted to the main supporting vertical profile (in the upper end, in the middle or in the bottom end).

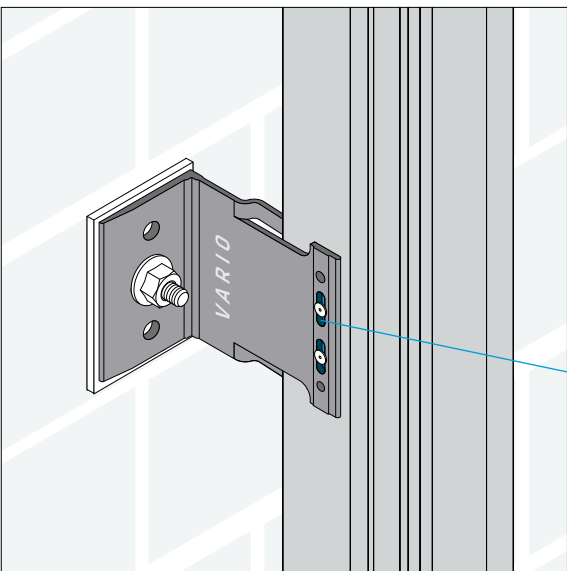
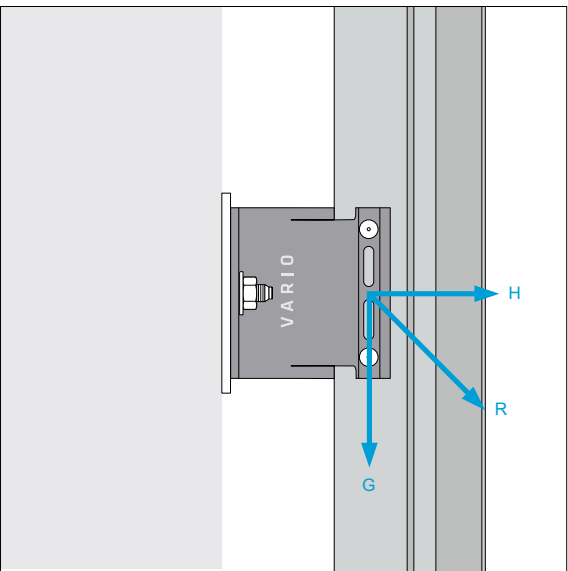
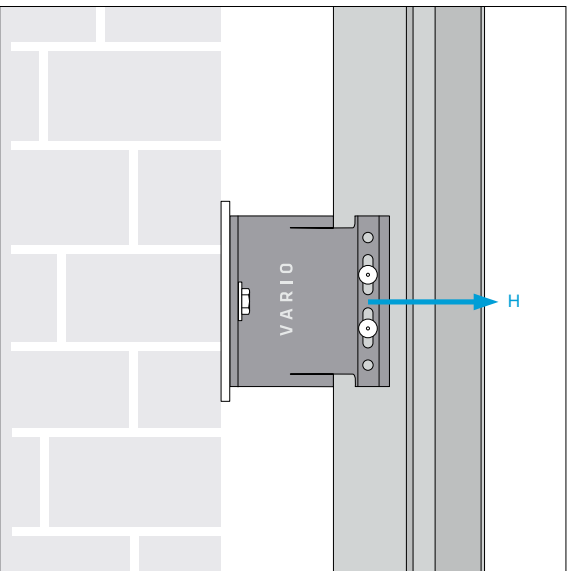
Each main supporting profile is mounted to one fixed and / or several flexible supporting points. As a result of the aluminum thermal expansion, it is recommended that the main supporting profile has a length of about one floor height. The length of the main supporting profile is precisely determined depending on the building location and the respective daily temperature amplitude.



Options for mounting the fixed and flexible supports in the space between floors.

A fixed support bears the load of the own weight for the loaded panel and a part of the wind load. There is only one fixed support for every single profile. It is obligatory this support to be fixed in a solid base-reinforced concrete or metal (steel or aluminum). When installing a wall bracket as a fixed support at the reinforced concrete base the distance from the edge of the concrete floor to the anchor axis should not be less than 120mm.

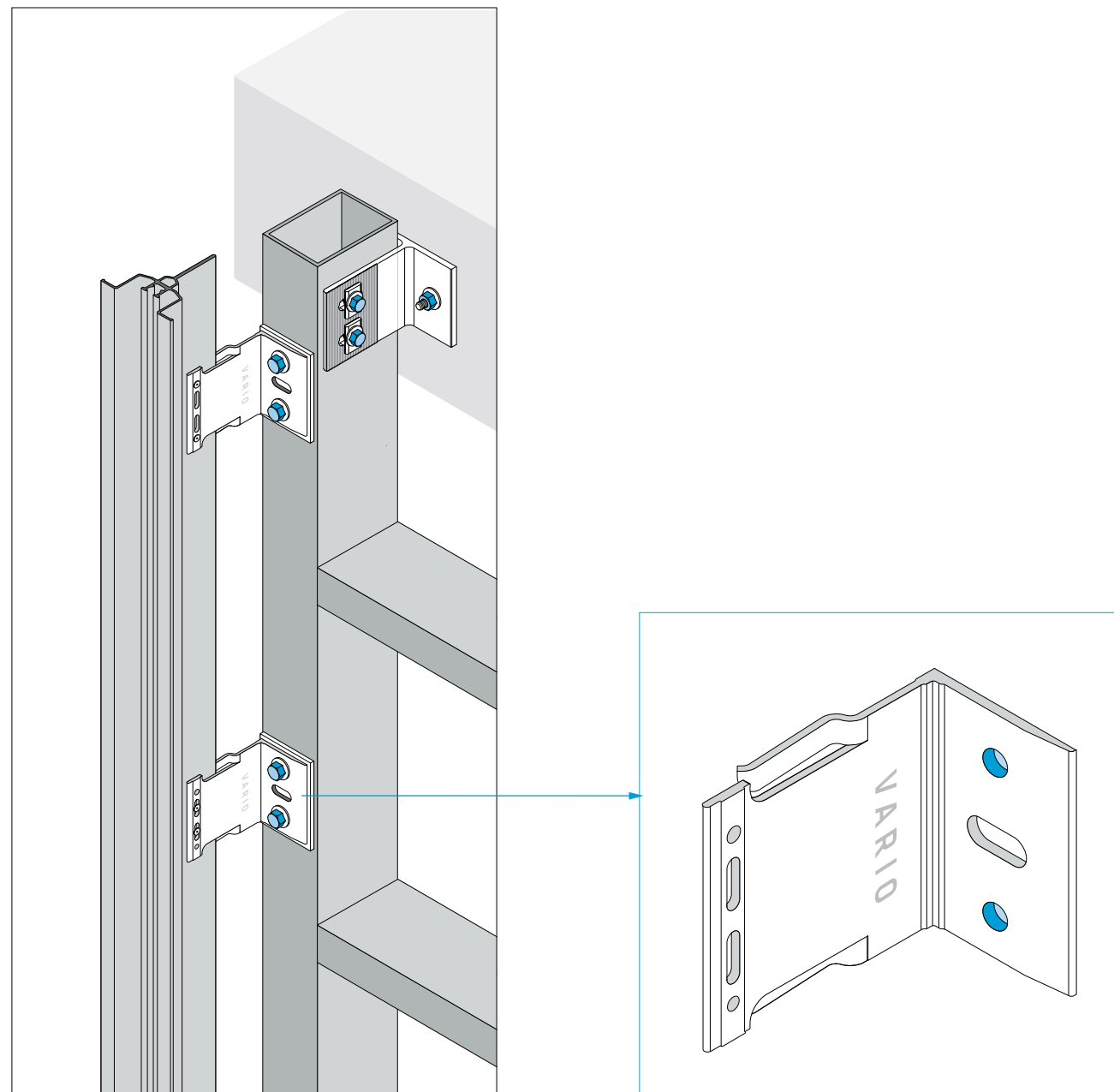
The flexible support bears the wind pressure. It is not obligatory to assemble the mounting Wall brackets to reinforced concrete or metal base. Selection of anchoring element depends on the type and quality of the construction base. Plugs and chemical anchors are most commonly used. The wind suction load is twice as high in the zone, which requires the mounting brackets to be positioned at distances twice shorter at the corner zones.



The oval shaped holes of the VARIO wall brackets are designed to compensate for thermal expansions of the main supporting profile.

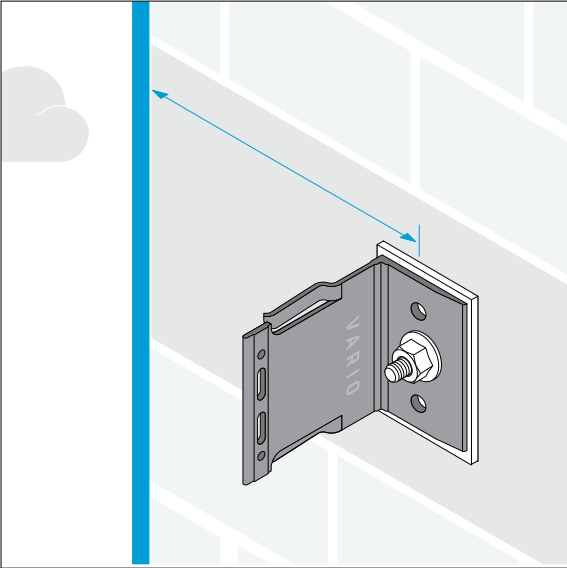
MOUNTING OF A WALL BRACKET TO A METAL CONSTRUCTION

The circular holes on the fixing bracket are used when mounting it to the metal sub-structure (grid). The fixing is realized through a bolt connection. If the metal grid is not an aluminum one, then an additional treatment of the contact zone between the profile and the bracket is required so that the effect of bimetal corrosion is eliminated.

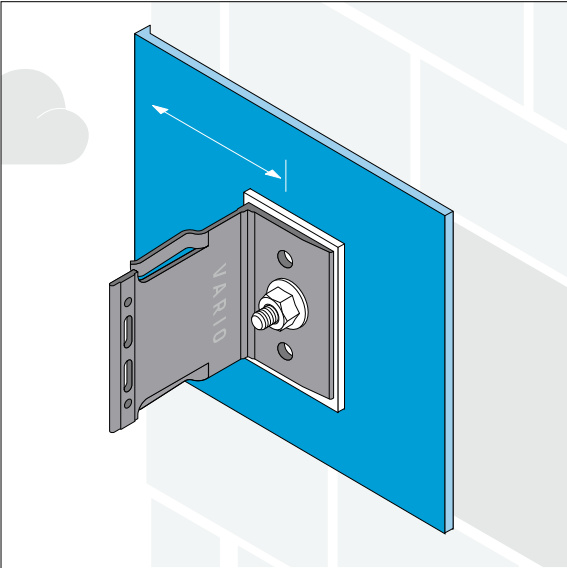


BRAVO

WALL BRACKET INSTALLATION - FIXED SUPPORT

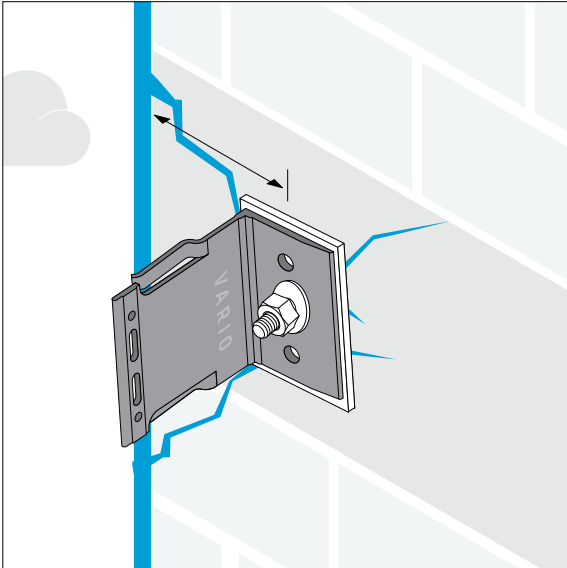


Correct

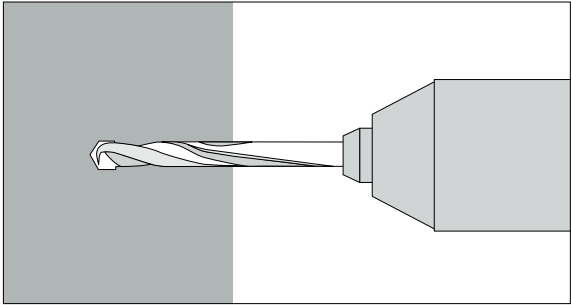


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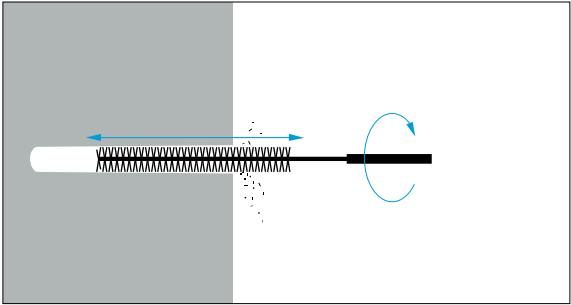
The fixed support bears the load induced by the weight of the panels mounted on it and a part of the wind load. It is mandatory that this support is fixed to a solid base - reinforced concrete or metal (steel or aluminum). When installing a wall bracket as a fixed support directly on reinforced concrete base, the distance from the edge of the concrete floor to the anchor axis should be no less than 120mm, if aluminum sheet is used for covering the area around the bracket.



