handbook for construction and installation of ducts

ductal

preinsulated aluminium ducts system

index

Introduction

P3ductal is the result of P3's long years of experience in the field of ducts systems. P3ductal makes it possible to blend the features of reliability and functionality with the need for industrialisation of the construction process. P3ductal is the outcome of this philosophy: a pre-insulated aluminium duct of remarkable performance whose assembly and installation systems, carried out on the basis of specific coded procedures, simplify the installer's job, thus ensuring excellent results on the technical, constructional and economic levels.

There are three aspects which influence the performance of an air conditioning distribution system:
> the quality of the product used
> the quality of the design and dimensioning phases
> the quality of the construction and installation processes

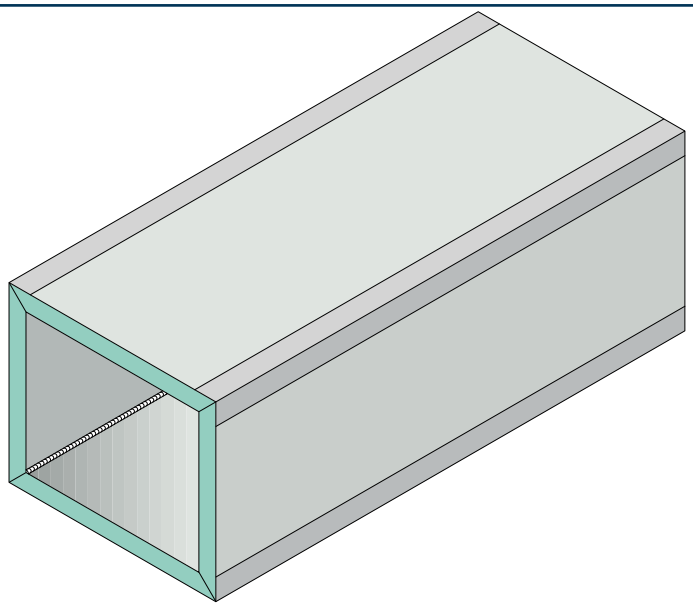
P3ductal responds most appropriately to all three aspects. This handbook enhances the already vast technical literature that P3 has produced. Just as the P3ductal technical handbook illustrated the technical performance of the ducts systems with P3ductal pre-insulated aluminium and the dimensioning handbook provides the professional with useful help in the delicate phase of designing the system, this construction handbook is a welcome aid to the duct layer in his daily job of construction and installation of ducts systems.
P3 has developed and launched a wide range of automatized equipment which not only simplifies but also adds speed and accuracy to the basic phases of plotting, cutting, bending, gluing and pressing of the pre-insulated aluminium duct. However, it should be noted that it is by analysing the phases involving manual construction that the constructional technique may be mastered.
This handbook is basically divided into two parts aimed at illustrating the actual construction of ducts as well as the application of accessories.
The first part illustrates the construction of both straight ducts and special pieces. For each working phase, details will be given of the measuring and cutting operations of the components and also of the assembly phase.
Application of accessories will be explained step by step from the moment the profile or the flange is cut up to the complete installation procedure.
Currently, there are a number of manufacturers who launch into the market ducts produced using the P3ductal system, often without complying with the standards laid down by P3. To be able to ensure, regardless of the installation conditions, compliance with the technical performance declared by P3 and guaranteed by the P3ductal system, it becomes necessary to clearly define standard, coded and shared constructional procedures.
The aim of this handbook is just that of establishing such criteria.

Methodological note

all constructional phases presented in this handbook are supplemented with illustrations showing P3ductal panels of 20mm thickness. The same techniques and methodological procedures are applicable to 30mm thick panels.

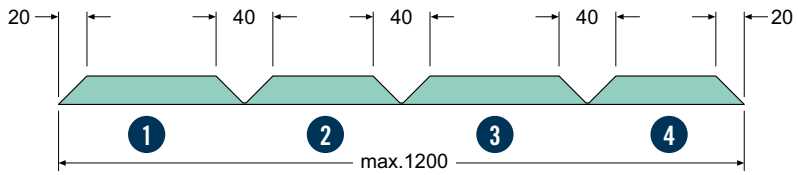
straight ducts

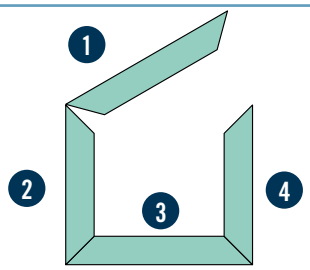
1. straight ducts



base and height lower than 1160 mm

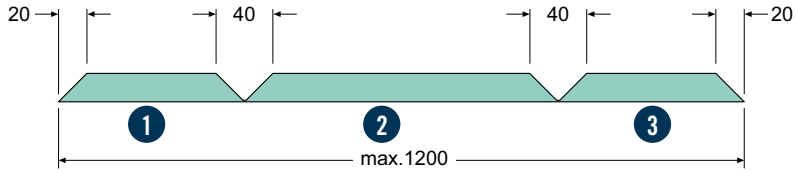
A sum of 4 sides lower than or equal to 1040mm

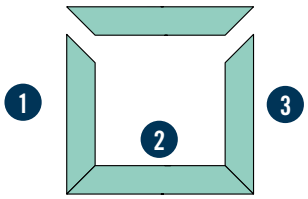




When the sum of the sides making up the duct is lower than 1040 mm it is possible to construct one duct on one single panel

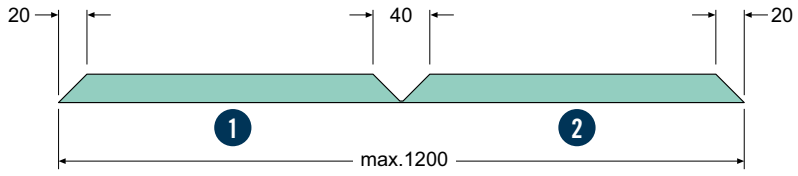
B sum of 3 sides lower than or equal to 1080mm

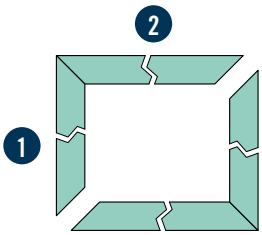




When it is not possible to construct a duct on only one panel and the sum of the three sides is not more than 1080 mm, the ducts may be constructed by making a “U” and a closing strip

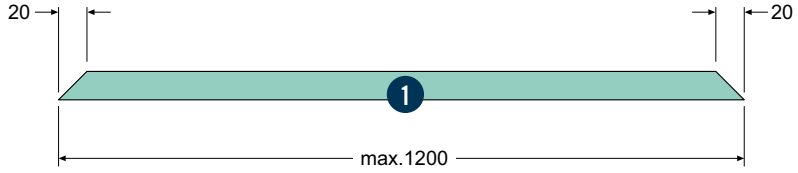
C sum of 2 sides lower than or equal to 1120mm

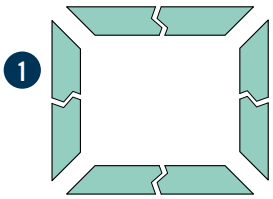




When it is not possible to apply the above systems to the construction of a duct and half the perimeter of the duct is lower than 1120 mm, the construction of the duct requires that two “L”

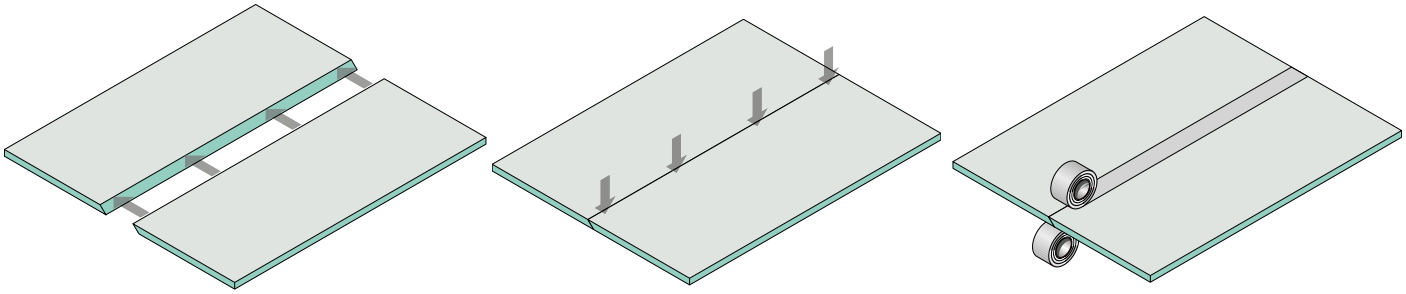
D single sides smaller than or equal to 1160 mm





When the previous techniques are not applicable and each of the four sides which make up the duct has a width lower than 1160 mm it is possible to make the duct in strips, that is, with all its sides cut individually

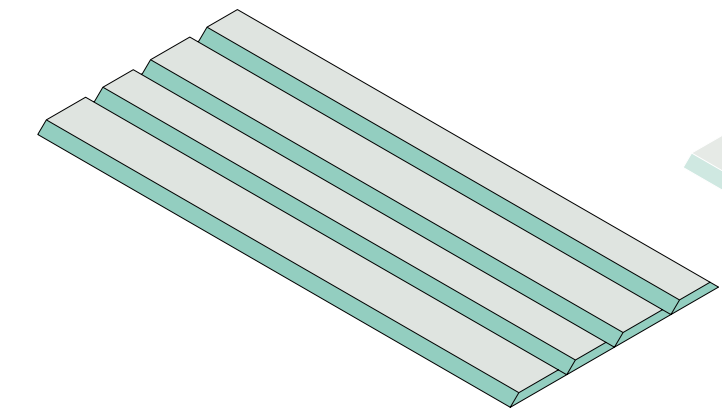
base or height over 1160 mm

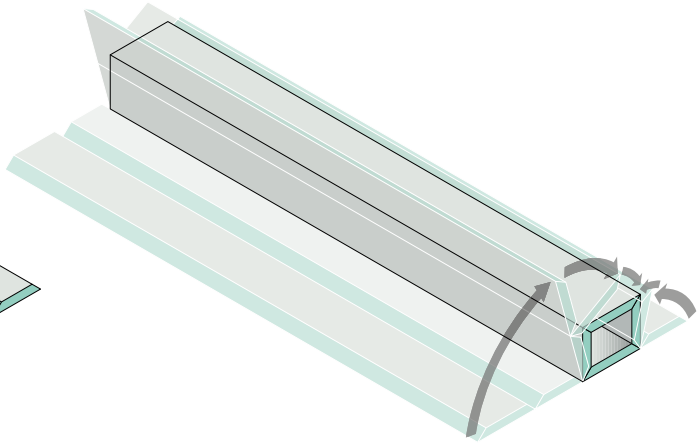


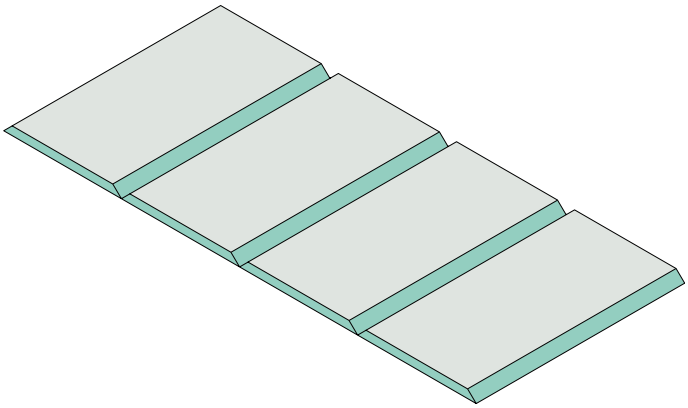
If the two opposing sides in the duct measure over 1160 mm each, the panel should be cut widthwise and the various sheets should be joined immediately after cutting until the length required for the flanging has been reached. The other two sides may be obtained from the panels by cutting these lengthwise. Indeed, it is possible to join the panels – or parts of them – to each other in such a way as to obtain one surface which may be easily worked.