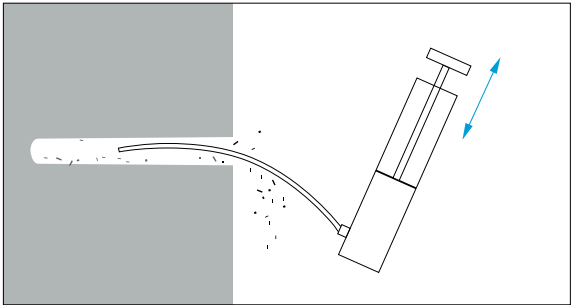
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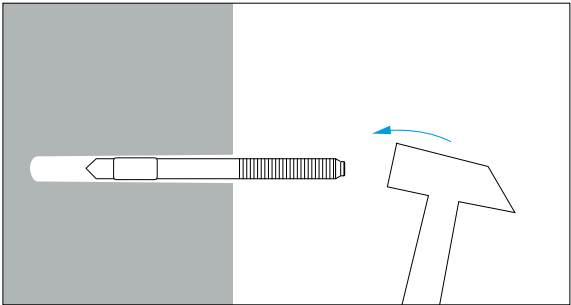
1 Drill a hole with a size as per installation instructions.



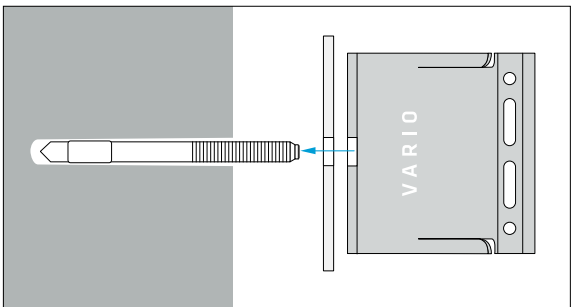
2 Clean up the hole by the use of a brush.



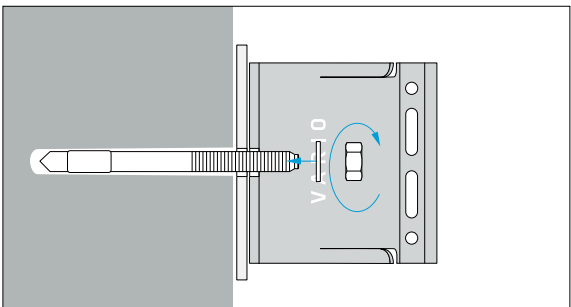
3 ...or by compressed air.



4 Hammer in the anchor.

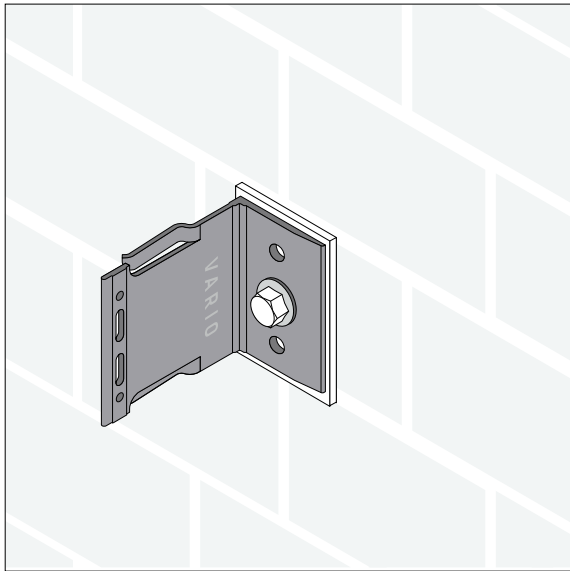


5 Place the bracket.

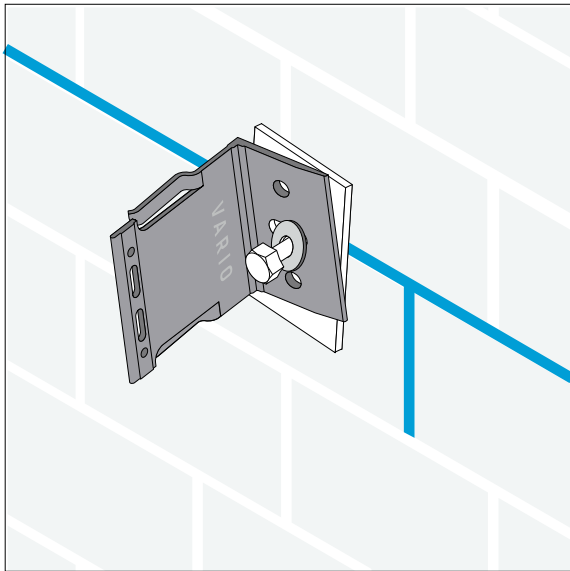


6 Place the reinforcing washer and fix the bracket.

WALL BRACKET INSTALLATION - FLEXIBLE SUPPORT

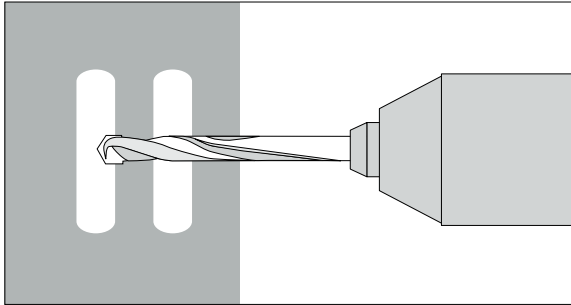


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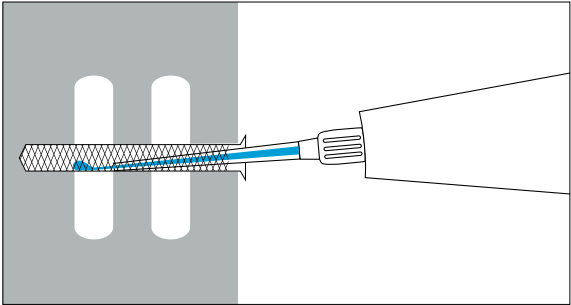


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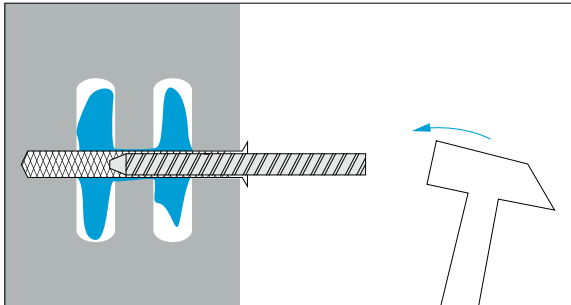
The fixed support bears the wind pressure. Wall brackets are mounted on a steady brick or aerated concrete wall. The project design inspects the construction base and recommends the appropriate anchoring elements. The wind load is twice as high in the corner zone of the building than on the inner zone, which requires the mounting brackets to be positioned at twice shorter distances at the corner zones.



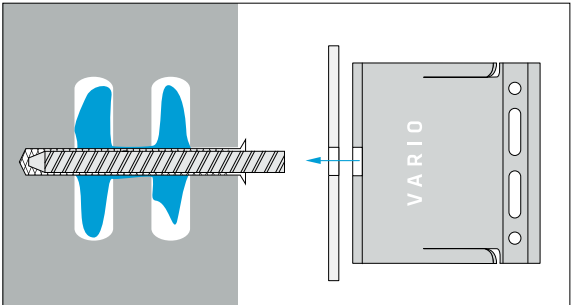
1 Drill a hole with a size as per installation instructions



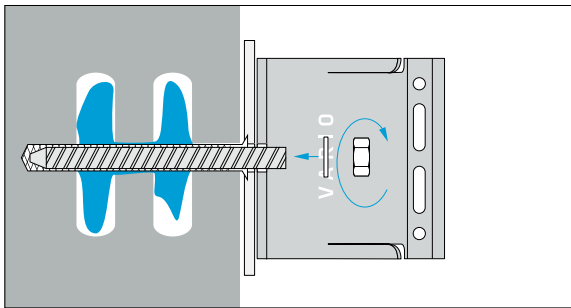
2 Pour the chemical product into the hole it should fill 2/3 of the volume



3 Hammer in the anchor.



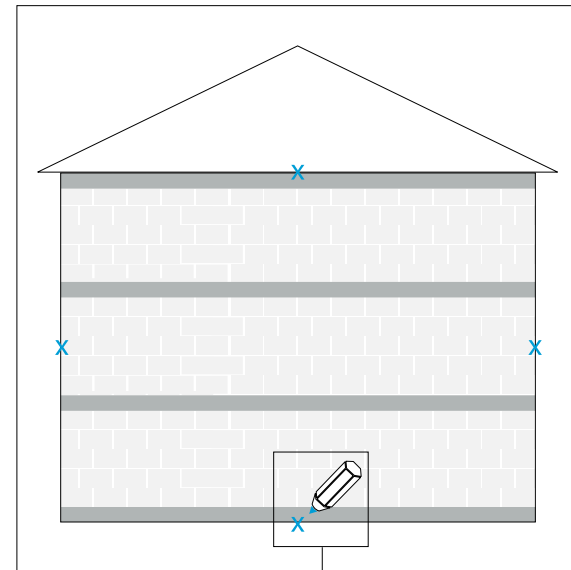
4 Place the bracket



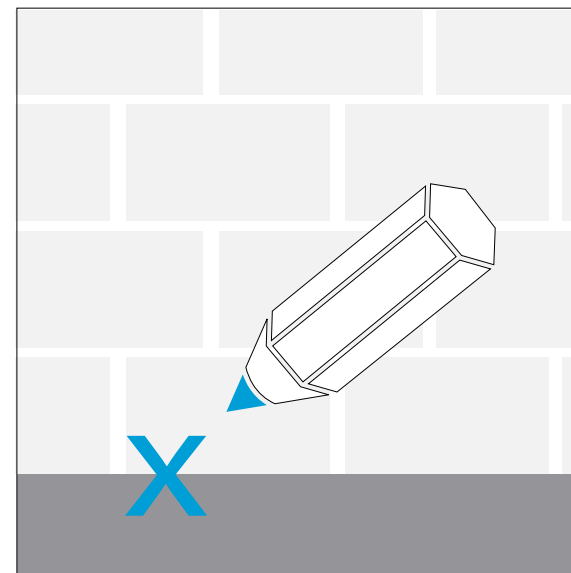
5 Place the reinforcing washer and fix the bracket

Assembly methods and basic guidelines for construction

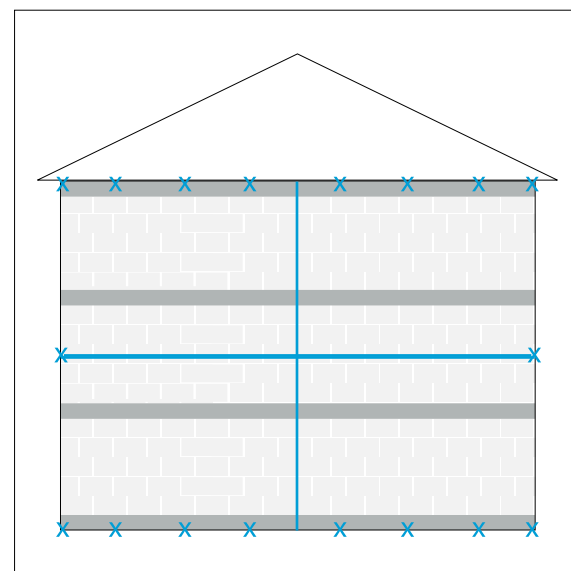
1 Reference point are marked on the wall by means of a laser level. Their purpose is to help in outline a coordinate system - horizontal and vertical base lines.



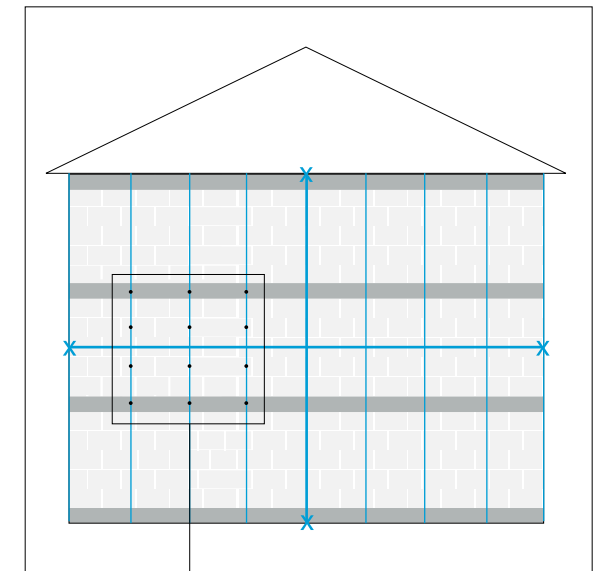
2 The benchmarks are put onto the wall



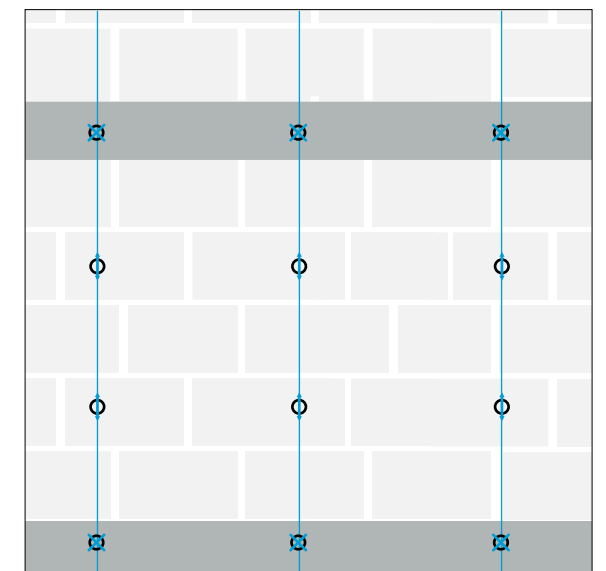
3 The central horizontal and vertical axis of the frame of reference are marked on the facade by means of a coloured thread. The horizontal and vertical lines are passing throughout the entire facade and are used for determining the position of the wall brackets and the distances between the supporting profiles. The position of the main supporting profiles (depending on the facade grid) are marked using a measuring device (tape-measure).