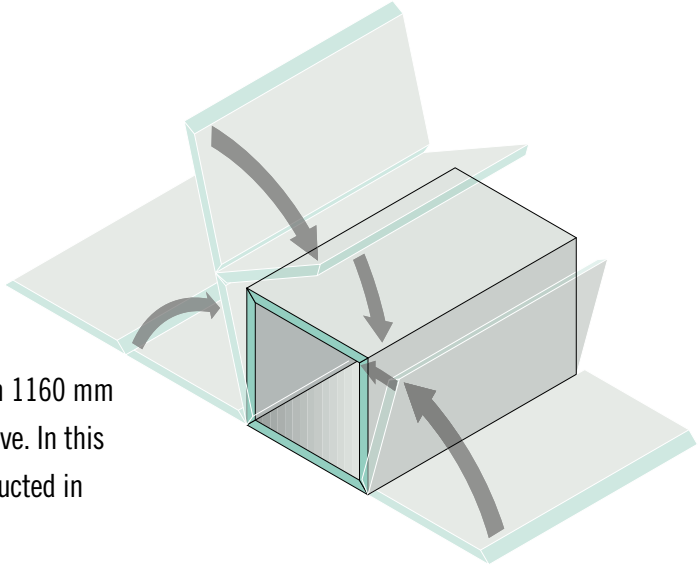
N.B. Avoid joining of strips less than 10 cm wide.

base and height over 1160 mm assembly







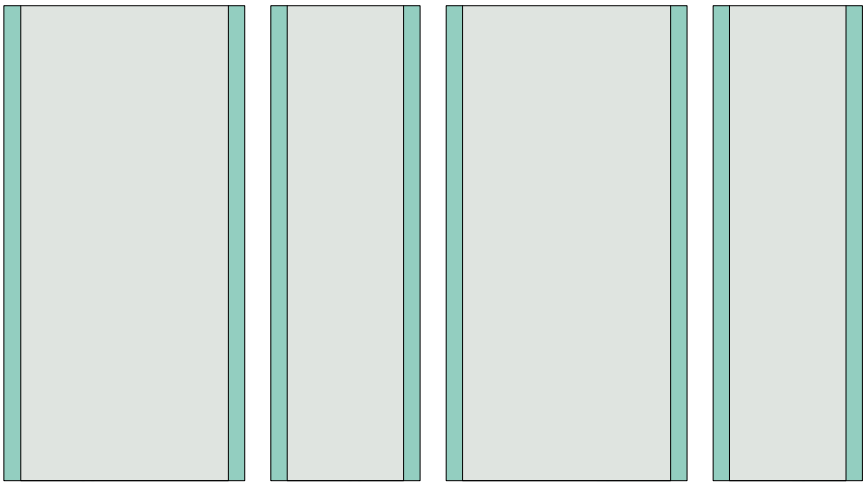


The construction of ducts in which all the sides measure more than 1160 mm each may be carried out by using one of the systems explained above. In this case, however, the panels must be cut widthwise. The ducts constructed in this way will have a maximum length of 1200 mm.

For all the techniques mentioned above, proceed then with the gluing, pressing, taping and siliconing phases

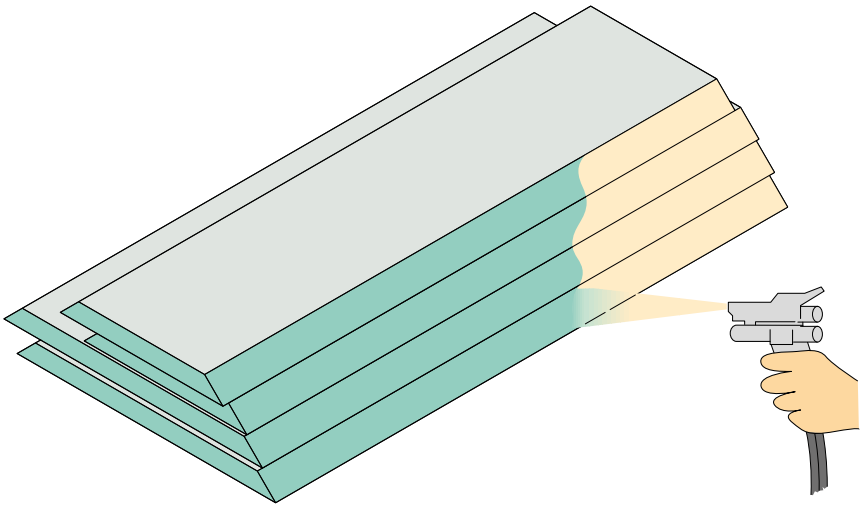
2. construction based on the strips method

phase 1 » cutting the strips



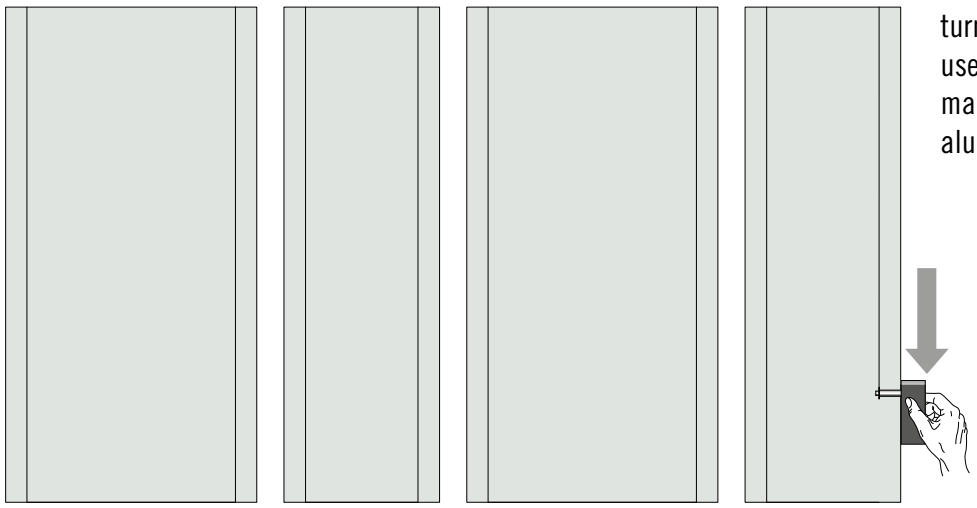
cut the strips to measure.

phase 2 » gluing the strips



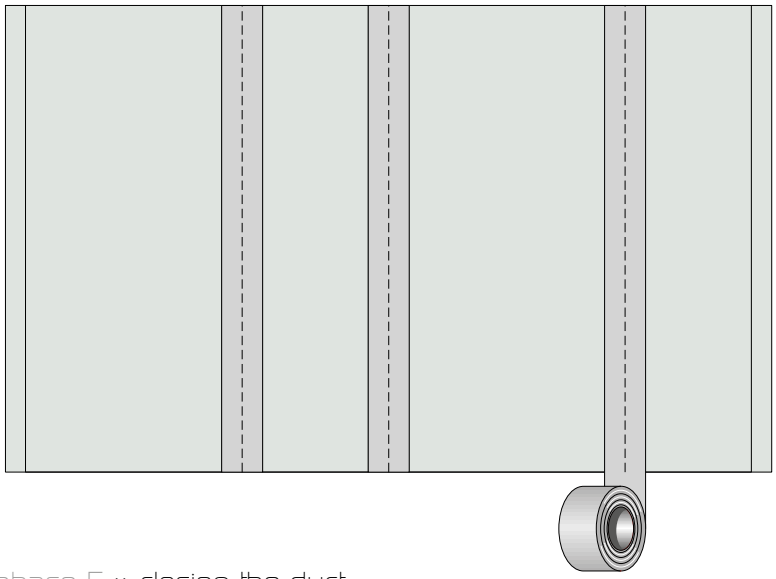
overlap the strips and apply glue on the external sides.

phase 3 » rotation of the strips and use of the tape marker



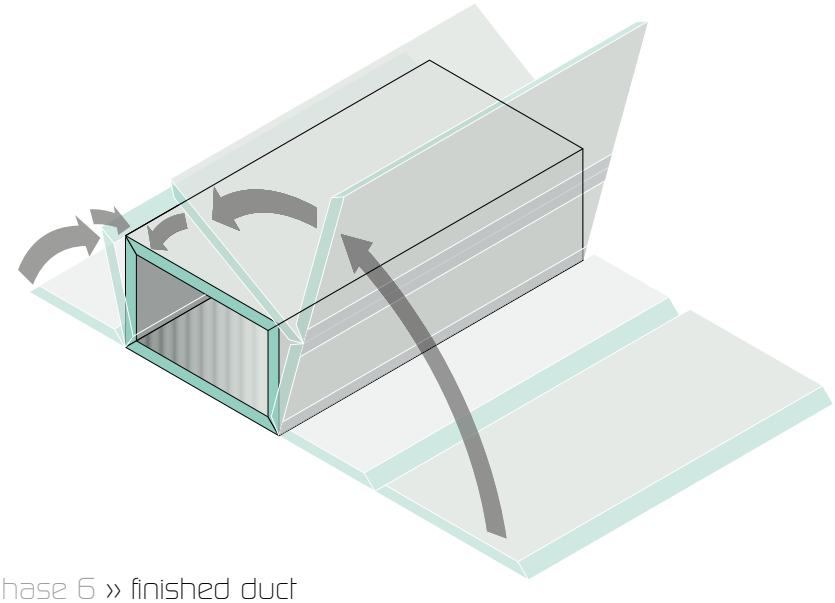
turn the strip upside down and use the tape marker to draw marks for the application of the aluminium tape

phase 4 » taping of the strips



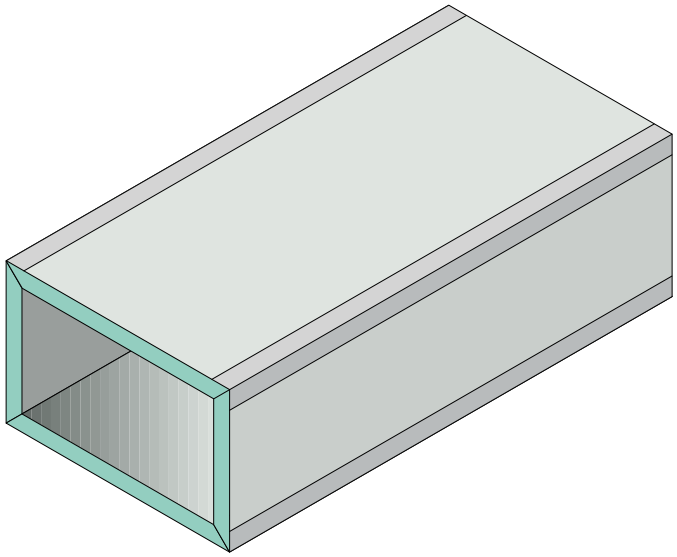
apply the aluminium tape

phase 5 » closing the duct

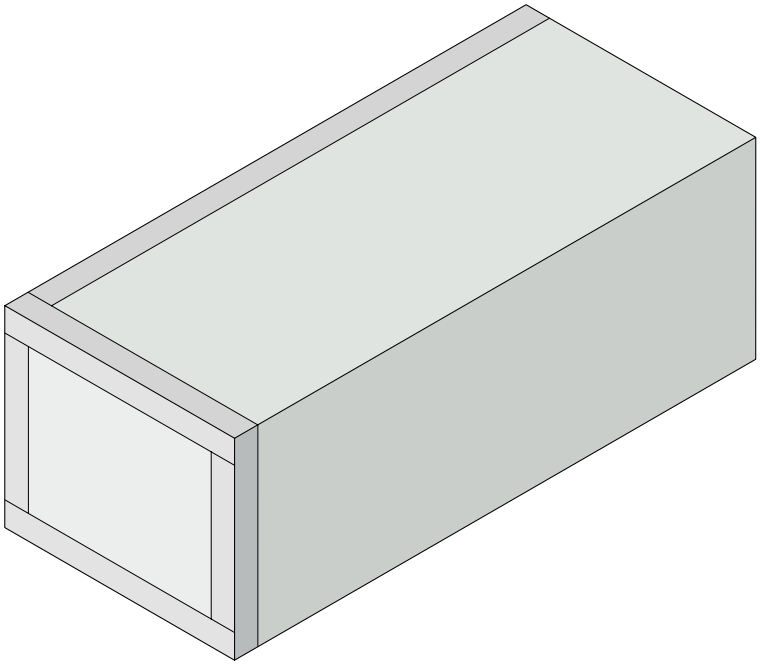


proceed to close the duct as shown in the drawing.

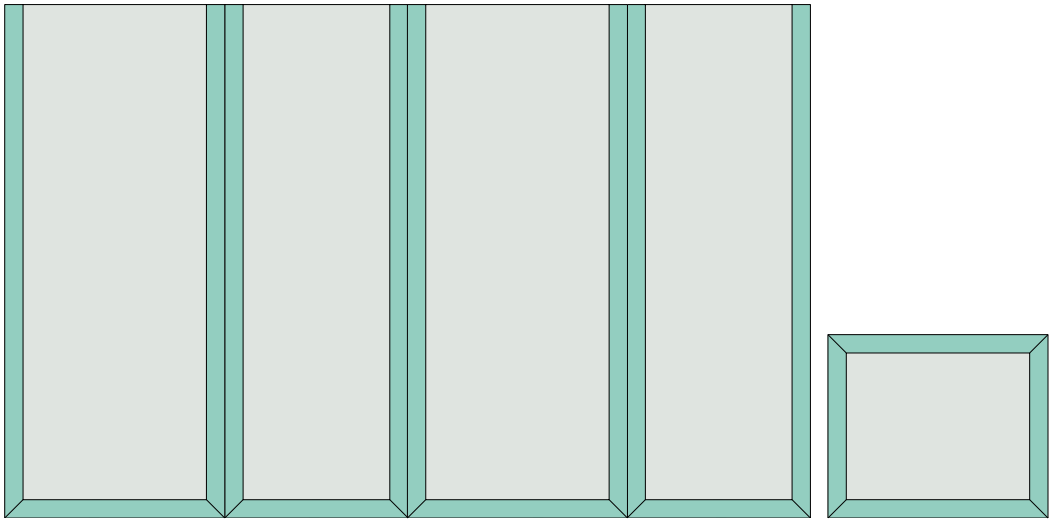
phase 6 » finished duct



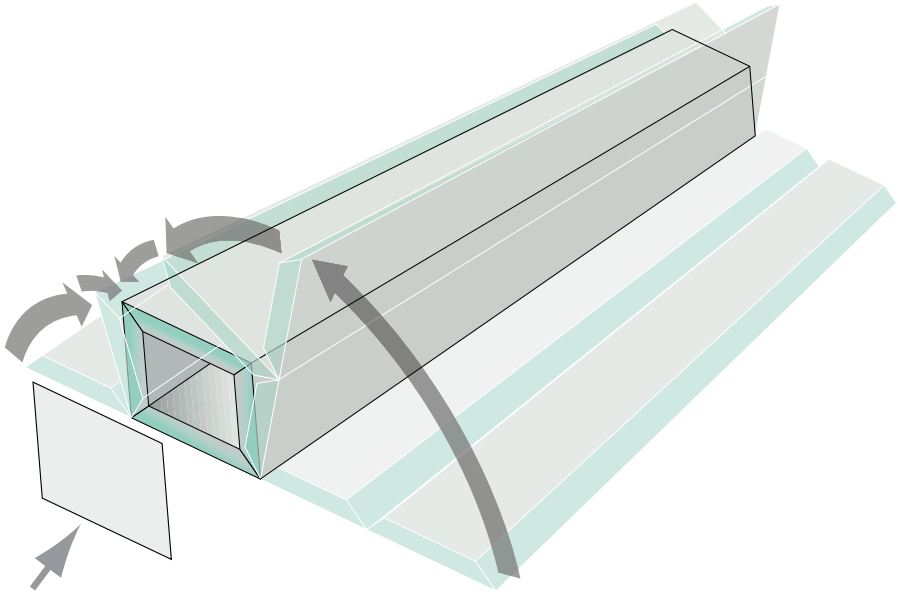
3. end-caps



components

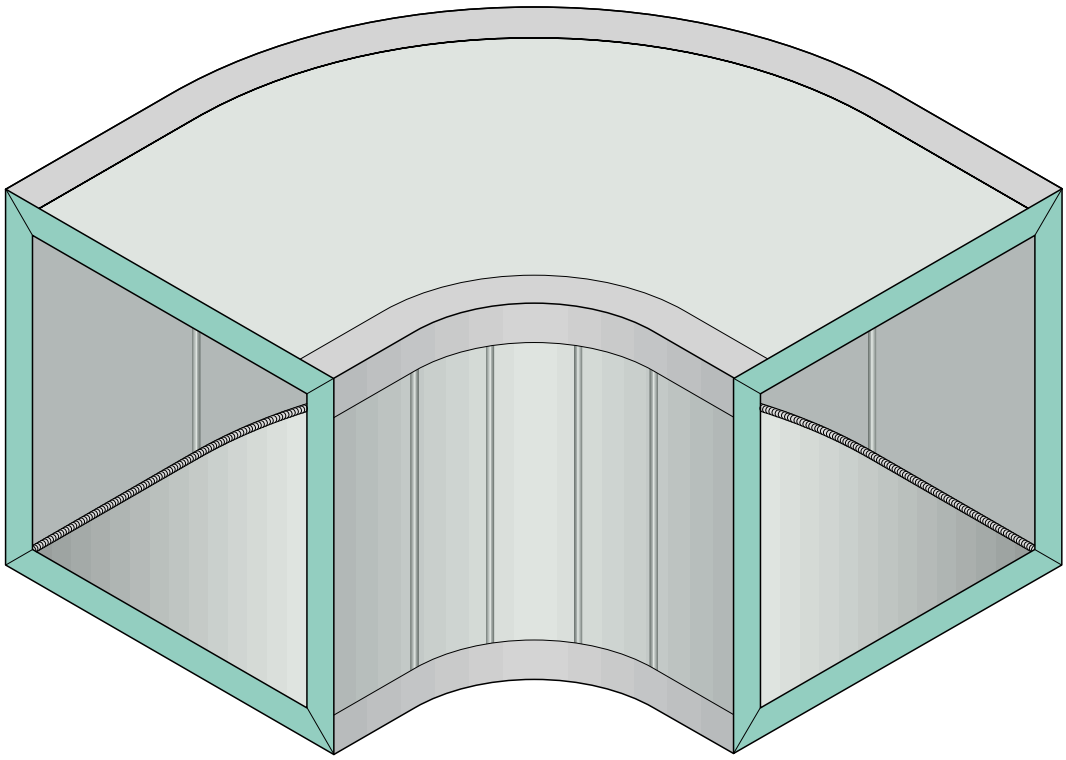


assembly

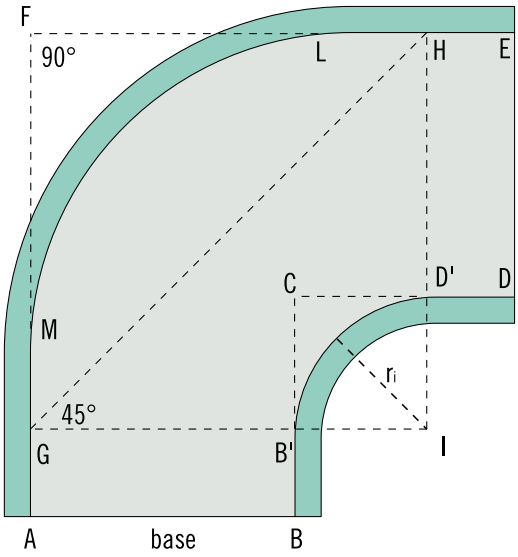


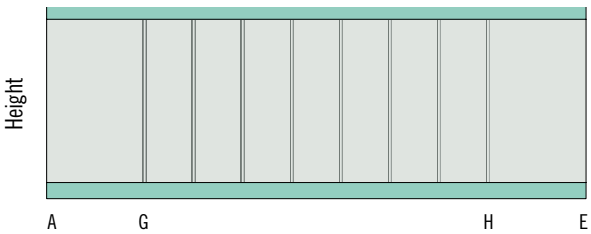
special pieces

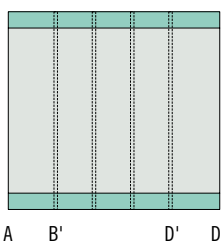
4. round elbow



measuring







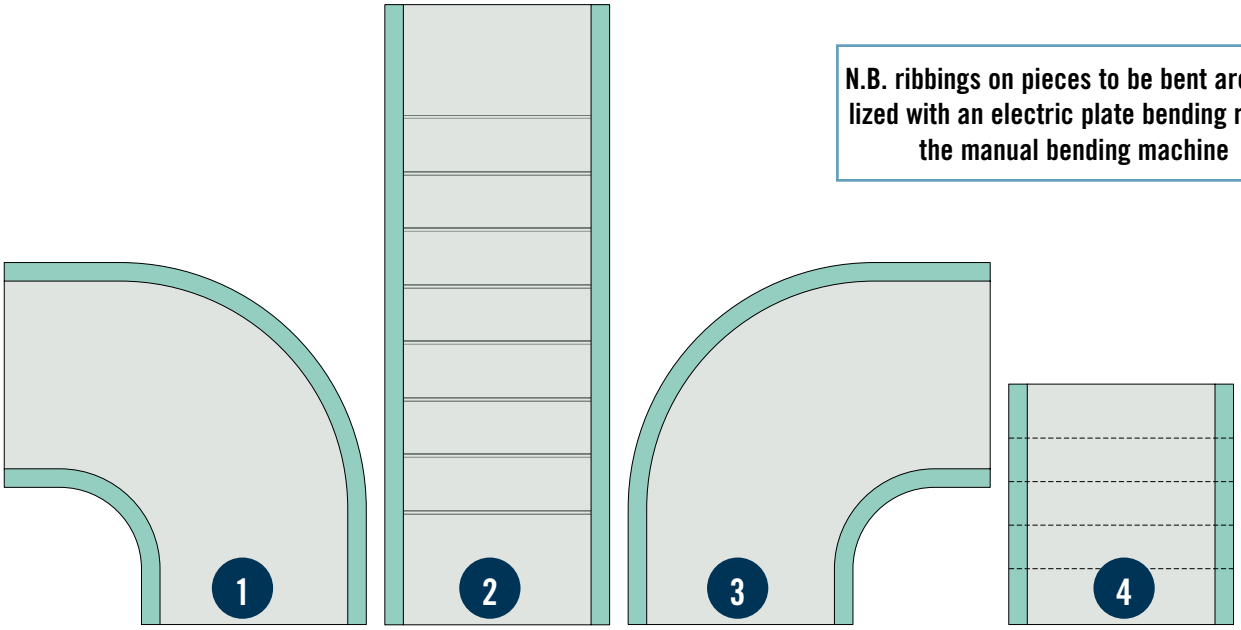
1. Draw a constructional line A-B, which corresponds with the side of the curve.
2. Draw a constructional line B-B', which corresponds with the neck of the curve. In order to make it possible to insert the flanges in it, this curve should not be shorter than 50 mm. The length in this stretch is the same as the parallel stretch A-G.
3. B'-C and C-D' have the value of an inner radius and are determined according to the table highlighted below.
4. Draw D'-D segment as phase 2
5. Segment D-E is plotted with the same length as segment A-B.
6. Segment E-H is plotted with the same length as segment B-B'. Point H may also be established by plotting segment G-H using a 45° T-square.
7. The extensions to segments D'-H and G-B' make it possible to find, at their intersections, point I.
8. Place the tip of the compass at I, open it to reach point G and then plot arc G-H
9. The inner arc B'-D' may be plotted by using the template if the radius is 150 mm or by using the compass.

It should not be forgotten that plotted dimensions correspond to the internal dimension of reduction. Therefore, you have to proceed with the cutting with the jackplane blade turned inwards. **Then, proceed with the cutting phase.**

Value of the minimum radius recommended according to height	
Inner radius (mm)	**Height (mm)**
150	<500
200	500/1000
250	>1000

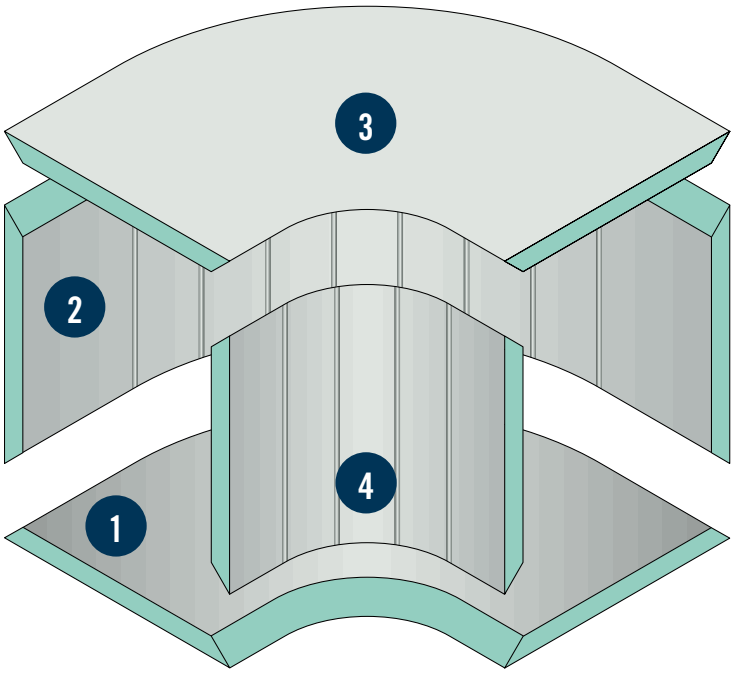
Distance between the ribbing lines according to the curve radius	
Curve radius (mm)	**Distance (mm)**
150-300	25
301-500	35
501-800	50
Up 800	80

components

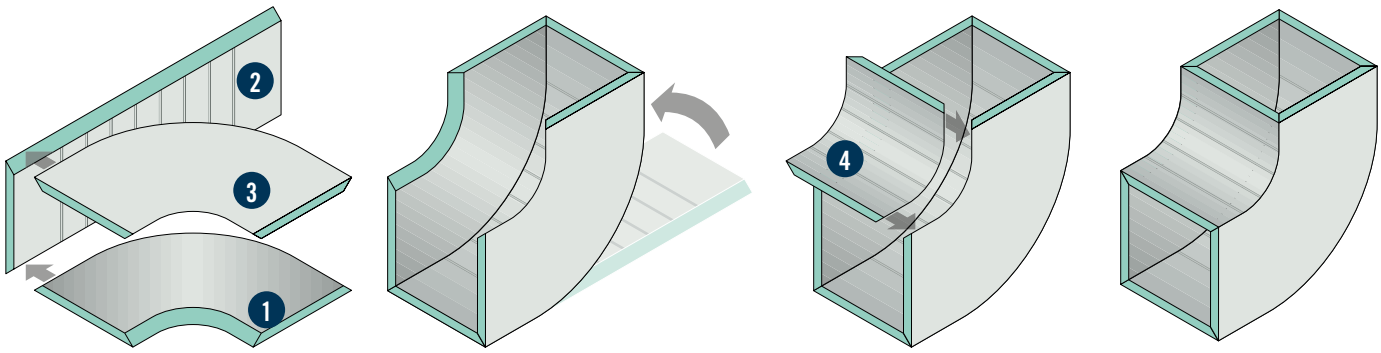


N.B. ribbings on pieces to be bent are realized with an electric plate bending roll or the manual bending machine