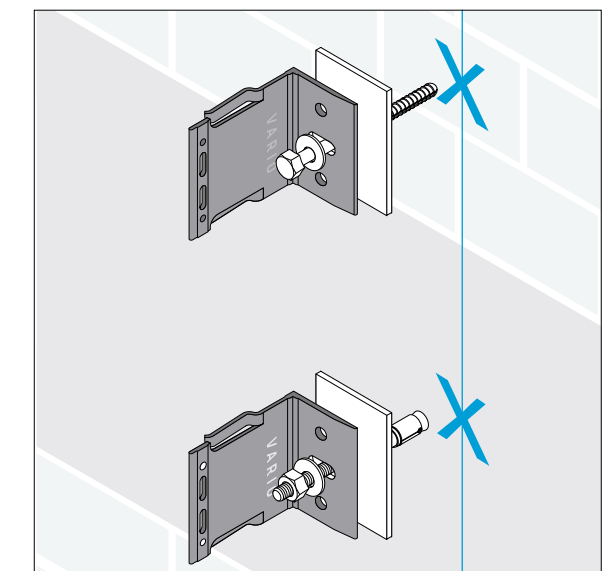
4 The exact position of the main supporting profiles is marked by a coloured thread.



5 The position of the flexible and fixed points (depending on the selected static diagram) are marked.

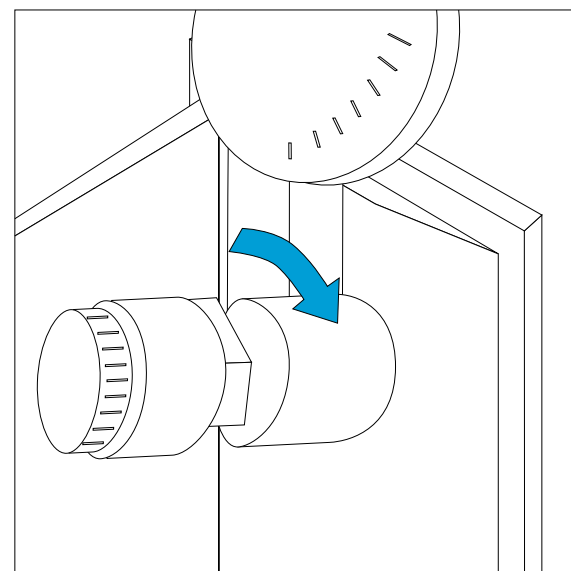


6 All wall brackets are mounted (if the building height and shape as well as the scaffolding allows).



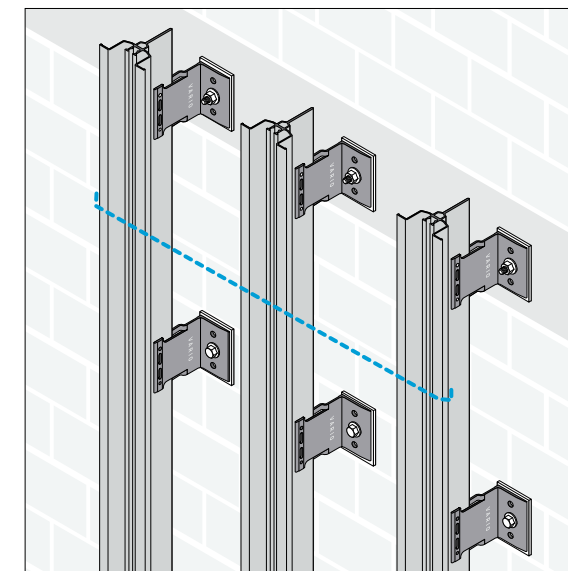
7

The final fastening of the elements should be performed by use of a torque wrench while controlling tension. The tightening force is indicated by the manufacturer of the fastening elements. The tension force for anchors of type Sormat M10 x 100mm is 30Nm (3kg). The maximum value of the tension torque for plugs of type Fischer FUR SXR in concrete is 11 Nm. For the different types of masonry it is not recommended to apply tension torque but only 'tightening the screw to open the plug'



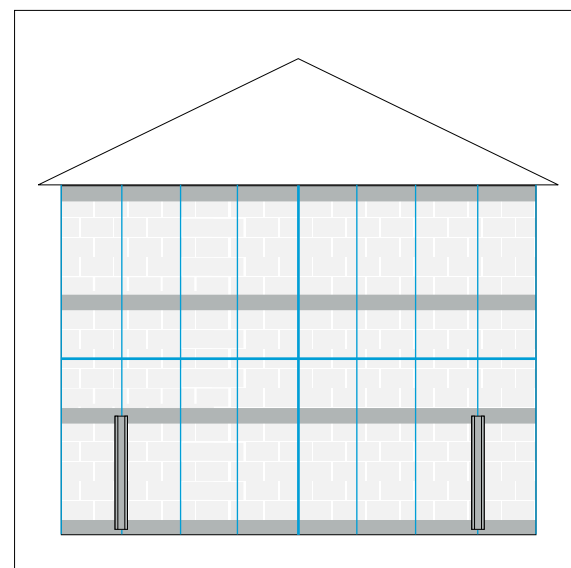
10

The inner supporting profiles are mounted and leveled against the cord.



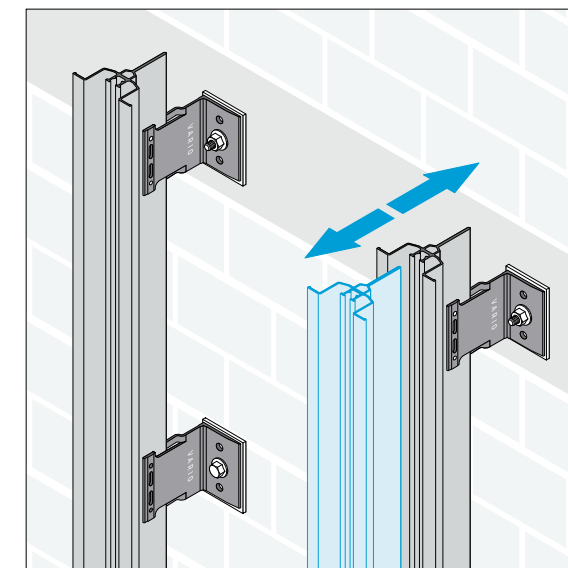
8

The vertical supporting profiles are mounted in both ends of the facade and are leveled using the horizontal axis of the frame of reference. They are aligned in the vertical direction and fastened with brackets by means of a level or laser.



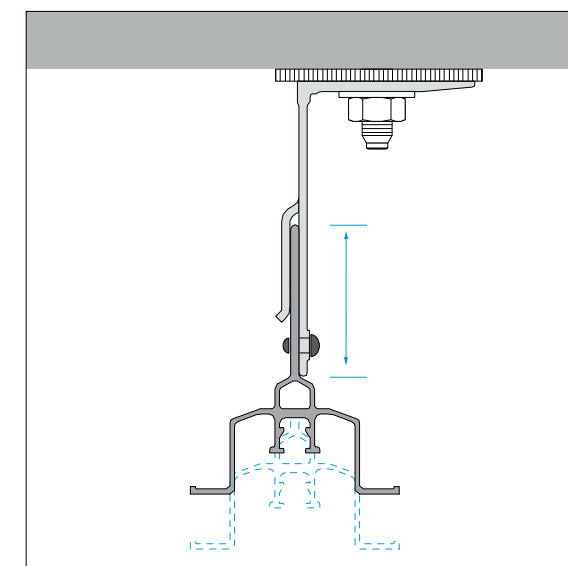
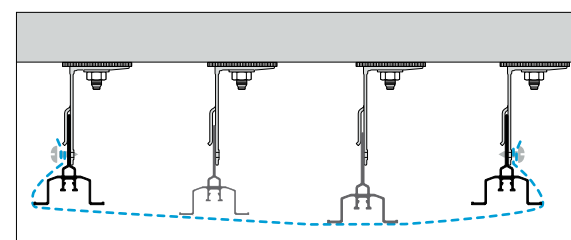
11

The tabs on both ends of the wall bracket allow for easy mounting of the mullion profiles. Depending on the bracket size the mullions can be adjusted from between 11mm to 40mm.



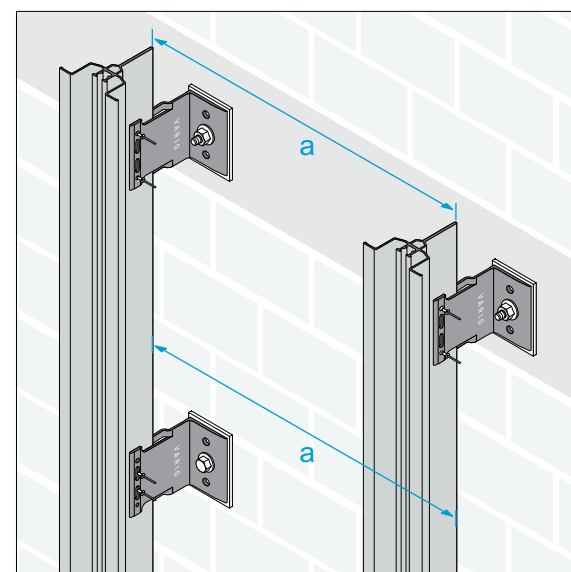
9

A screw is tightened on the leveled side and then a cord is tied across the horizontal plane to level the other mullions.



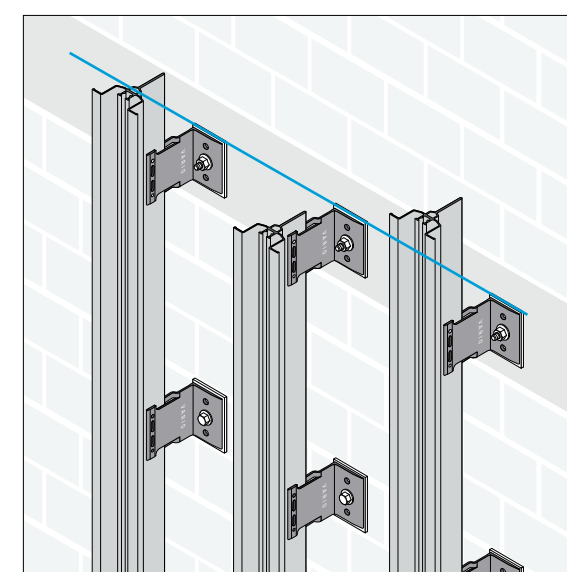
12

It should be verified that the center-line distance between vertical mullion profiles is the same at the top and bottom.



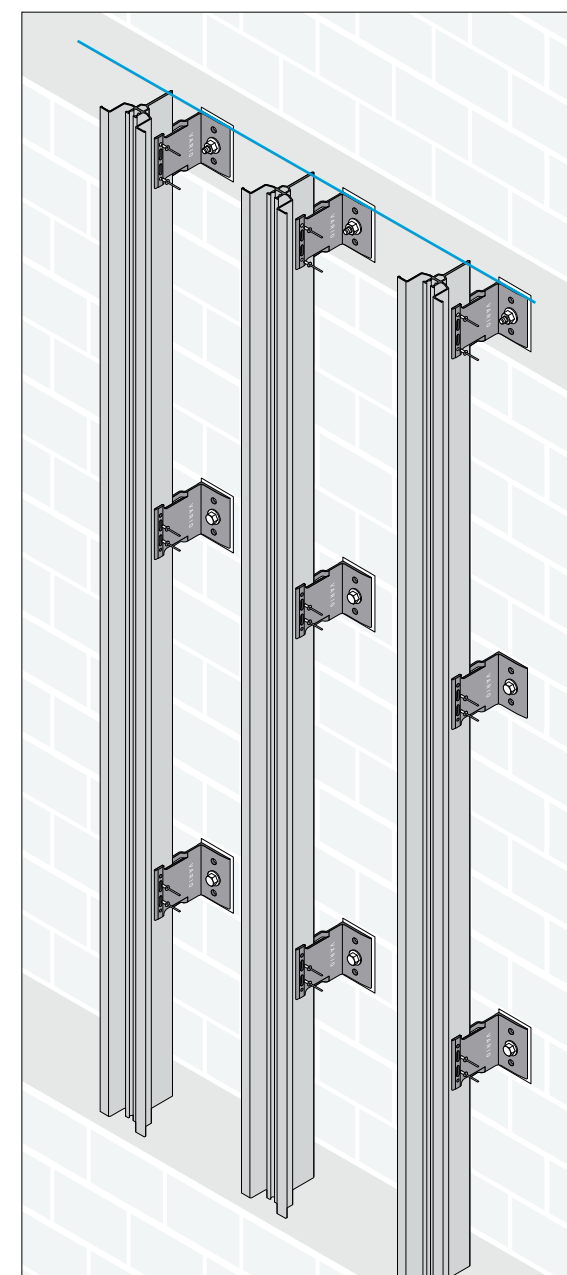
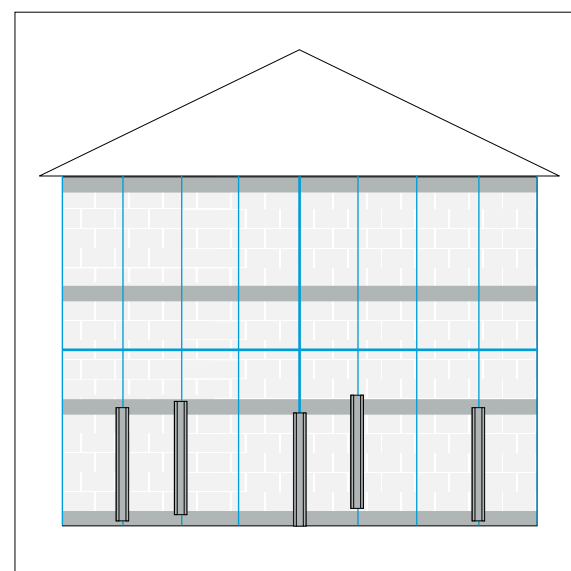
14

After the profiles are aligned horizontally and vertically, they are temporarily fastened with screws. Afterwards the rivet holes are drilled for permanent fastening. Note: The screws used for temporary fixing should be removed after riveting in order to allow for the expansion and contraction movement of the vertical mullions.