assembly

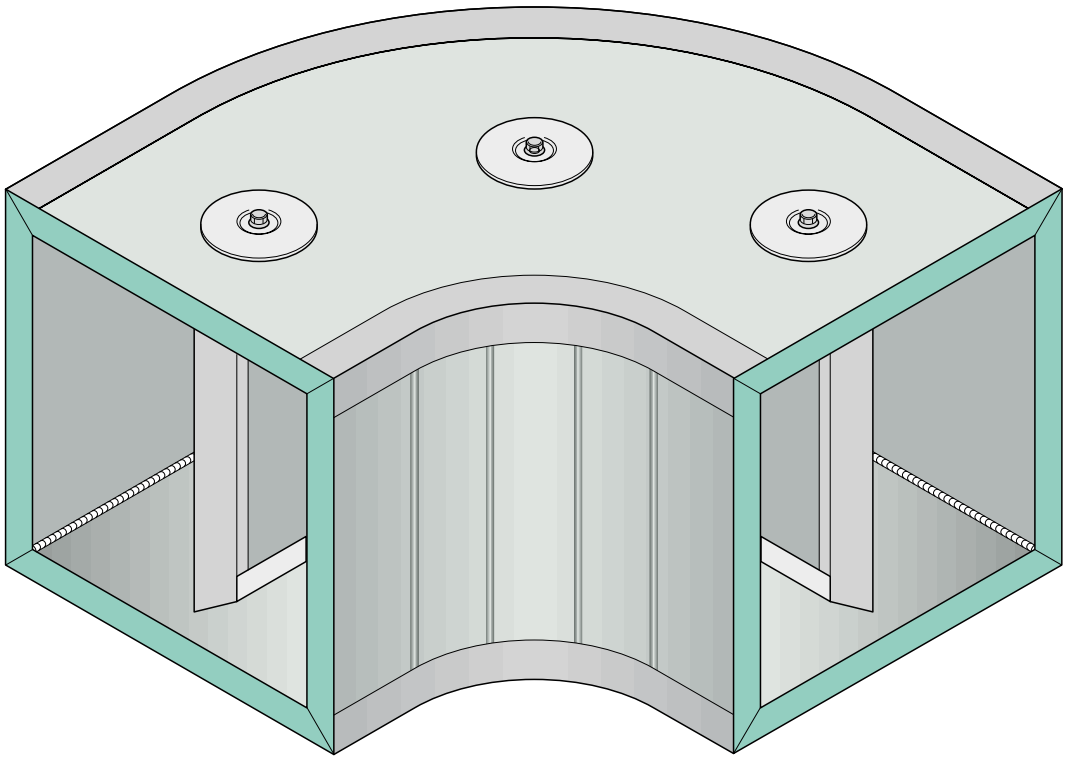


step-by-step assembly

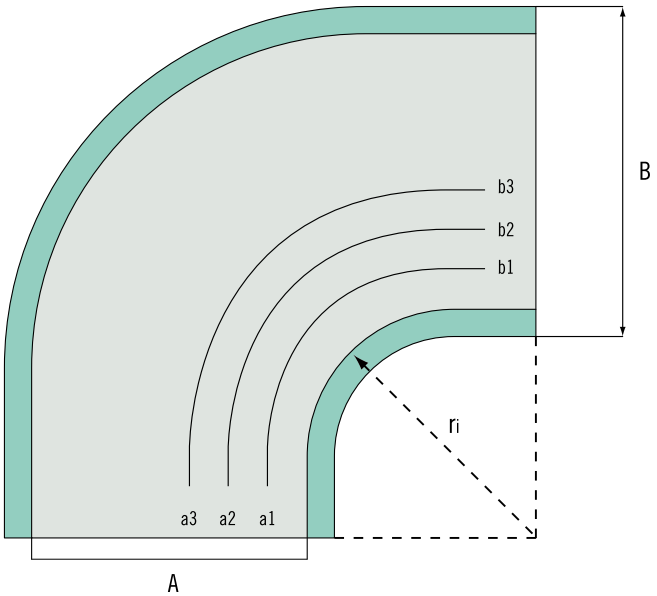


Then, proceed with the pressing, taping and siliconing phases

5. round elbow with splitters



measuring



The number of splitters in an elbow depends on the average radius and on the size of the piece. Splitters may be constructed either in panels or in sheet metal.
Splitters in panels require holes at the ends so that an aerodynamic profile is created. This profile will later be coated with aluminium adhesive tape.
In addition, portions of a U-shaped profile will be fitted at the ends in order to ensure best adhesion.
Use of these splitter flaps is not applicable to curves of less than 45° or to ducts in the smallest sizes.

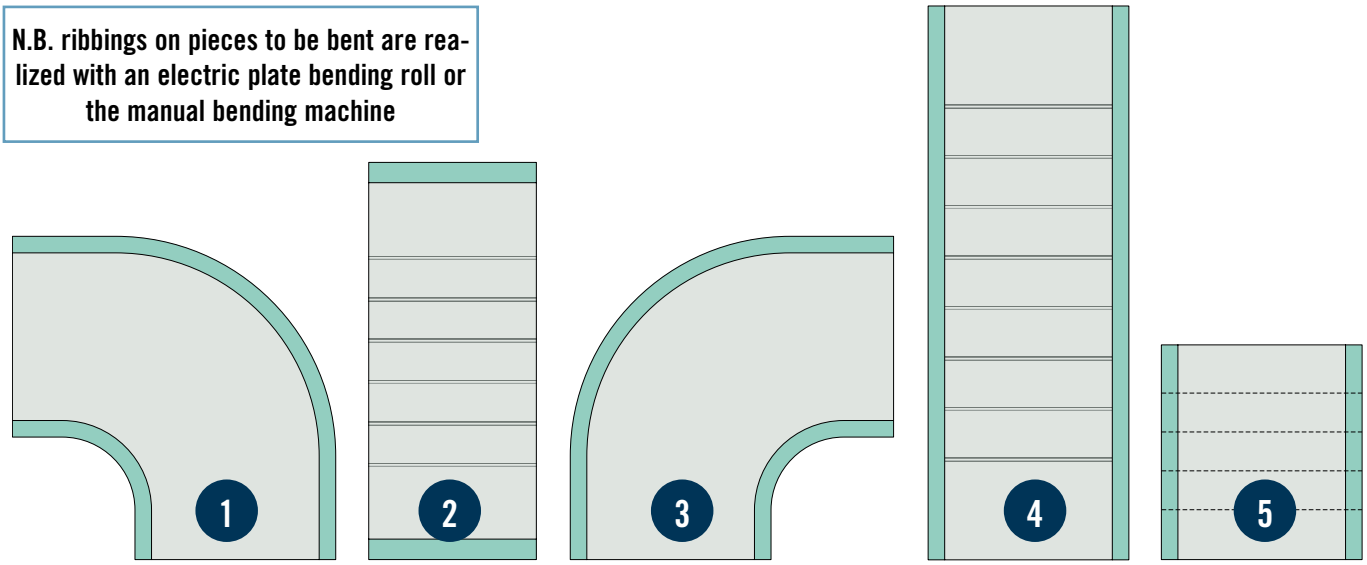
It should not be forgotten that plotted dimensions correspond to the internal dimension of reduction. Therefore, you have to proceed with the cutting with the jackplane blade turned inwards.
Then, proceed with the cutting phase.

Splitter placing				
Duct width A (mm)	N° splitters	Distance between splitters		
		a1	a2	a3
400-800	1	ca. A/3		
>800 - 1600	2	ca. A/4	ca. A/2	
>1600 - 2000	3	ca. A/8	ca. A/3	ca. A/2

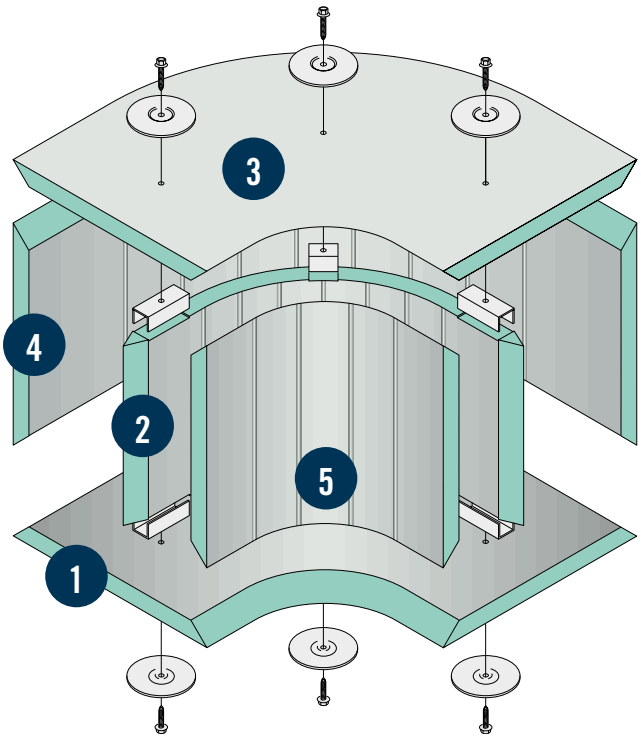
If A=B then b1=a1; b2=a2; b3=a3

components

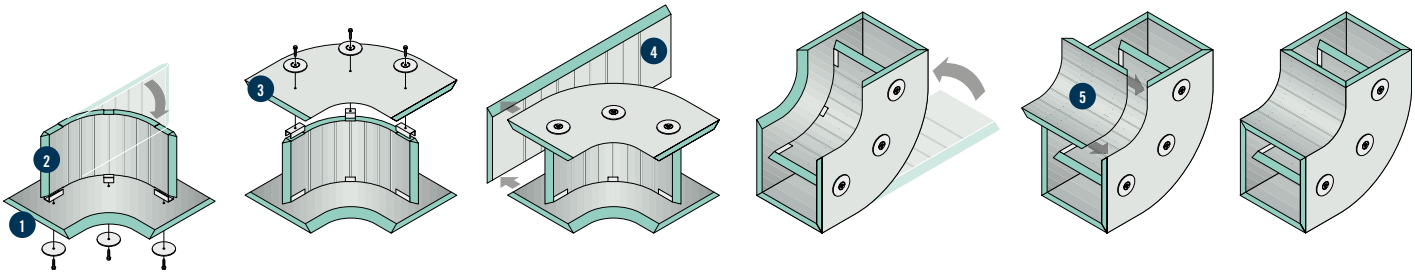
N.B. ribbings on pieces to be bent are realized with an electric plate bending roll or the manual bending machine