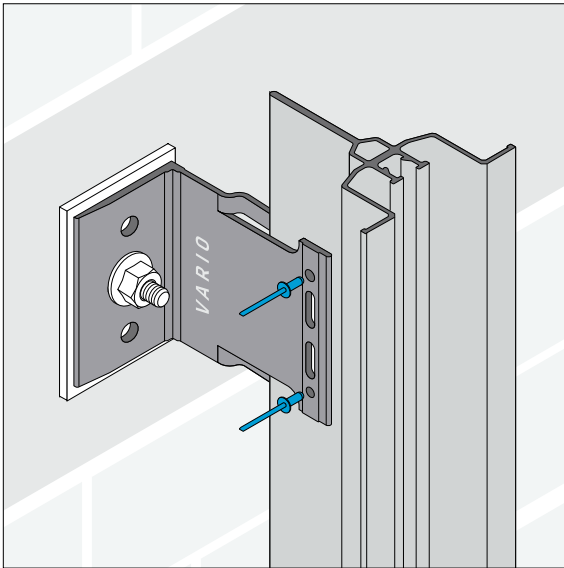
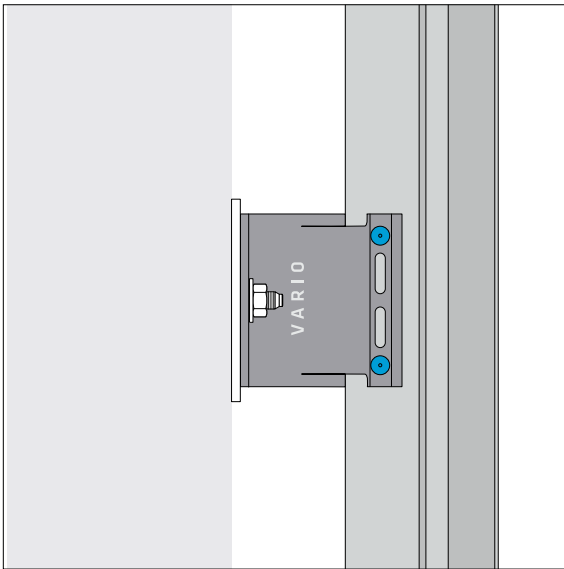
13

After several of the inner supporting profiles are installed they are leveled with the horizontal axis of the frame of reference.



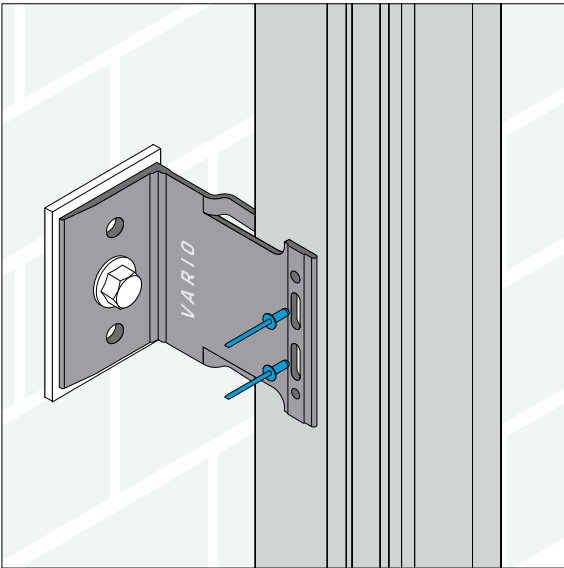
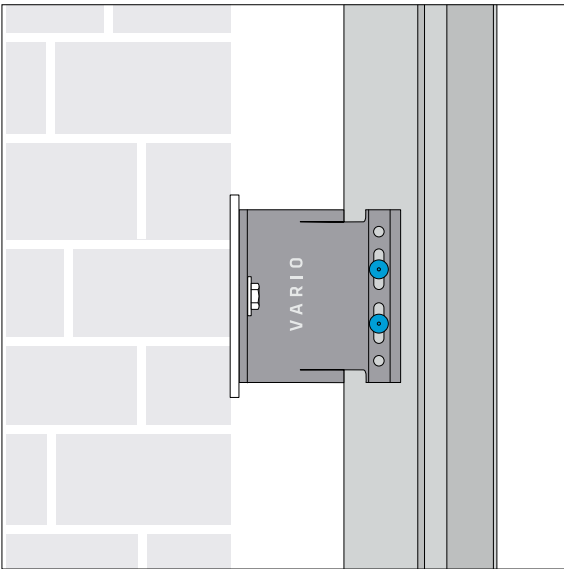
FASTENING THE MULLIONS
FIXED SUPPORT

The mullion profile is fastened to the wall bracket with rivets 4.8 x 12mm in the round openings in order to achieve a fixed connection. The fixed connection should be used at the top of each profile. The remaining brackets should be fastened as a sliding support.

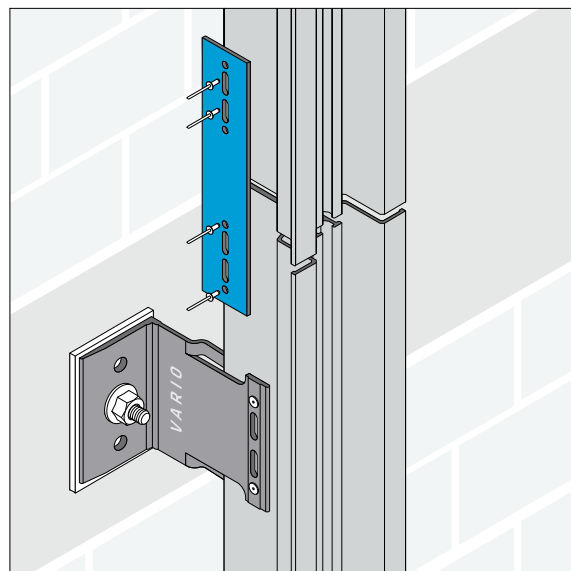


FASTENING THE MULLIONS
SLIDING SUPPORT

The mullion profile is fastened to the wall bracket with rivets 4.8 x 12mm in the oval openings in order to achieve a sliding connection. The sliding connection should be used where needed to provide the proper expansion and contraction movement of the profile.

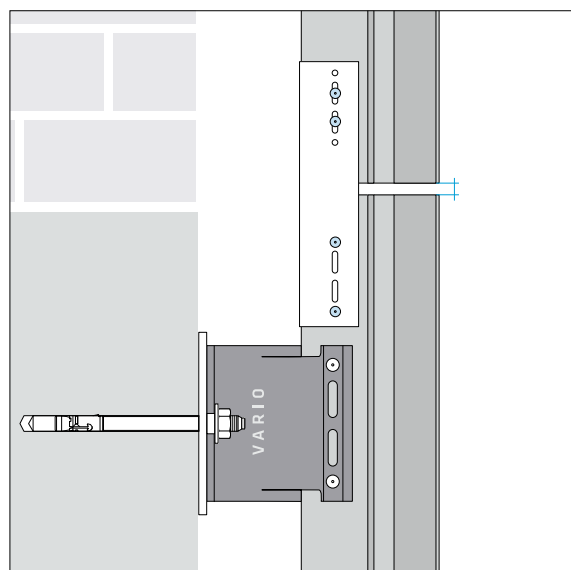


Mounting
Fixing Brackets

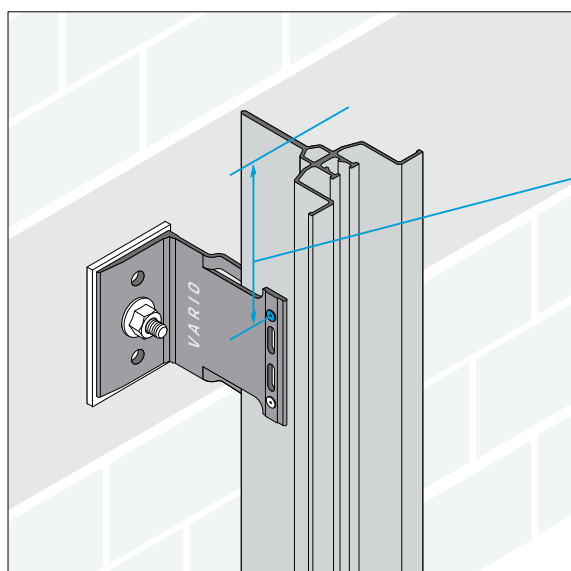


JOINING THE MULLION AT THE EXPANSION JOINT

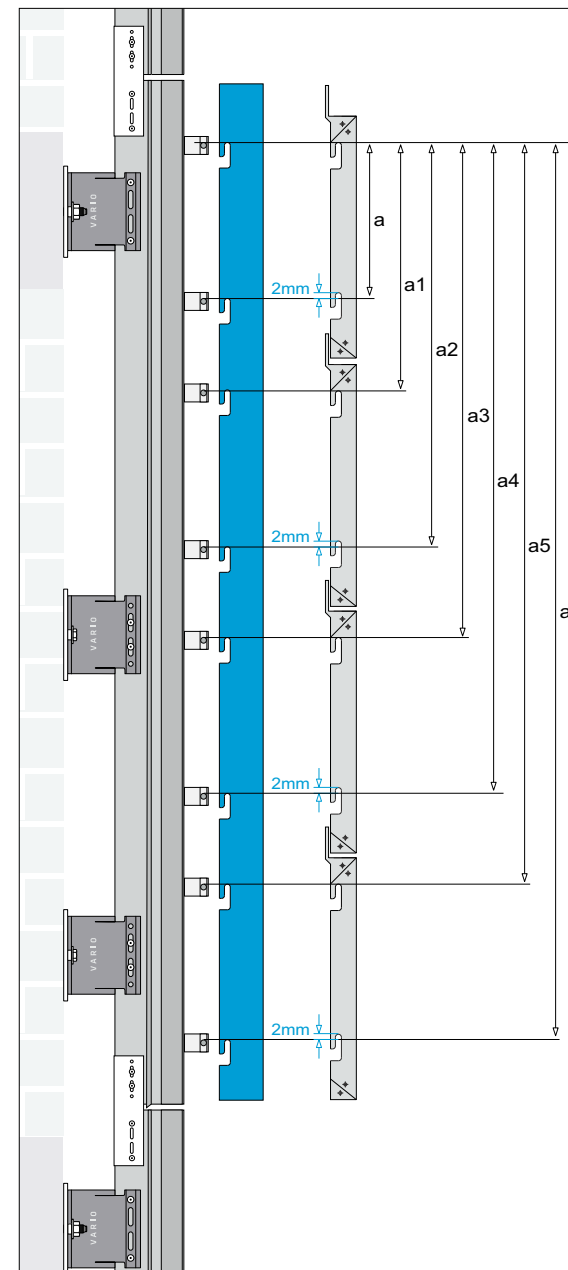
The connection between the vertical mullions at the expansion joint is made with an aluminium plate that provides the freedom of movement at the expansion joint. Rivets 4.8 x 12mm are used to fasten the mullions.



Note: The visual diagram for mounting the mullion profiles is used when fixed support is placed at the top of the mullion profile.



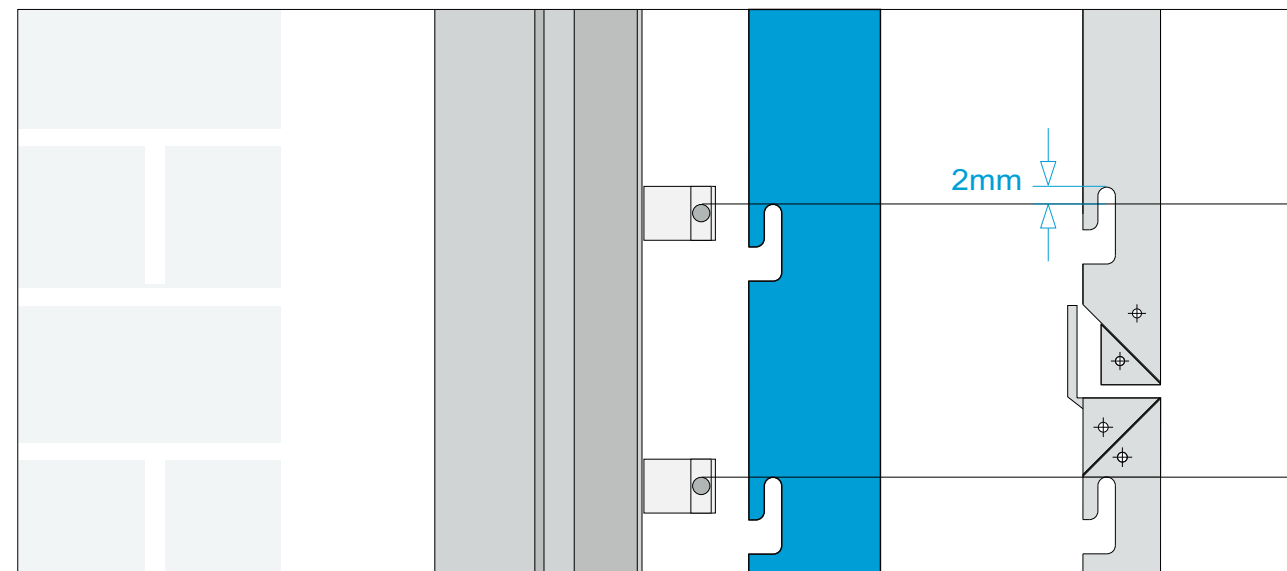
The distance from the edge of the mullion to the fixing bracket should not exceed 300mm.



TEMPLATE FOR MOUNTING HANGER ACCESSORIES

The template is used to place the hanger accessories in the correct position with respect to the cassettes. The template can be made from a strip of excess Etalbond®. The slots in the template should follow exactly the slots in the Etalbond® cassettes. In order to minimize the error during installation the template should be made to a full floor height.

Note: Each cassette should be mounted on the top of the cassette only at the left and right side of the cassette. The remaining slots should leave an appropriate expansion gap depending on the height of the cassette and the temperature difference. The diagram below shows an expansion gap of 2mm. This is appropriate for a 2 meter high cassette with a 35°C temperature difference.

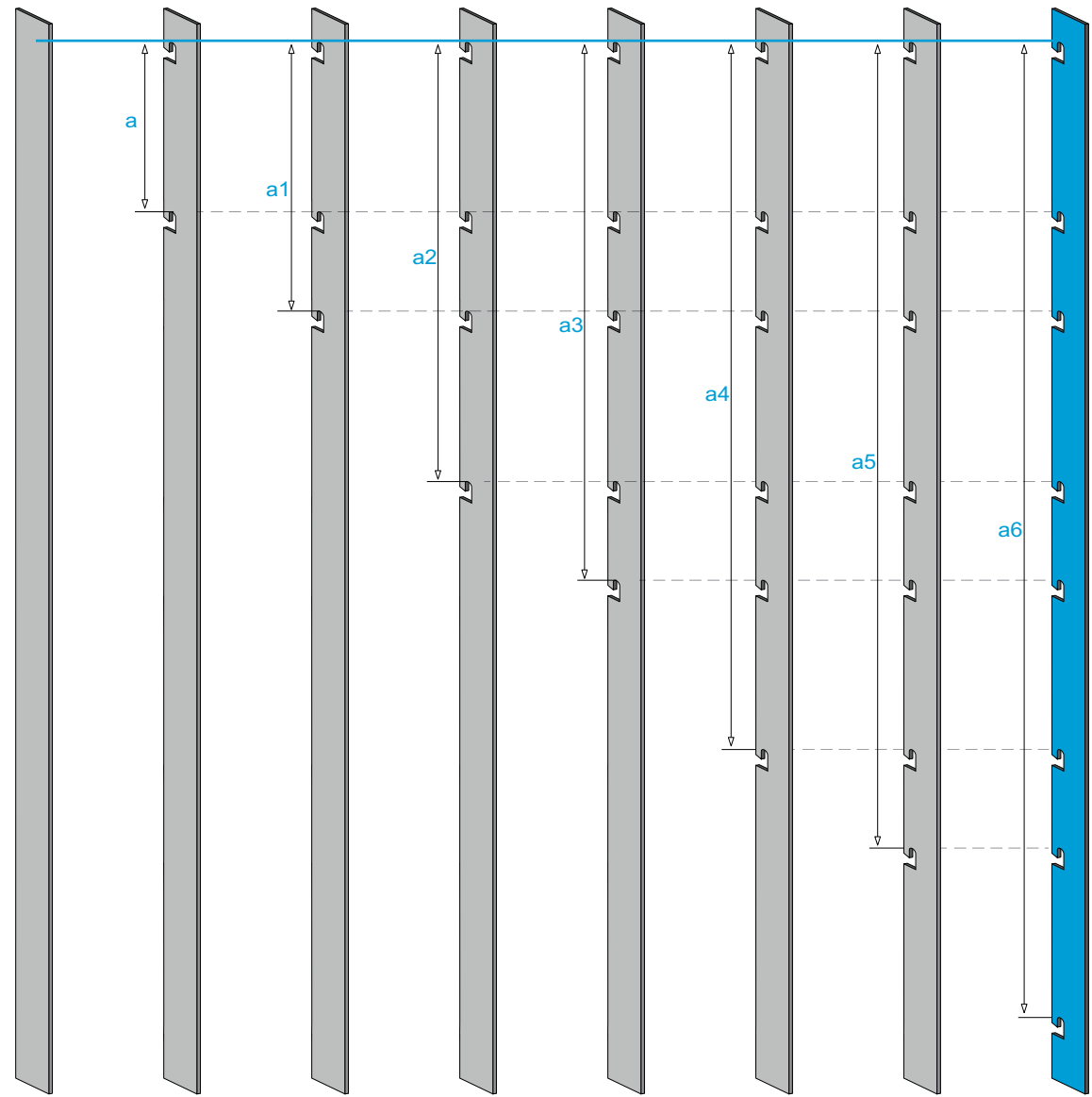


MAKING THE TEMPLATE

Note: The number of hangers and their spacing depends on the cassette size and the wind loads exerted on it. This should be calculated by a facade engineer.

The position of the top hanger on the vertical mullion serves as a base point on the process of making the template. After the first slot is made the next slot is made with an equal distance from the cassette slot plus the distance of the expansion gap (i.e. 2mm).

The remaining slots are made in the same manner. Starting from the base point and adding the expansion gap to the distance on the cassette panel. The distance between the slots depends on the number of cassettes and the number of slots per cassette. The gap between the cassettes should also be considered when making the template.

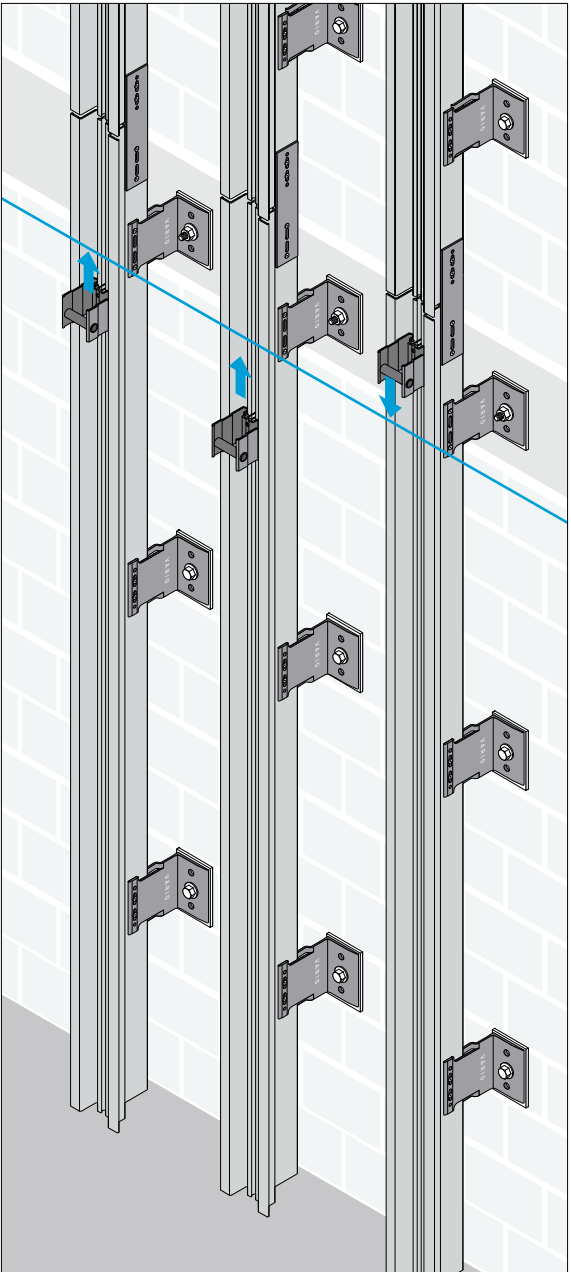
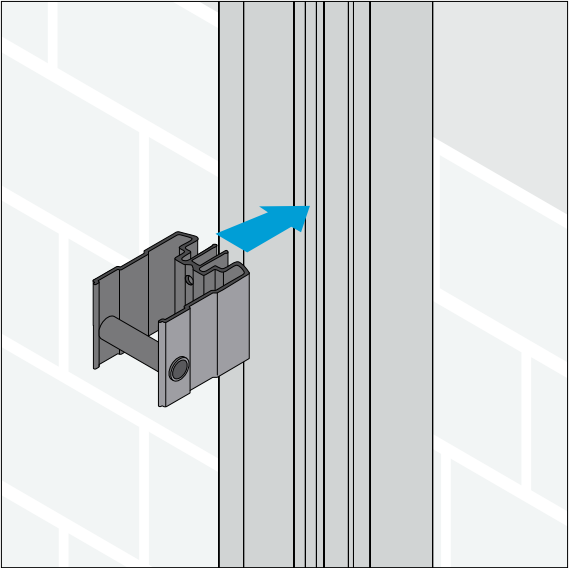


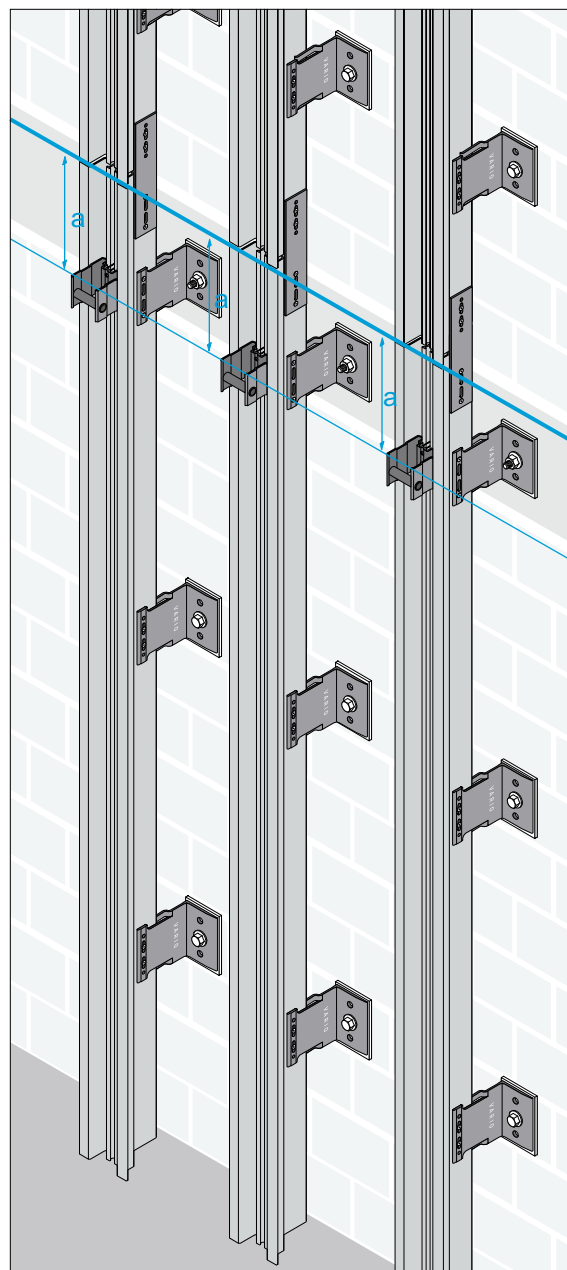
INSTALLING THE FIRST ROW HANGER ACCESSORIES

The hanger accessories have a special designed shape that allows the direct installation of the hanger on to the mullion profile, instead of sliding them into the mullion profile. The hanger clicks into the groove that is designed in the middle of the mullion profile. Then the hanger can be adjusted up and down to find the correct position.

Note: The distances between the hangers and the distances to the corners are dependant upon the cassette sizes and the number of slots that each cassette has. These calculations are made during the beginning of the project and are based on wind loads and size of cassette panels.

The first hangers are installed at the top of the mullion and the remaining hangers are placed into position using the hanger template.

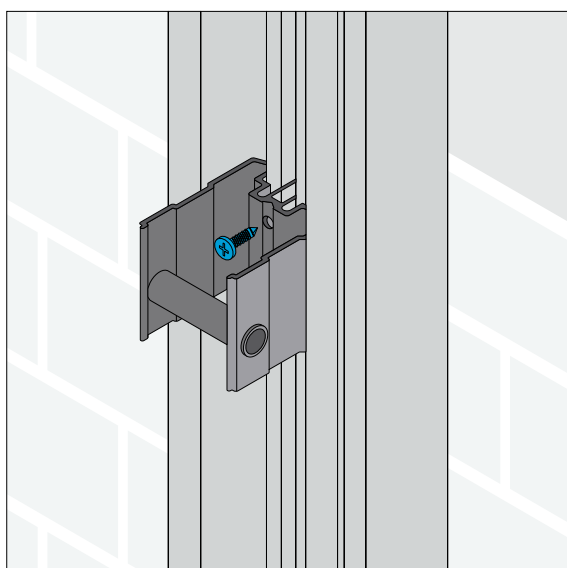




After making sure that the top hangers are properly installed on the first and the last vertical mullion, then you fix them permanently with a self-tapping screw M4.8x32mm. The hangers on the intermediate mullions are then vertically aligned by either using a leveling cord or a laser level.

In the case that the hangers are aligned by a leveling cord, the cord is attached to the first and last hanger and the intermediate hangers are lined up. Once the intermediate hangers are lined up they are also fixed with a self-tapping screw M4.8x32mm.