assembly

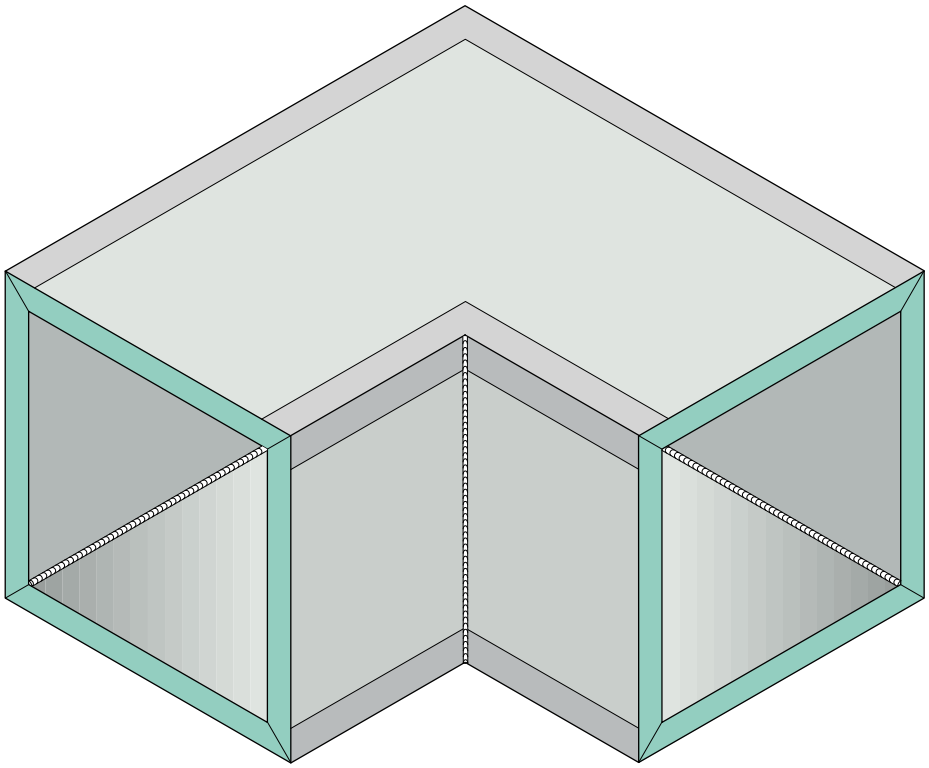


step-by-step assembly



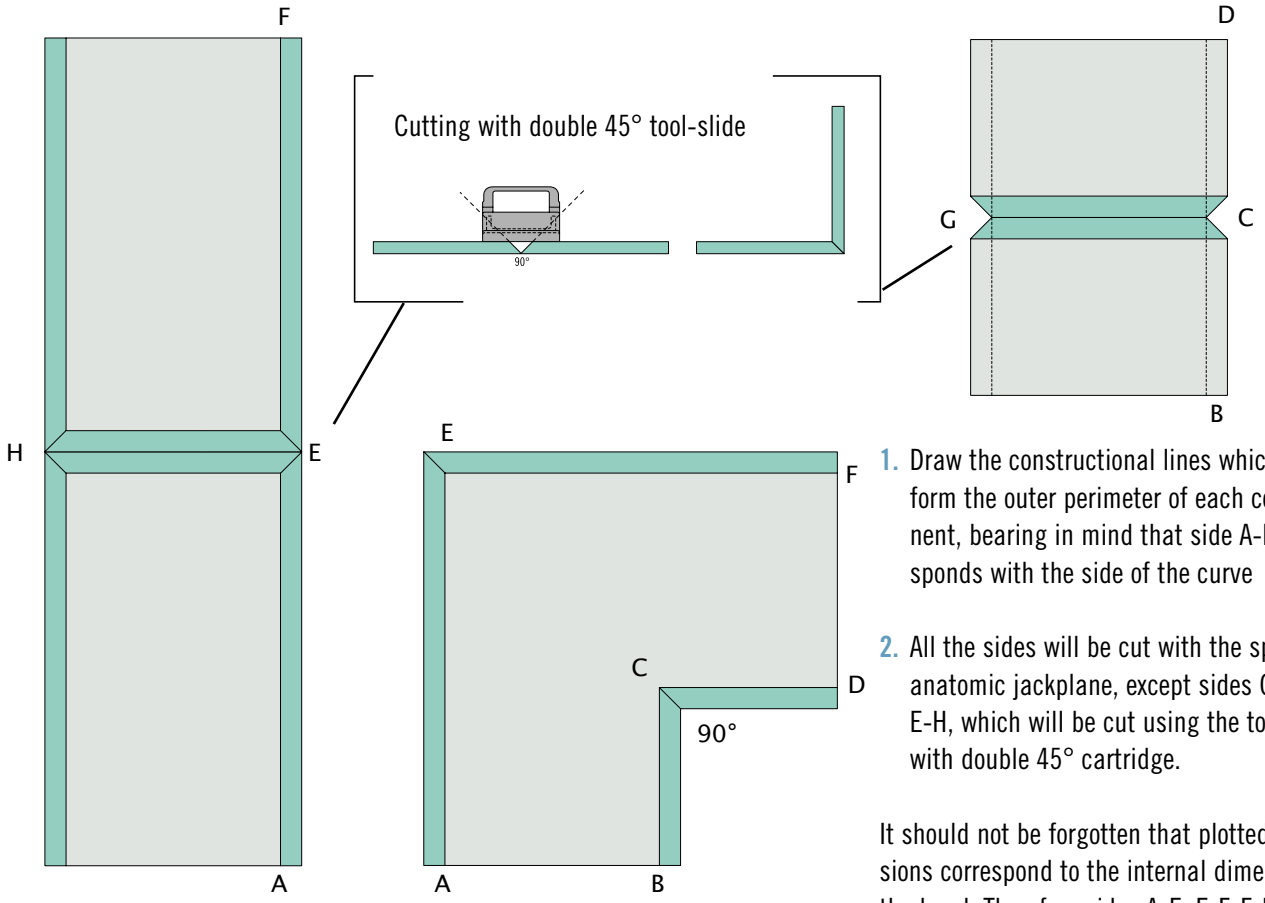
Then, proceed with the pressing, taping and siliconing phases

6. raw edge elbow



raw edge elbow

measuring



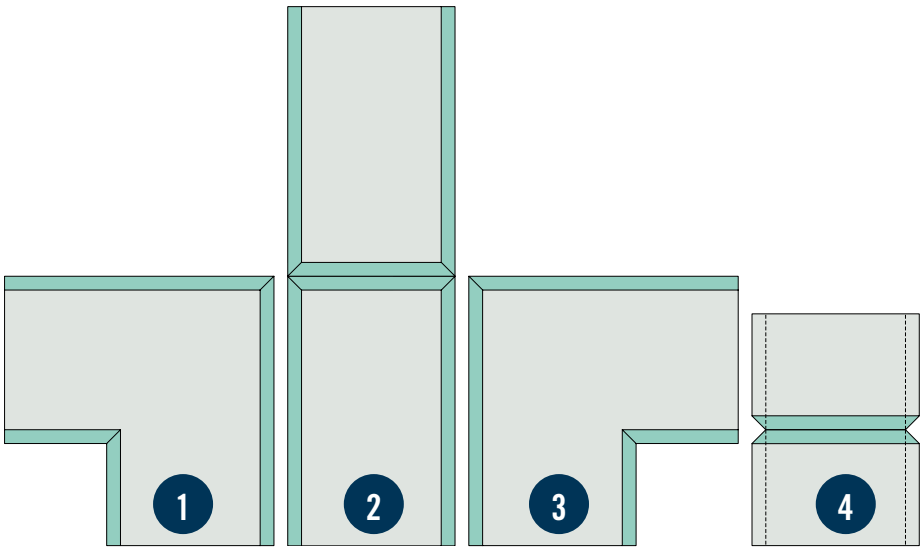
1. Draw the constructional lines which will form the outer perimeter of each component, bearing in mind that side A-B corresponds with the side of the curve

2. All the sides will be cut with the special 45° anatomic jackplane, except sides C-G and E-H, which will be cut using the tool-slide with double 45° cartridge.

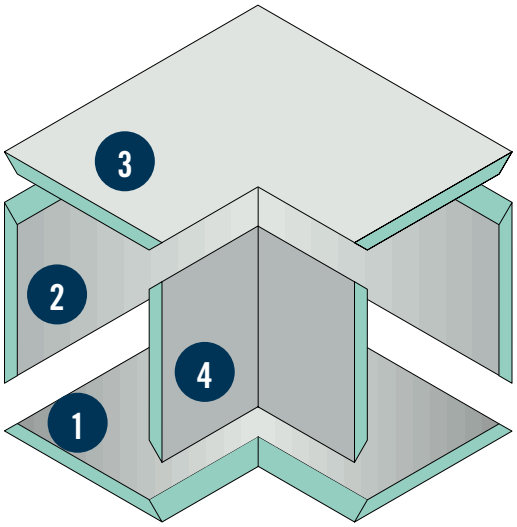
It should not be forgotten that plotted dimensions correspond to the internal dimensions of the bend. Therefore sides A-E, E-F, F, B-C and D-F have to be cut with the jackplane blade turned inwards.

Then, proceed with the cutting phase.

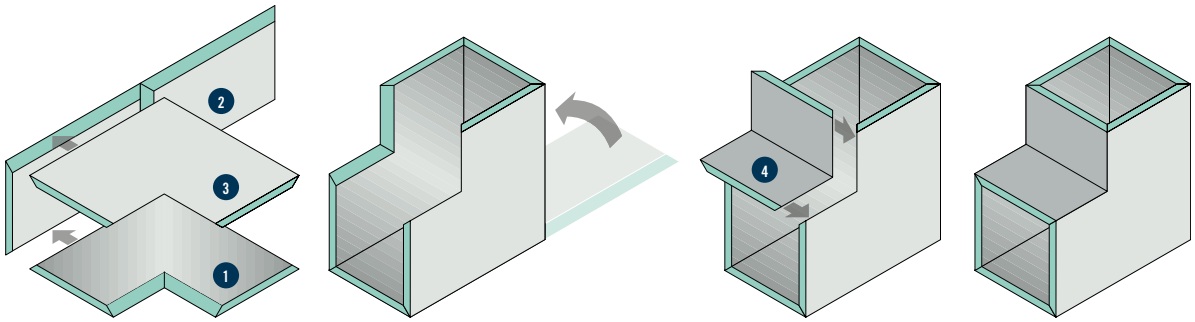
components



assembly

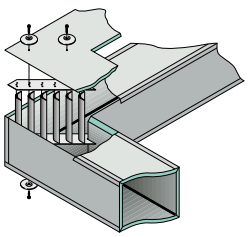


step-by-step assembly



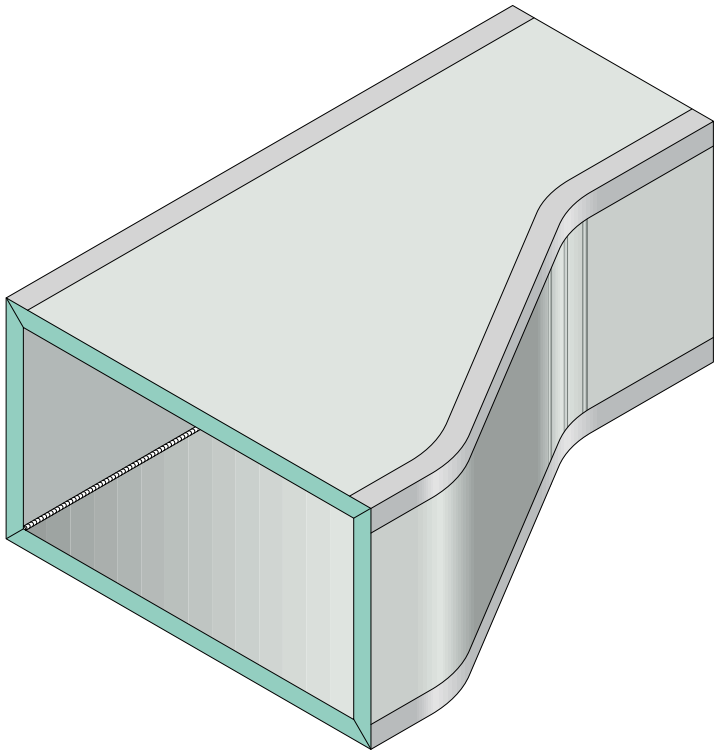
Then, proceed with the pressing, taping and siliconing phases

turning vanes

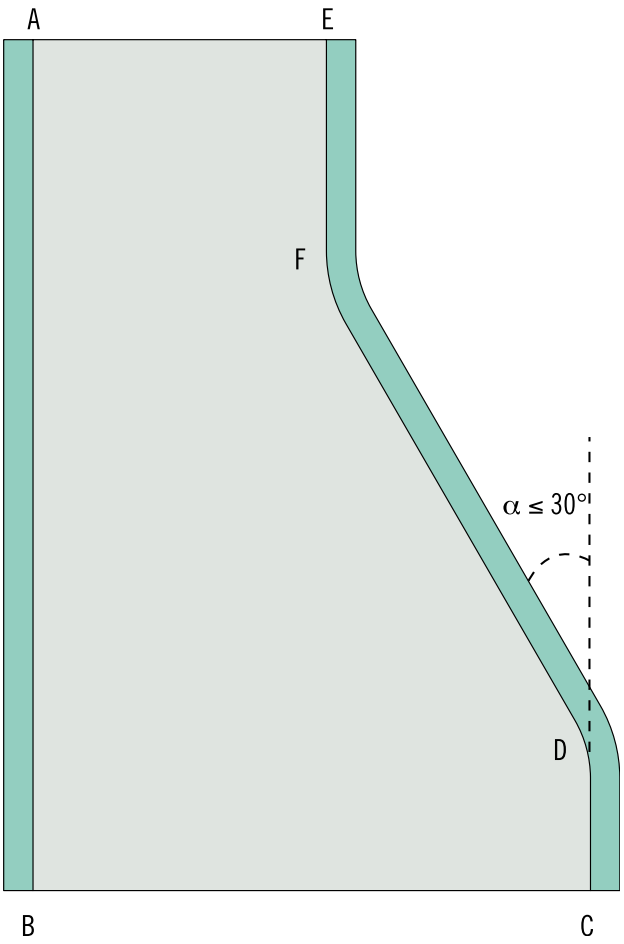


Raw edge elbows, which are used when limitations concerning space make it impossible to fit round elbows, require the use of aluminium turning vanes. See section on “application of accessories - paragraph 19: turning vanes” for details on how to fit these profiles.

7. reductions



measuring



1. Draw A-B, B-C, C-D, A-E and E-F.

1.a Segments C-D and E-F represent the necks in the reduction. These necks must have a minimum length of 50 mm to make it possible to insert the flange.