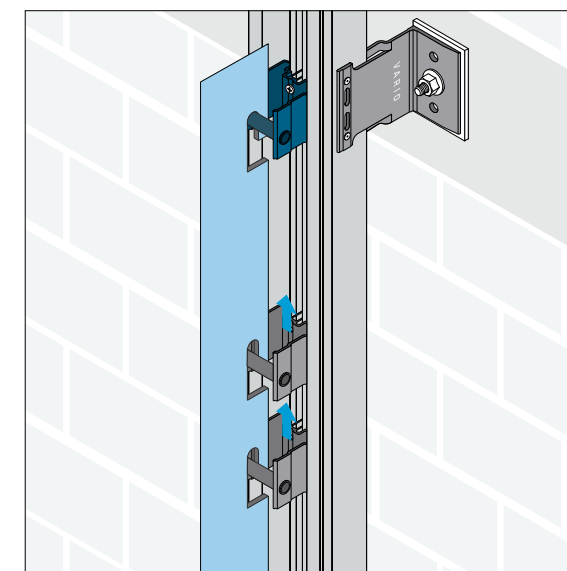
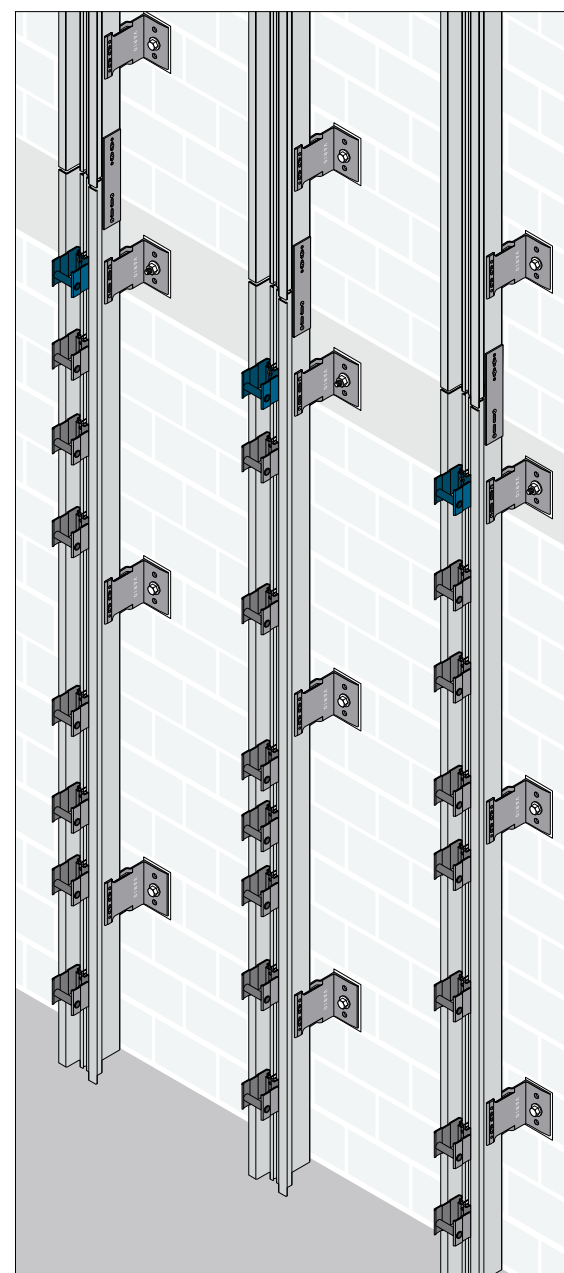
Note: Each cassette should be mounted on two hangers only at the top level. The lower hangers on which the cassette is supported should have an expansion gap as calculated by the project engineer.



INSTALLATION OF HANGERS WITH THE MOUNTING TEMPLATE

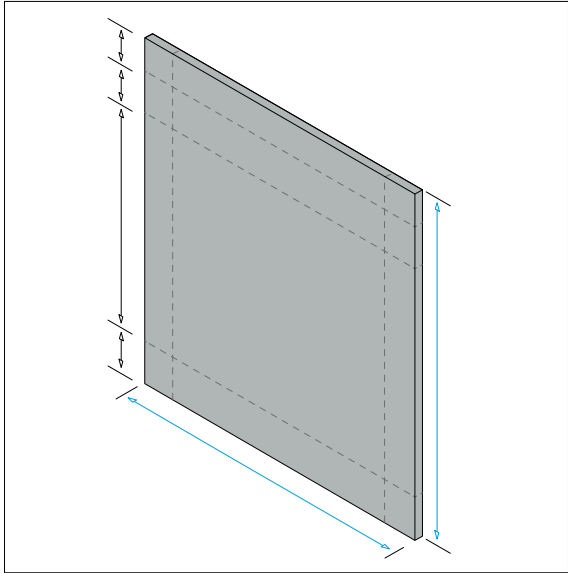
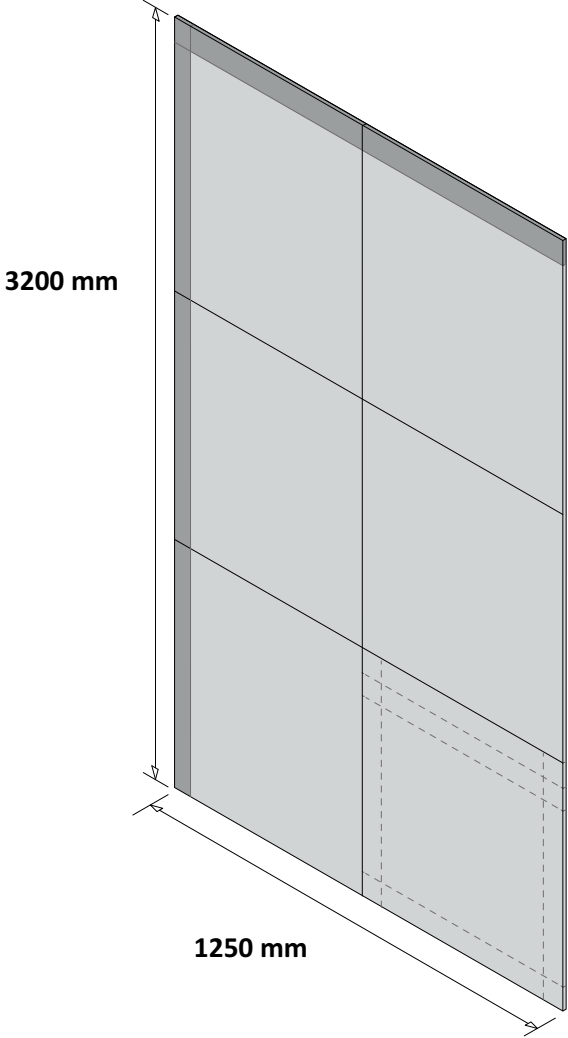
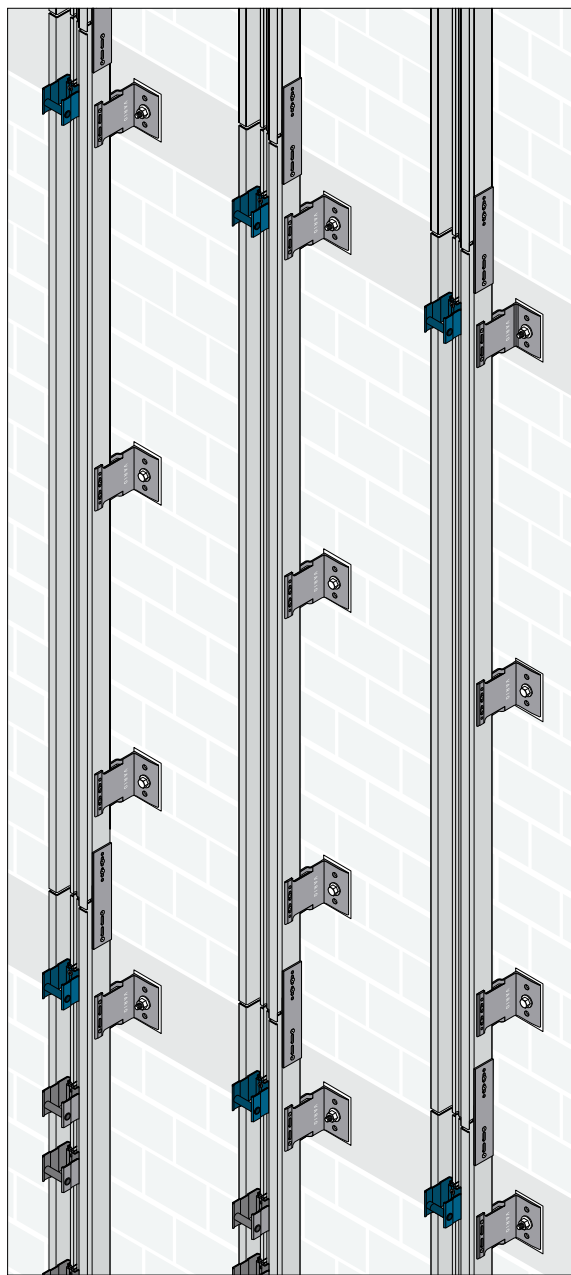
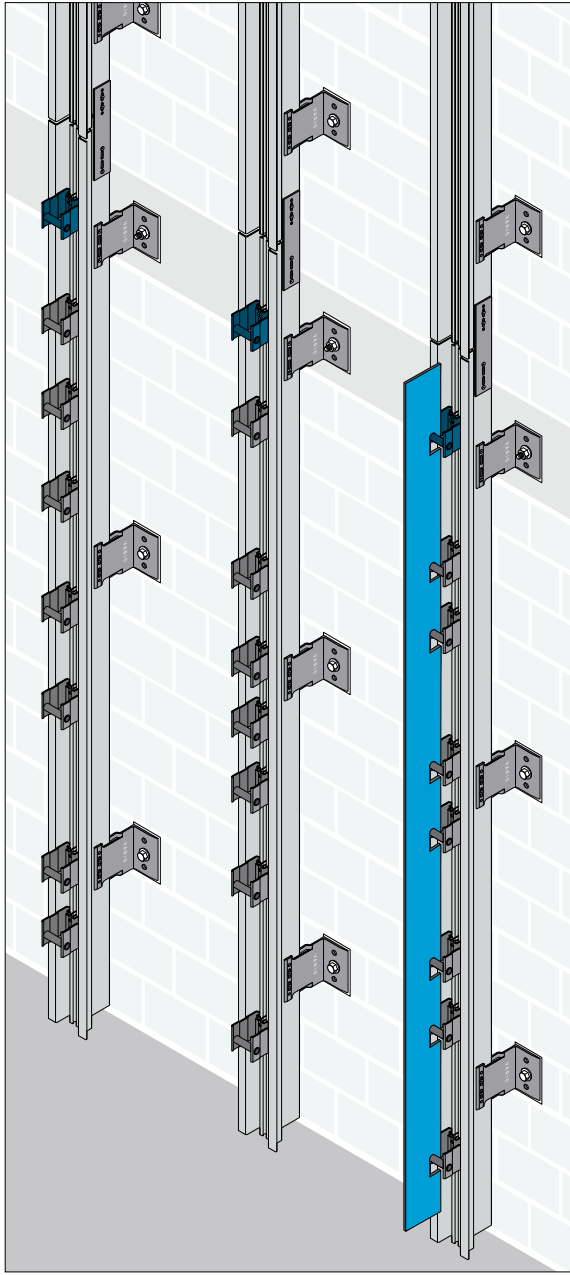
The steps are repeated for the first row of hangers and on each subsequent floor. The intermediate hangers are installed using the mounting template as shown in the diagrams.

Note: Depending on the layout of the facade, there may be different cassette sizes, which will require different templates to be made.

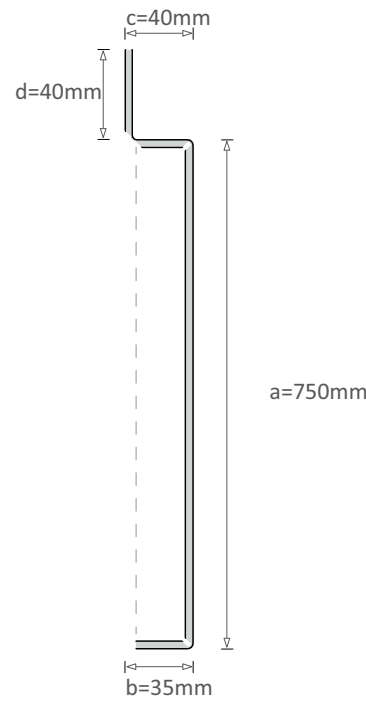


The diagrams below show in detail how the hangers are easily and quickly assembled with the use of mounting templates. This technique is very useful for facades that have the same size panels over a large area of wall cladding.

Note: Mounting templates should always be designed and manufactured by the project engineer.



CASSETTE CONSTRUCTION FROM PANEL ETALBOND



The above drawing shows the basic dimensions of the aluminium composite sheet 3200mm x 1250mm. The dimensions of the pattern for making a cassette are as follows:

h = sum of all the dimensions (-1mm) for each bend

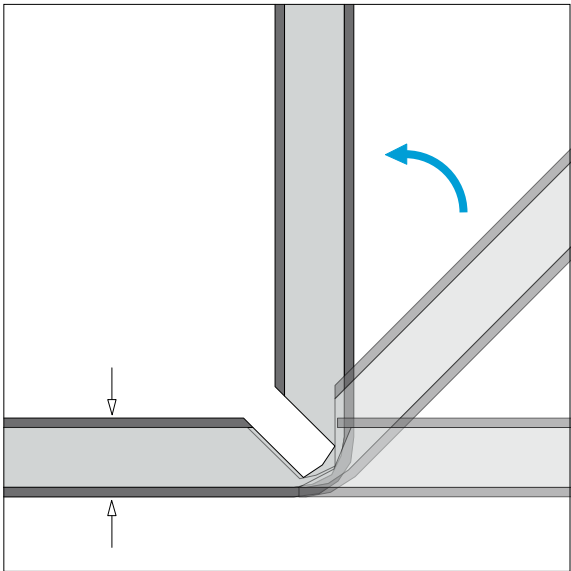
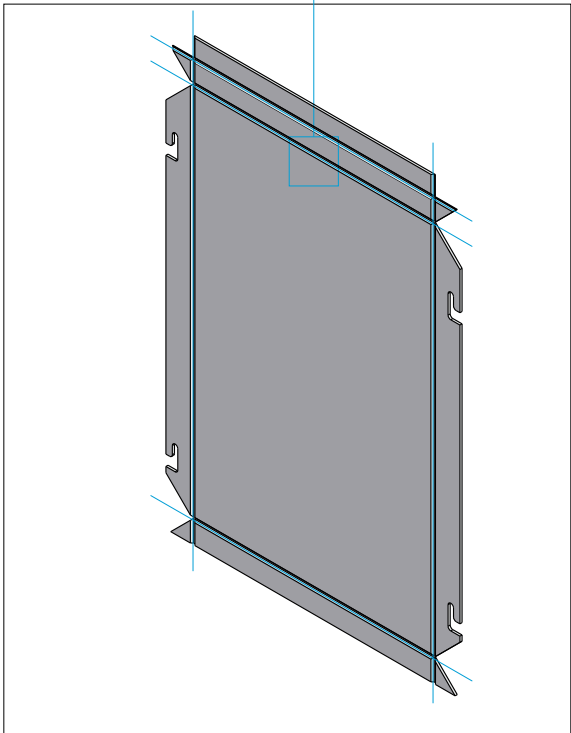
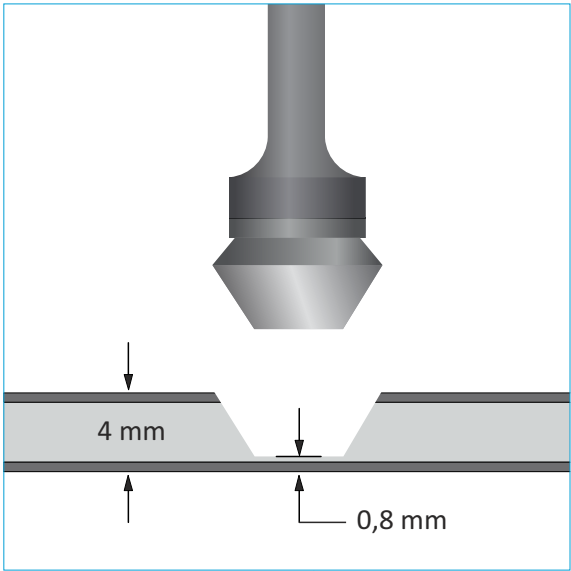
w = sum of all the dimensions (-1mm) for each bend

ie:
 $h = a + b + c + d - 3$
 $h = 750 + 35 + 40 + 40 - 3$
 $h = 862 \text{ mm}$

Note: To fasten the top of the cassette, it is recommended the size of the bend to be at least 40mm.

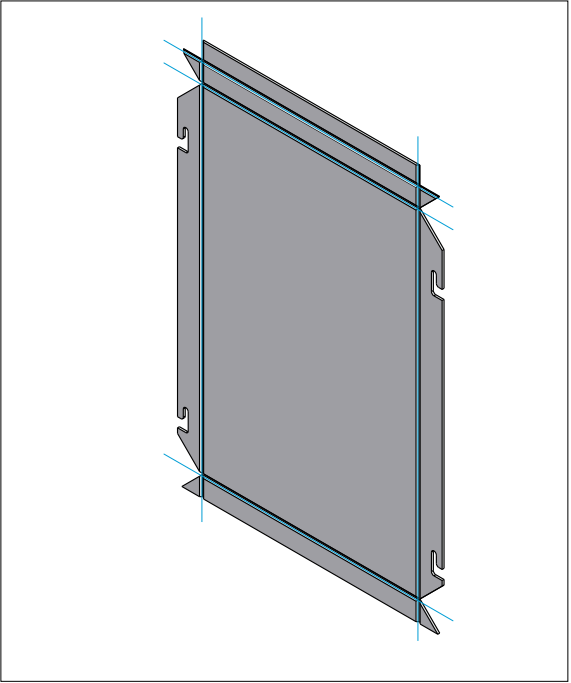
MANUFACTURING CASSETTES

The routing is made on the back side of the panel by use of a milling machine or CNC router. The remaining thickness of panel after routing should be a minimum of 0,8mm. Example: For a panel thickness = 4mm.
panel thickness 4mm - Milling Depth 3,2mm = 0,8mm



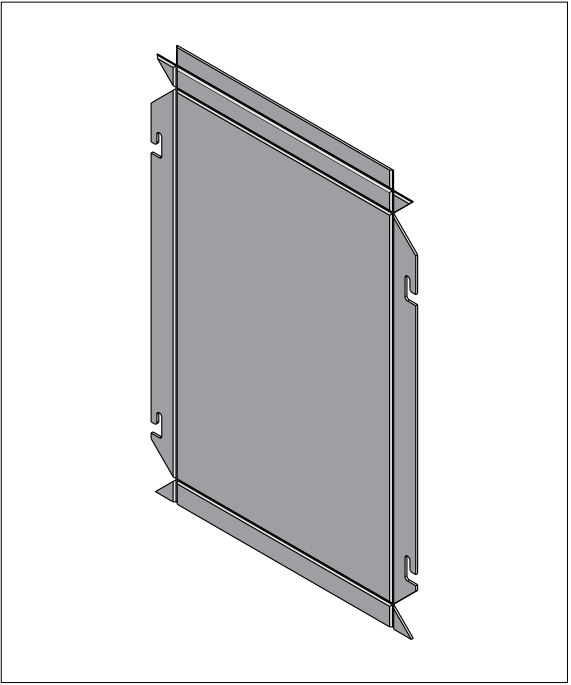
1

Routing diagram



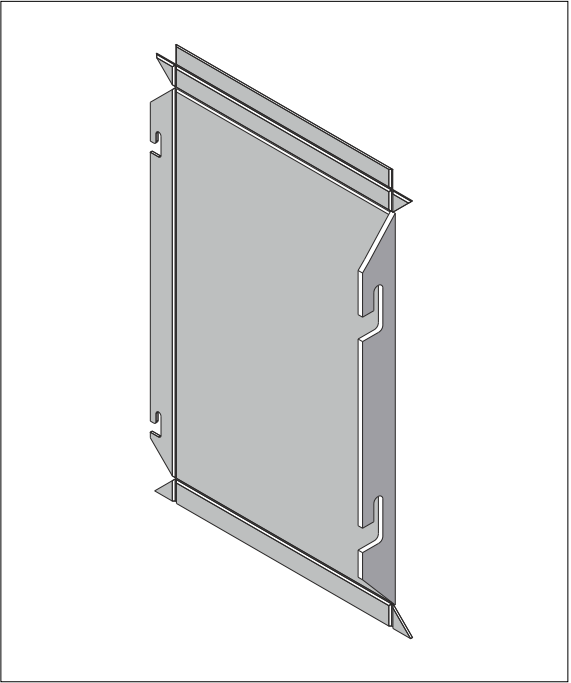
2

Remove the routed part from the rest of the sheet



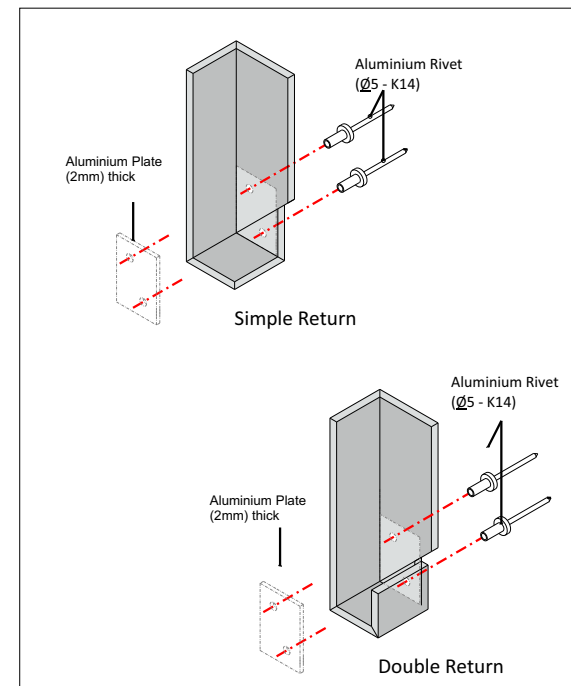
3

Bending of the side edges in order to create the cassette



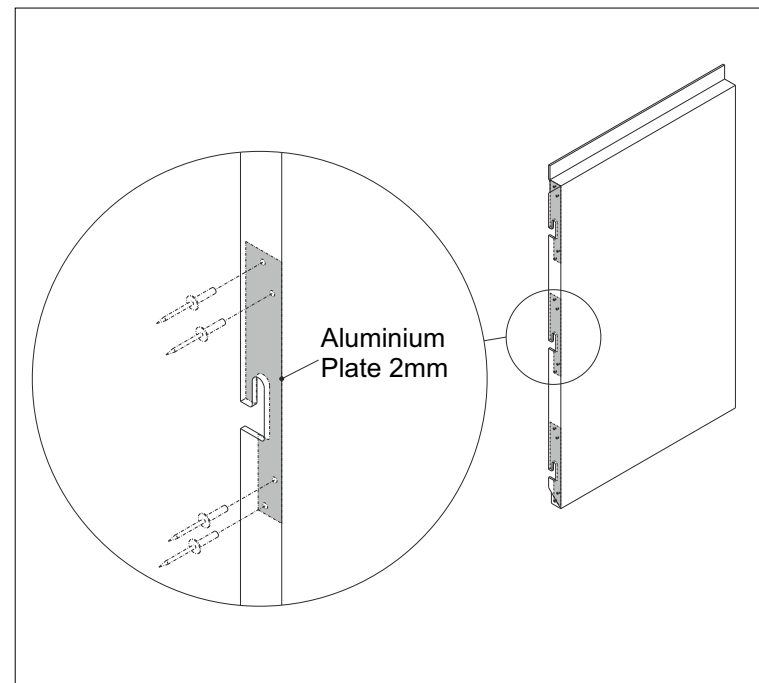
4

Bending the edges and making the corner connections



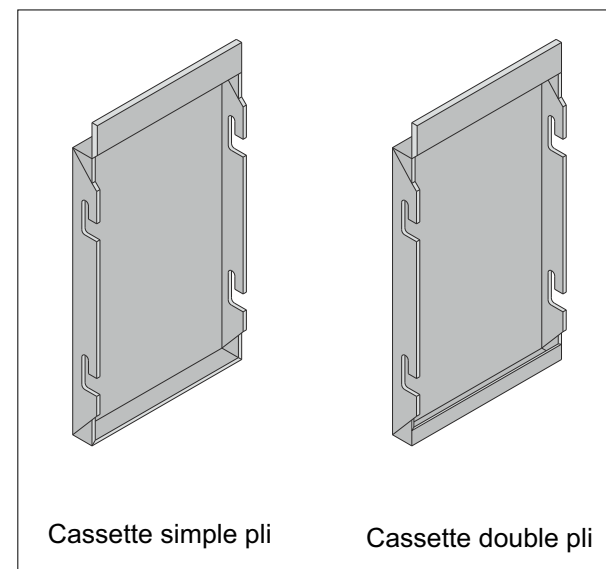
5

Reinforcement plates made from aluminium plates 2mm thick. This is very useful for heavy wind load conditions.



6

Two types of cassettes are possible. Single return cassettes and double return cassettes. Note that when double cassettes are used weep holes must be made for proper water evacuation.

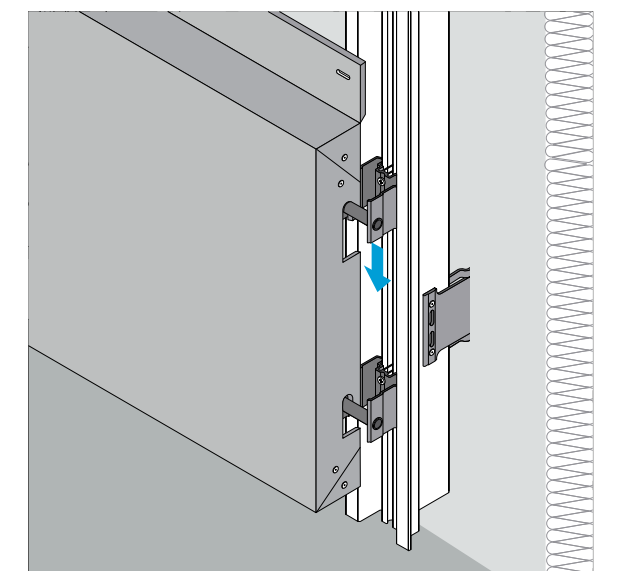
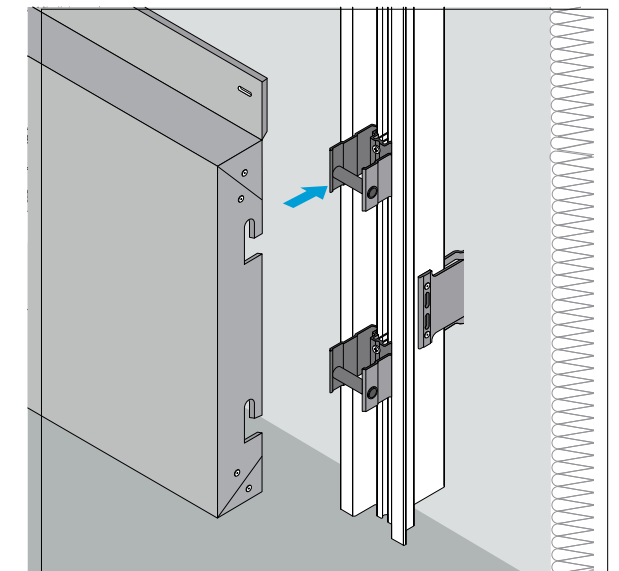
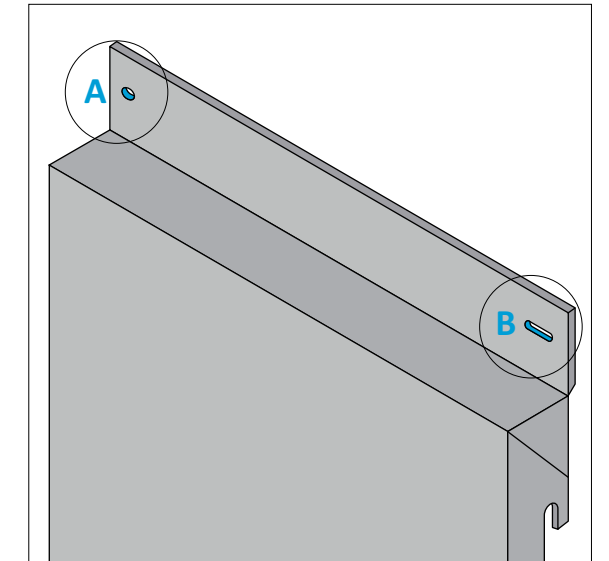