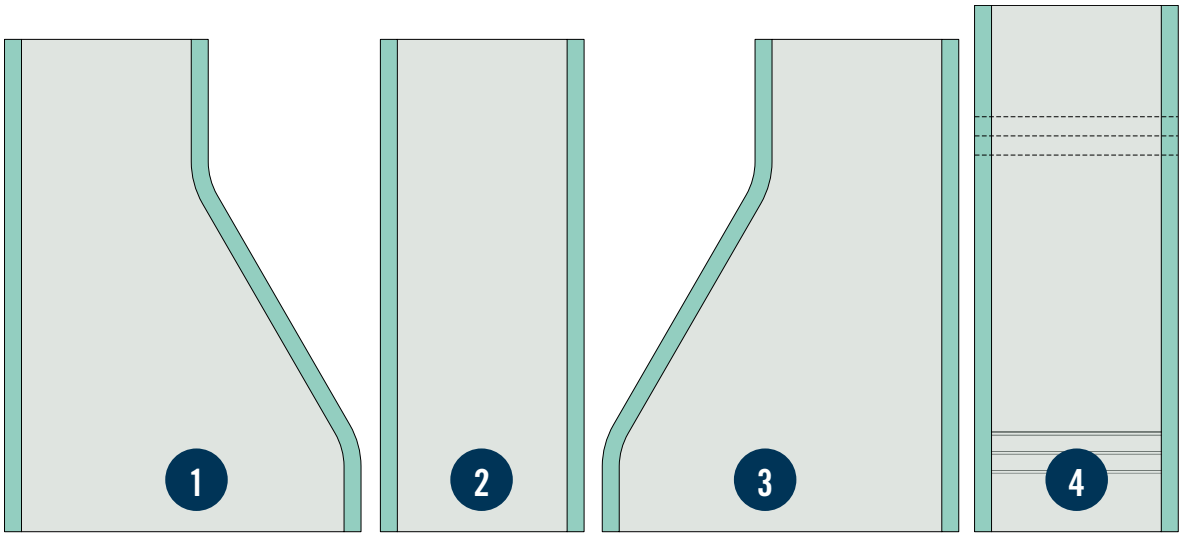
2. Draw segment F-D. This must not have a sloping angle of more than 30°.

3. If the reduction is fitted on more than one side, follow the same procedure on the other sides of the reduction.

It should not be forgotten that the sizes correspond with the inner sizes of the elbows. Therefore, segments A-B and E-C must be cut using the jackplane with the blade facing outwards.

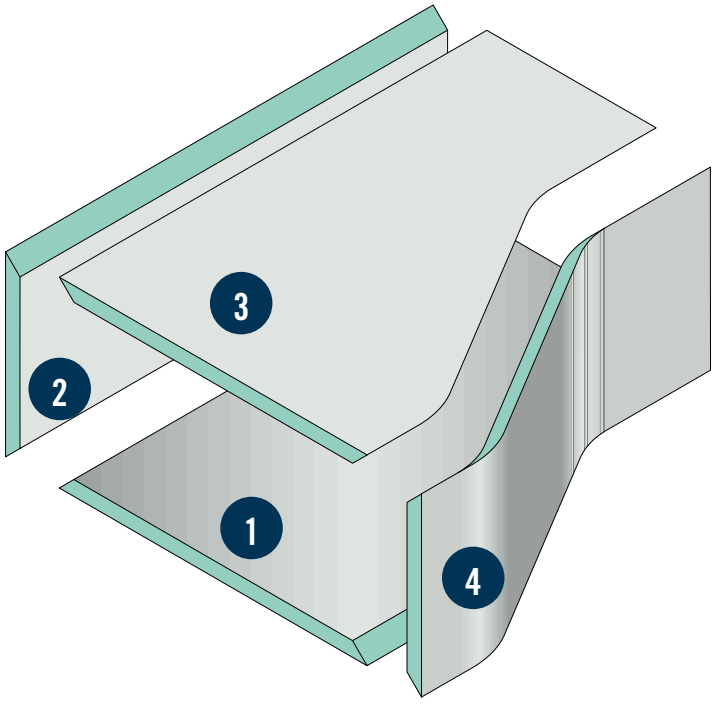
Then, proceed with the cutting phase.

components

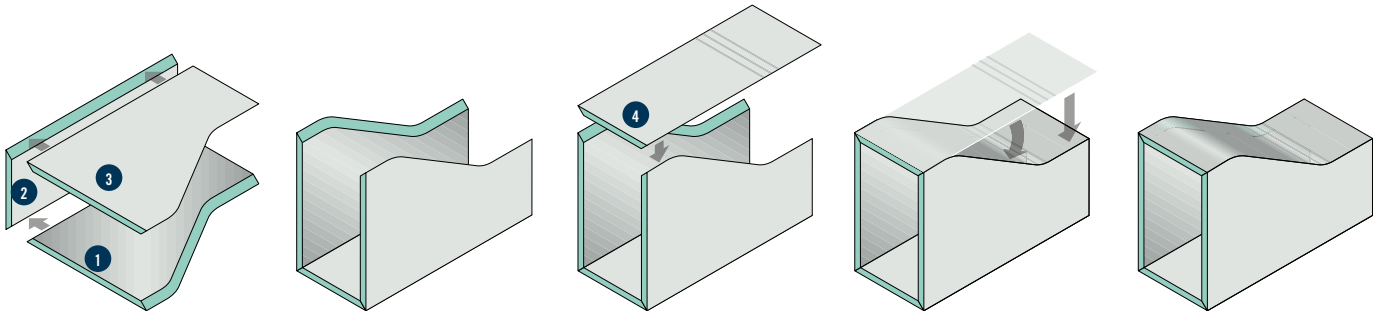


N.B. ribbings on pieces to be bent are realized with an electric plate bending roll or the manual bending machine

assembly

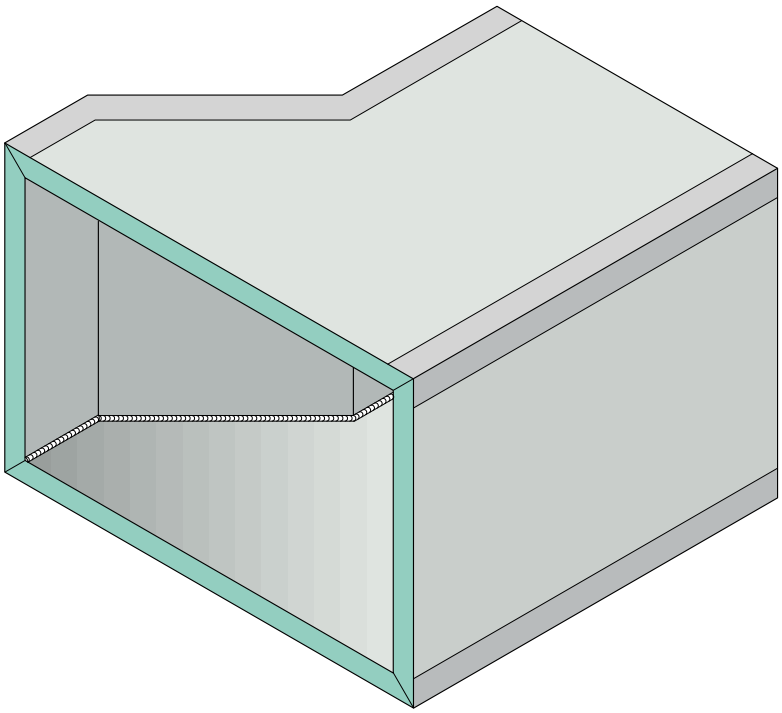


step-by-step assembly

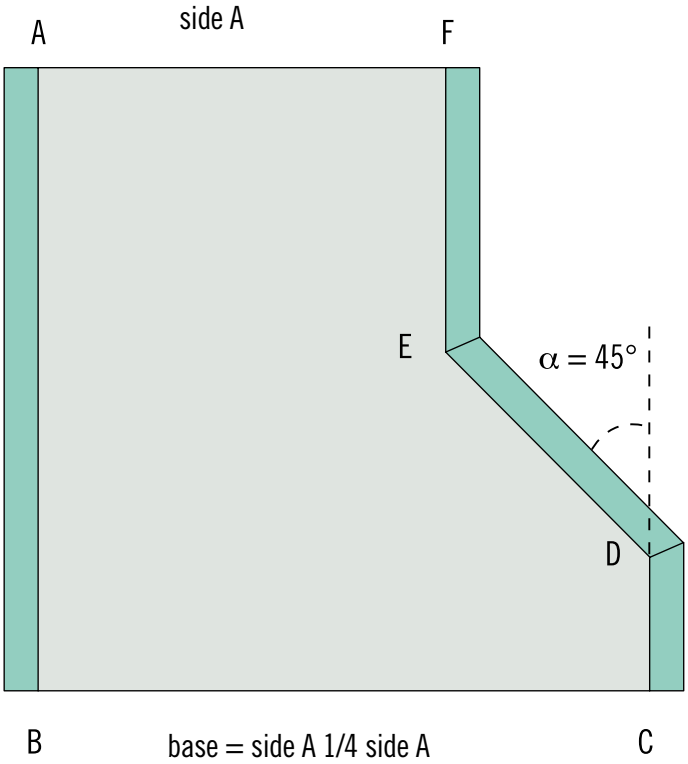


Then, proceed with the pressing, taping and siliconing phases

8. tap -ins



measuring



1. Draw A-B, A-F and B-C.

1.a Segment B-C has a length equal to A-F plus 1/4 of A-F.

2. Draw segment D-C with a minimum length of 50 mm to allow insertion of the flange.

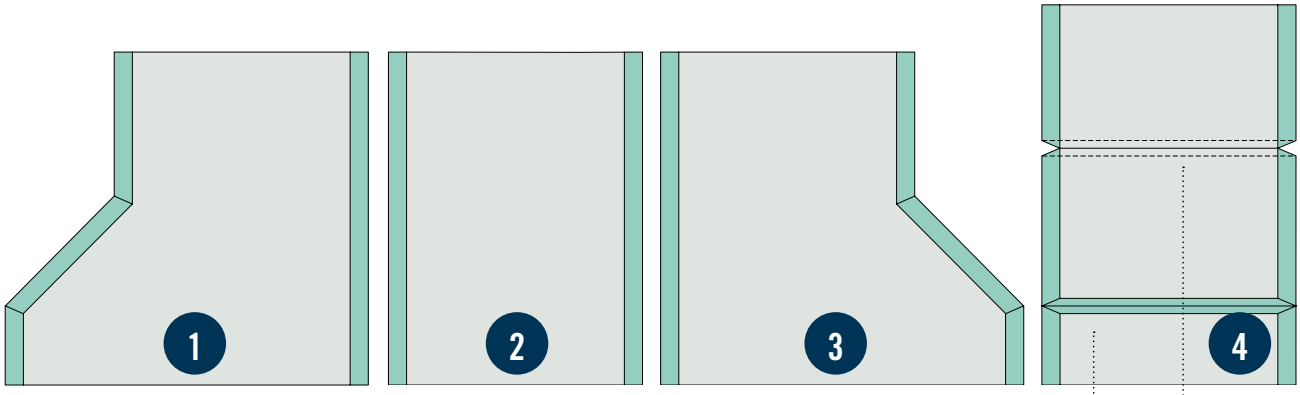
3. Draw segments F-E and E-D.

3.a Segment E-D must be drawn at a sloping angle of 45°.

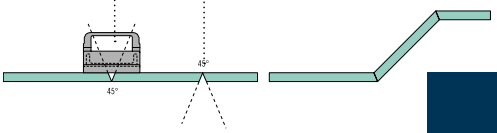
It should not be forgotten that the sizes drawn correspond with the inner dimensions of the elbows. Therefore, segments A-B and F-C should be cut using the jackplane with the blade facing outwards.

Then, proceed with the cutting phase.