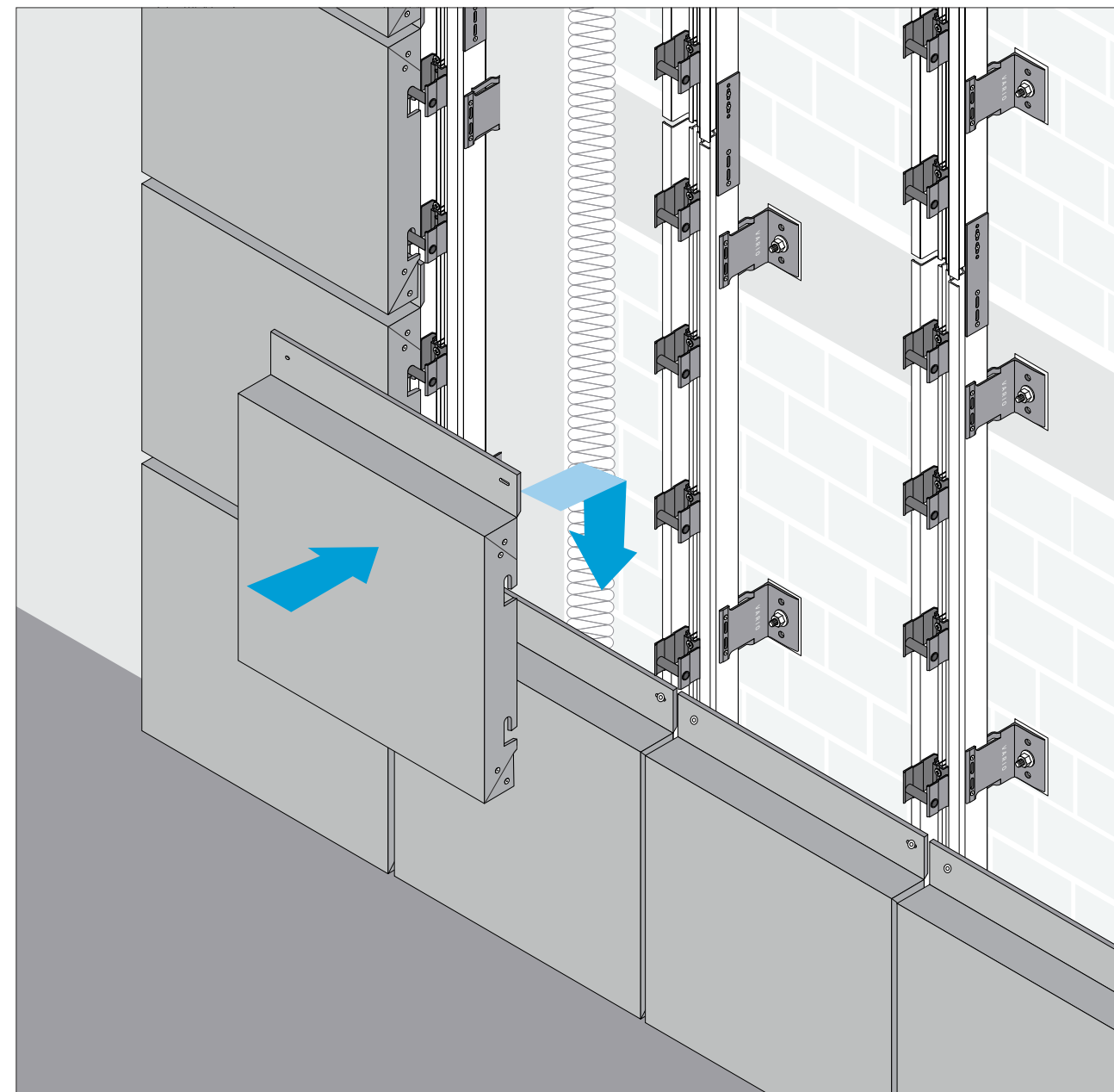
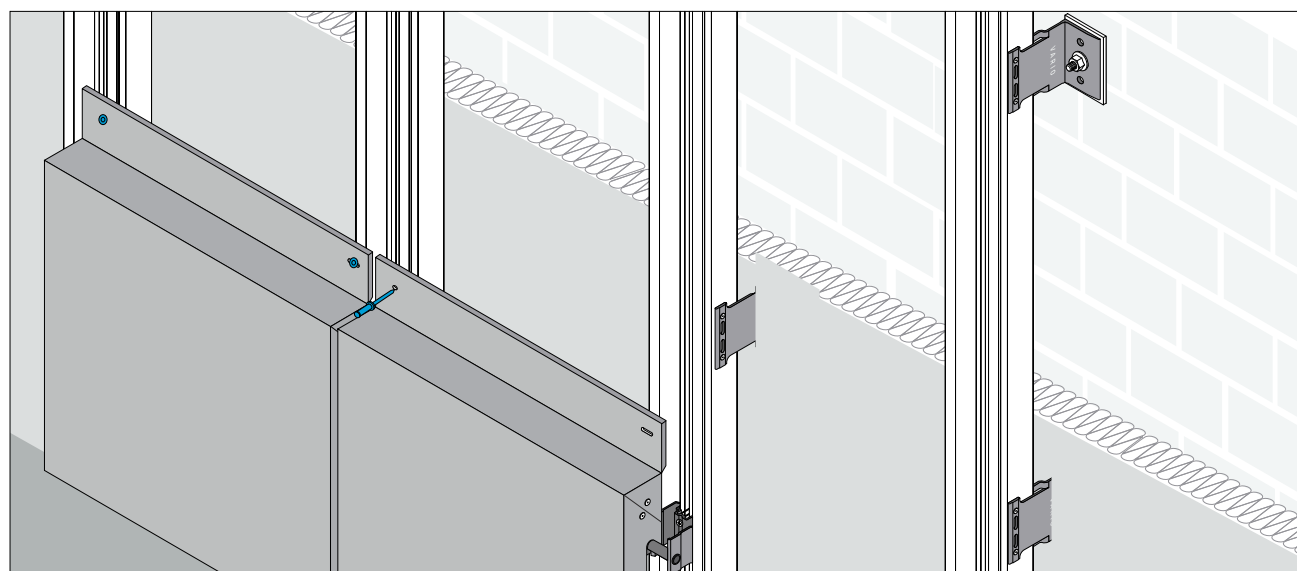
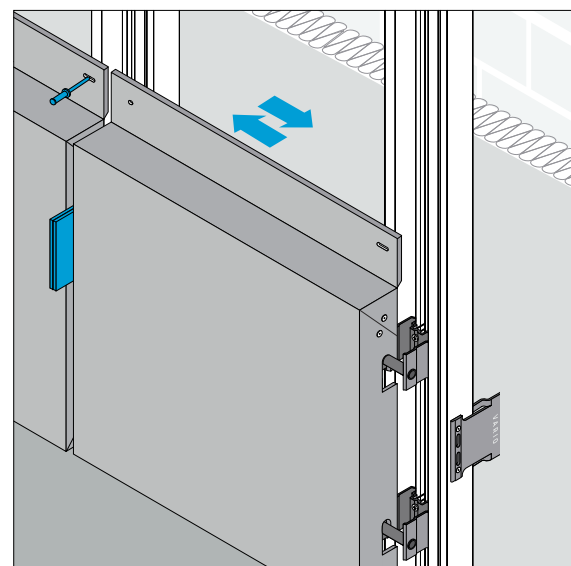
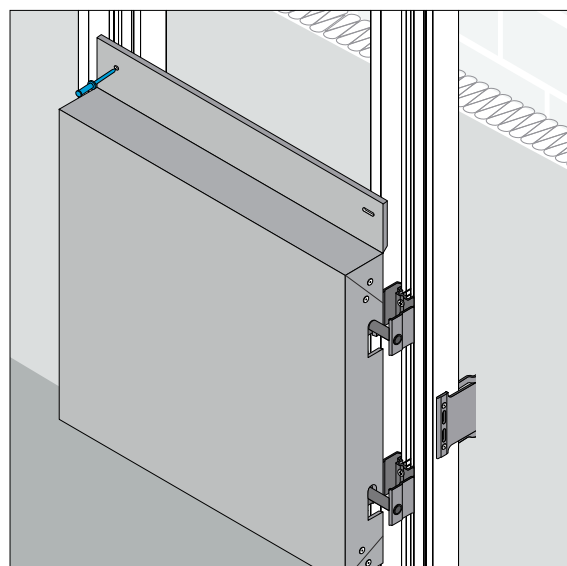
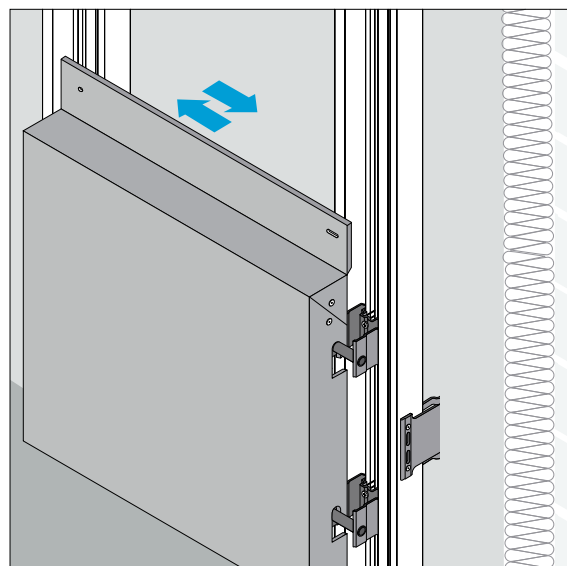
MOUNTING THE CASSETTE

The cassettes are mounted to the sub-structure by hanging the slotted edges over the hanger accessories. The joint between each cassette can be calibrated by using a spacer template from 10-20mm. Finally the cassette is fastened to the mullion profile with an aluminium rivet 4,8x14mm on the left and right side of the cassette. One hole must be round (fixed) and the other hole oval shaped in order to provide dilatation of the cassette in the horizontal direction.

A - ROUND HOLE

B - OVAL HOLE



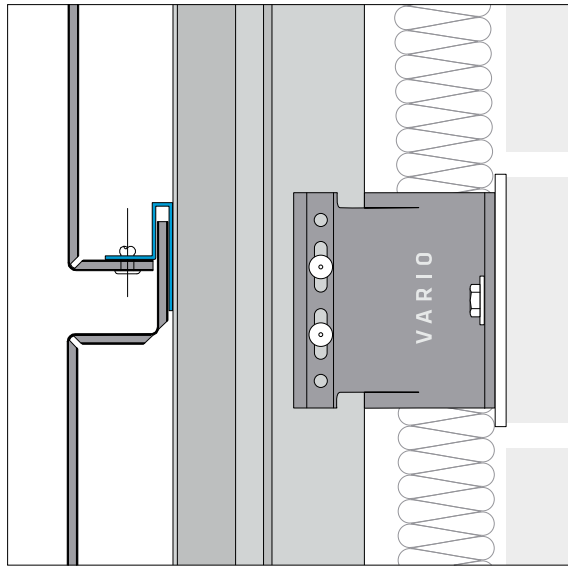


STEPS FOR MOUNTING CASSETTES

The cassettes are placed from the bottom - up. First we make a vertical column of cassettes and then a horizontal row of cassettes at the bottom edge. As the cassettes are filled in we make sure that fire breaks at each floor level and around windows are respected and continuous as specified by the project engineer. We also make sure to properly seal the edges at the bottom, around windows, and at inter-faces with other building materials as specified by the project engineer.

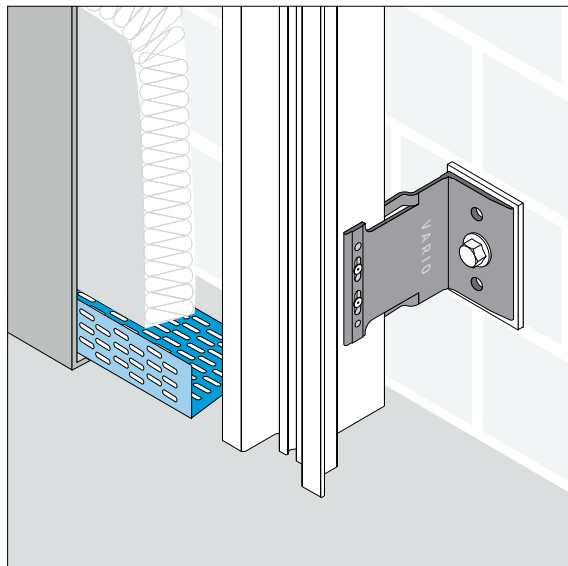
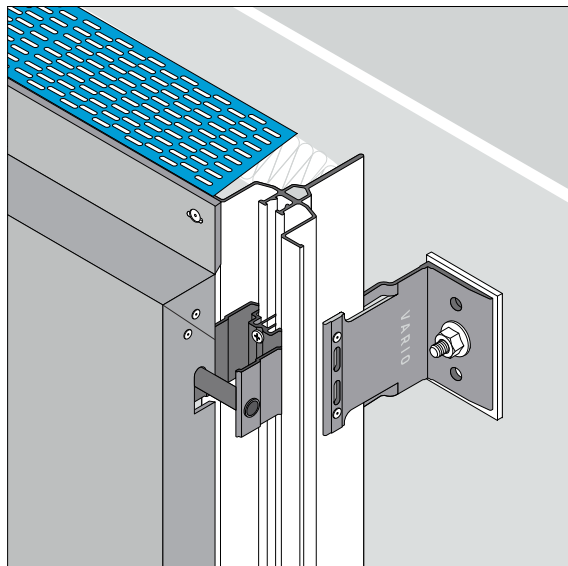
REINFORCEMENT PROFILE

The reinforcement profile is fastened to the bottom edge of the cassette with rivets placed every 25cm. This solution is required when it is specified by the project engineer for large cassettes and heavy wind loading conditions.



VENTILATION PLATE

A ventilation plate is used at the top and bottom edges of the facade in order to have proper air ventilation and still create a barrier to other elements. Ventilation plates are also used as fire breaks in combination with rock wool insulation as specified by the project engineer.





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