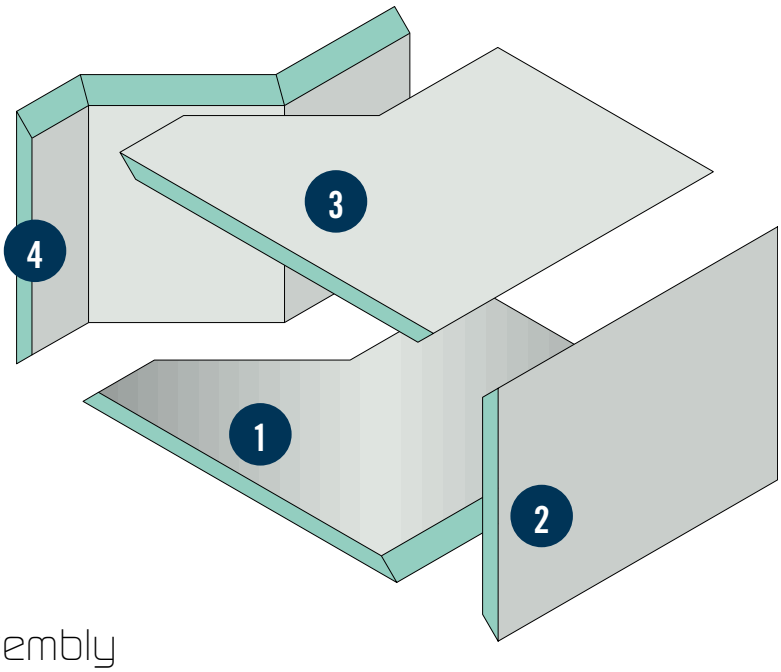
components



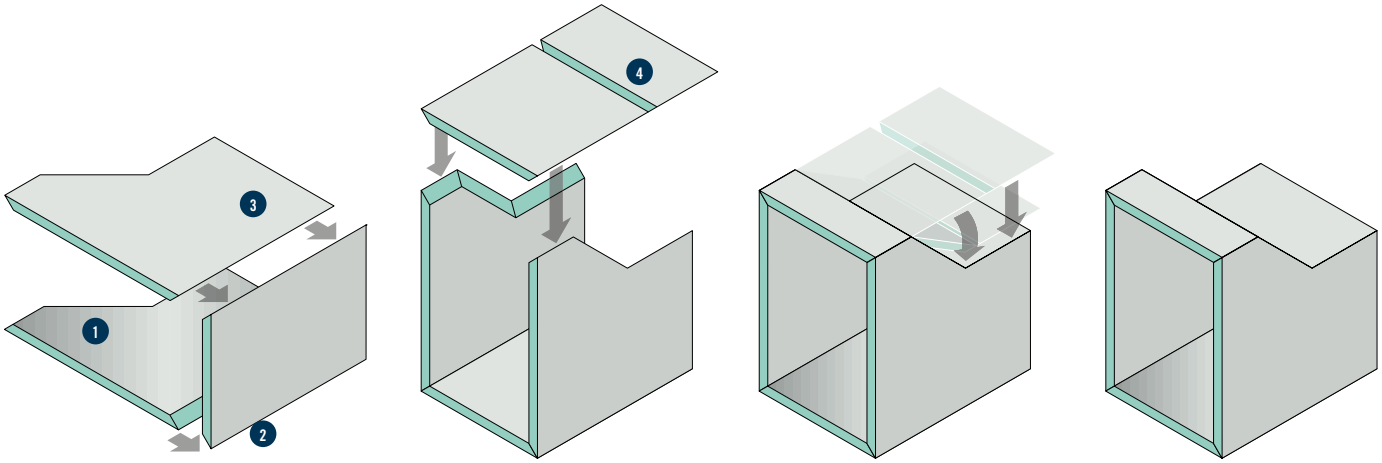
Cutting with double 22,5° tool-slide



assembly

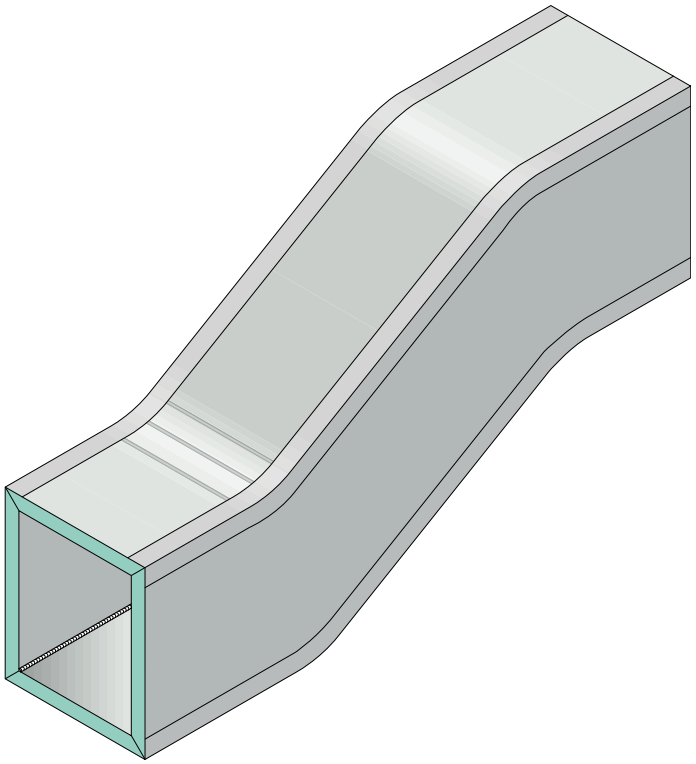


step-by-step assembly

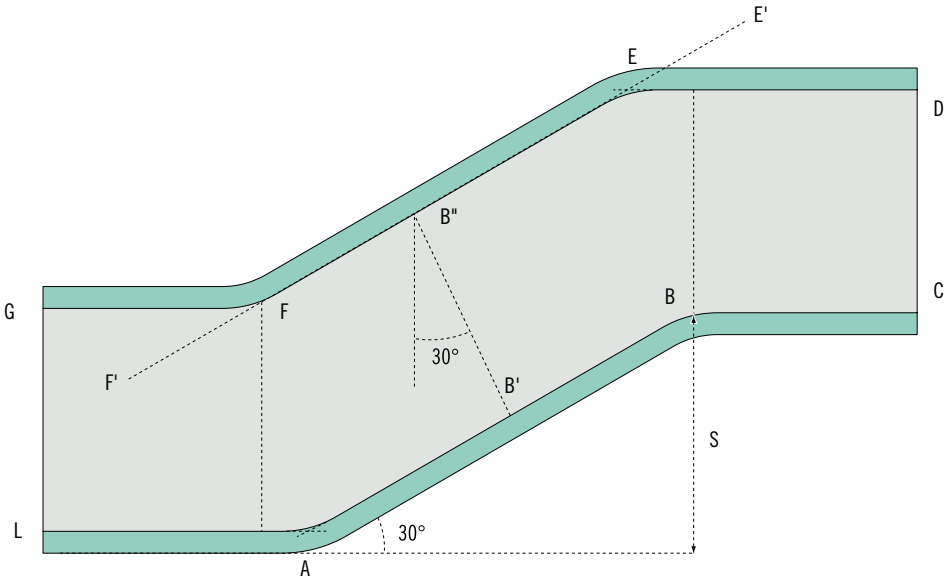


Then, proceed with the pressing, taping and siliconing phases

9. take-offs



measuring



1. Starting from A and knowing the value of s, use a T-square to draw segment A-B at 30°.

2. Draw the constructional lines B-C and C-D

2.a Segment B-C is the neck of the take-off. This neck must have a minimum length of 50 mm in order to allow insertion of the flange.

3. Use a T-square to draw segment B'-B" at 30°. This segment should be the same length as C-D.

4. Draw line F'-E'. This line should be of indeterminate length and should be drawn at a sloping angle of 30°, just like line A-B, which passes through B".

5. From point D draw a horizontal line until it intersects line E'-F'. This will determine point E.

6. Draw line A-L, which should be at least the same length as E-D.

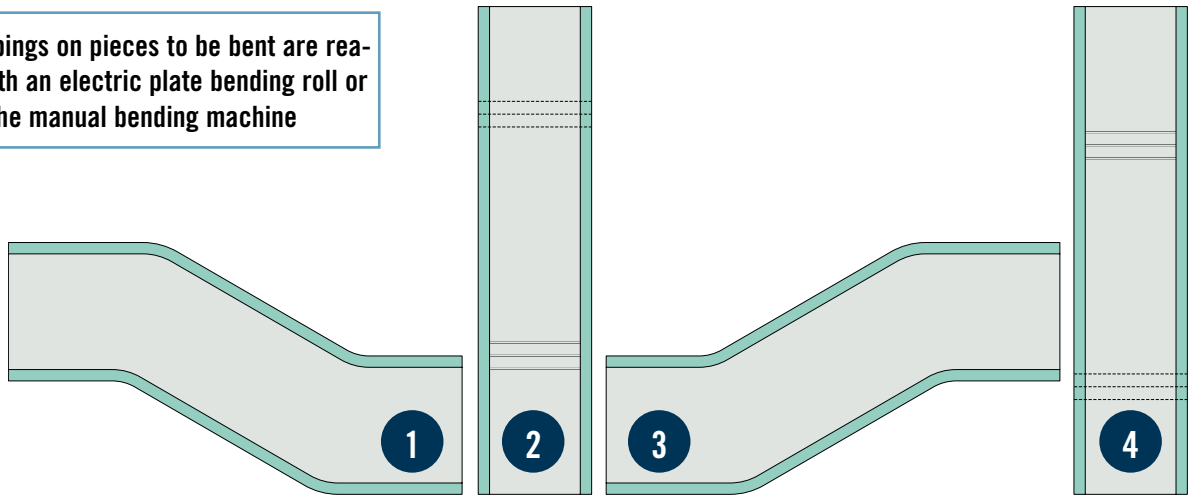
7. Draw lines L-G and G-F

It should be remembered that the sizes drawn correspond with the inner sizes of the offset. Therefore, lines L-A-B-C and D-E-F-G should be cut using the jackplane with the blade facing outwards

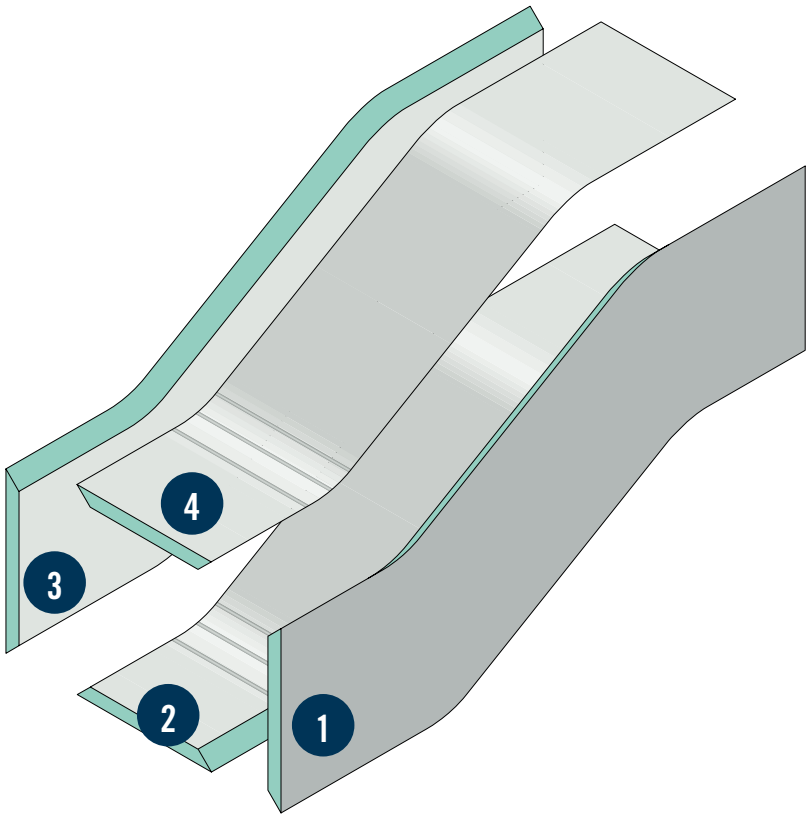
Then, proceed with the cutting phase.

components

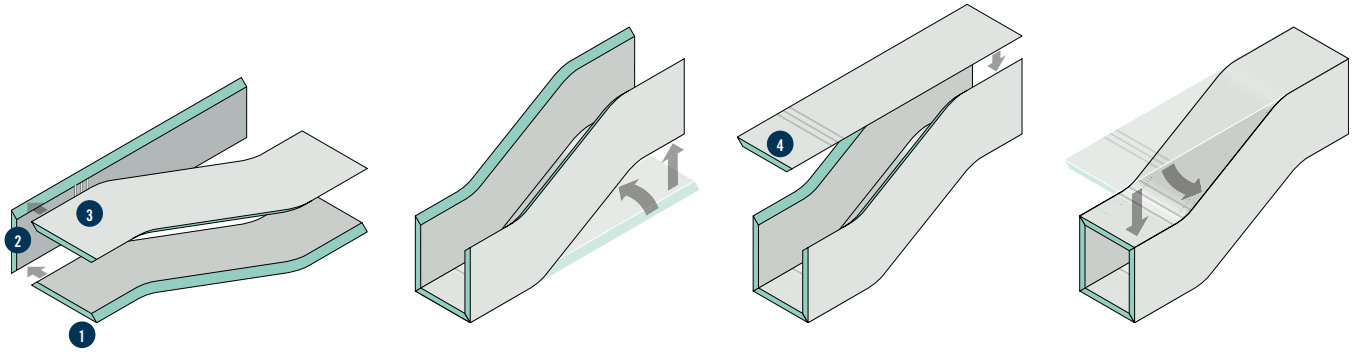
N.B. ribbings on pieces to be bent are realized with an electric plate bending roll or the manual bending machine



assembly

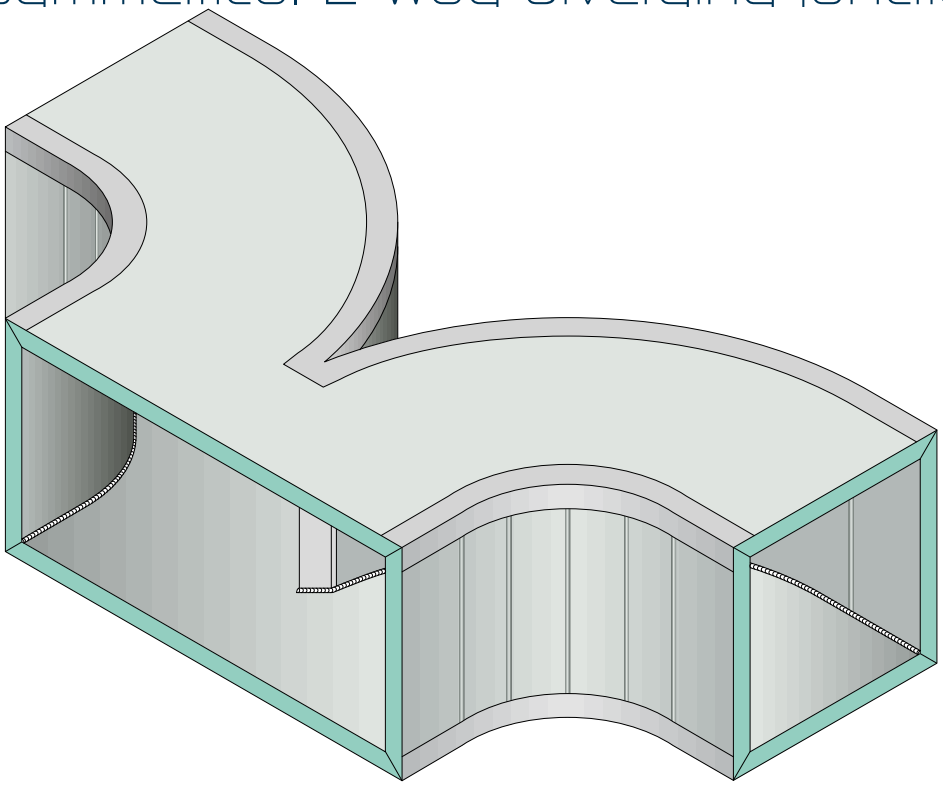


step-by-step assembly

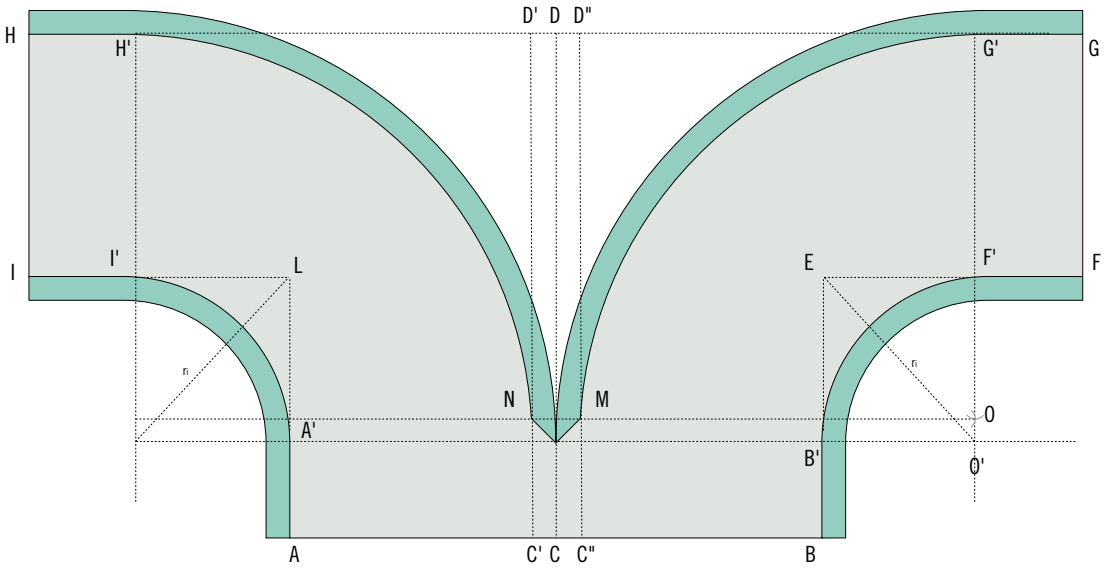


Then, proceed with the pressing, taping and siliconing phases

10. Symmetrical 2-way diverging junctions



measuring

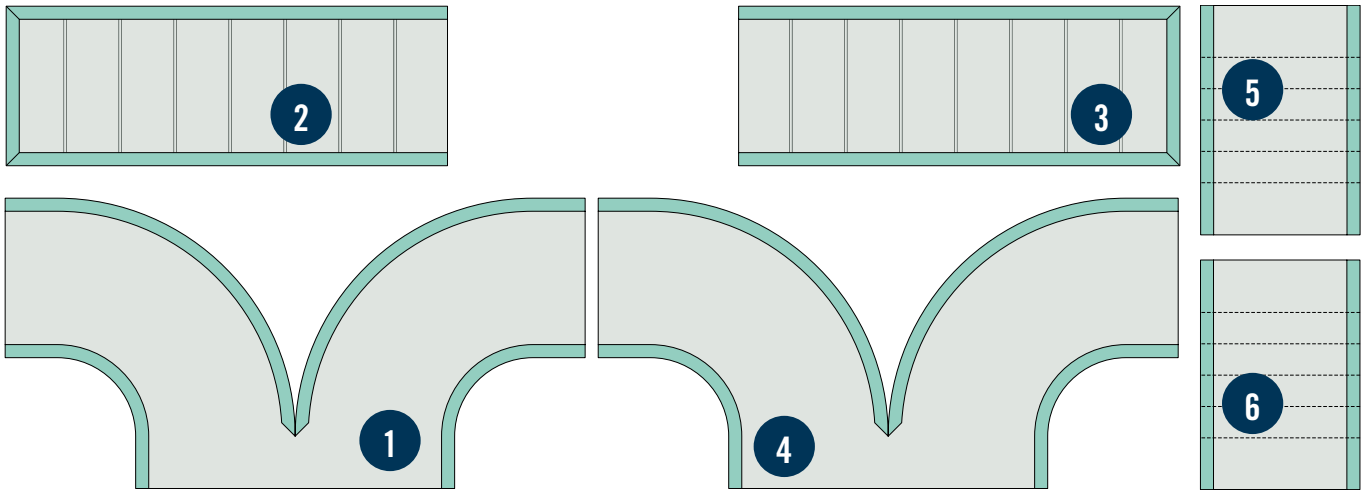


1. Draw lines A-B, B-E, E-F, F-G, G-H, H-I, I-L, L-A. Note: B-E E-F, I-L, L-A all have sizes equal to Ri (see table on page 16) plus the neck (minimum 50 mm)
2. On line A-B draw a constructional line C-D with distances which are proportional to the air flow values
2.a Draw constructional lines C'-D' and C"-D" at a distance of 20 mm from C-D (30 mm if the panel's thickness is 30 mm).
3. The inner arcs B'-F' and A'-I' may be drawn using the round template if the radius is 150 mm, or with the compass.
4. Place the tip of the compass at D", draw points G' and M; the opening of the compass is equal to the sum of the inner radius B'-E added to the smaller of the two sizes at the end where air enters C"-B and those at the end where air goes out F-G.
5. Place the tip of the compass at points G' and M and, with the same opening radius used to determine points G' and M, find point O.
5.a Point O is the same both for the inner radius and for the outer radius if the elbow has a constant section (O=O'). If the elbow is asymmetrical, the two centres for drawing arcs M-G' and B-F will be different (O≠O').
6. Place the compass at O, open the radius to reach M and draw arc M-G'.
7. Proceed in the same way to draw the left diverging junction.

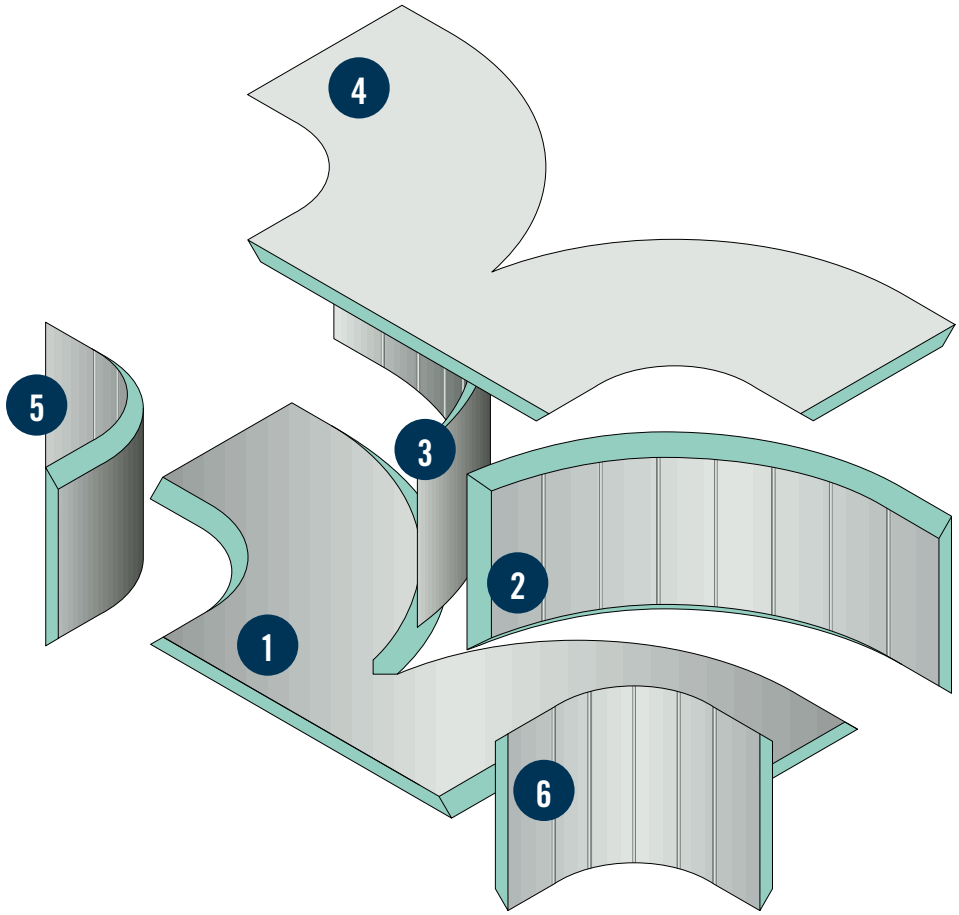
It should be remembered that the sizes drawn correspond with the inner sizes of the diverging junctions. Therefore, lines I-A, B-F, M-G, C'-H should be cut using the jackplane with the blade facing outwards.

Then, proceed with the cutting phase.

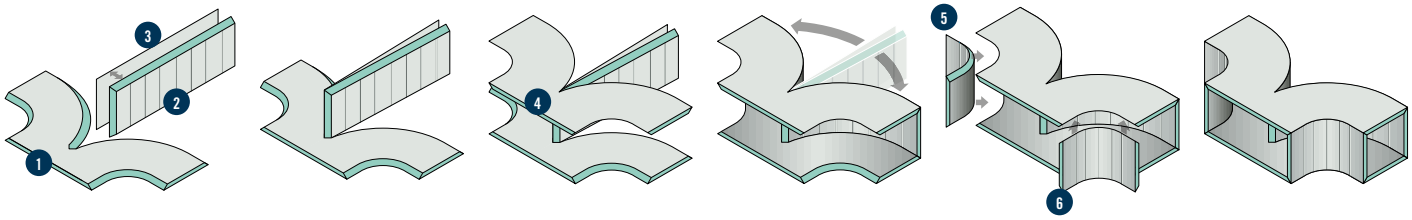
components



assembly

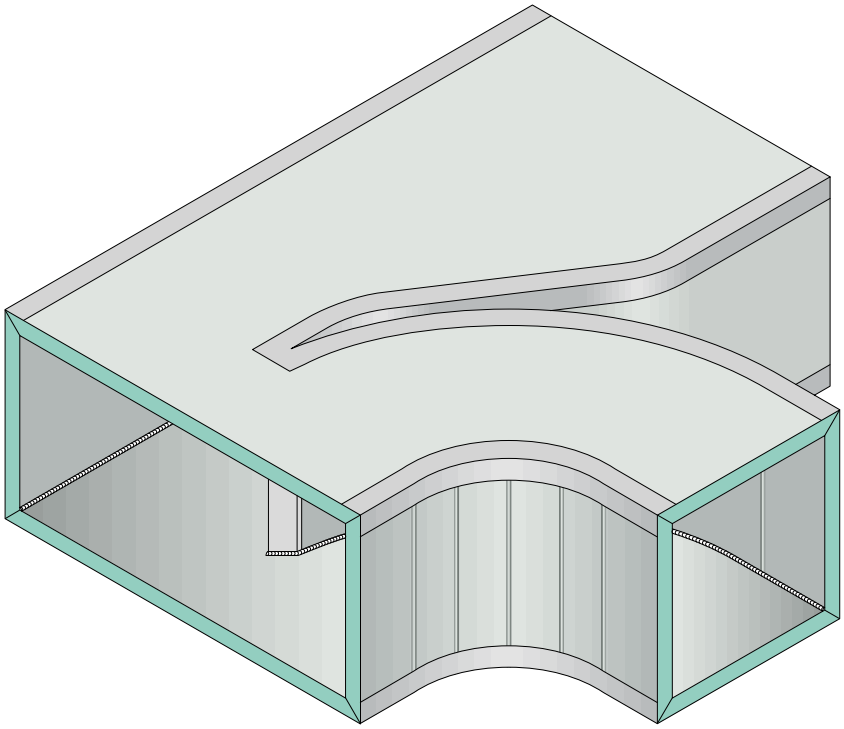


step-by-step assembly

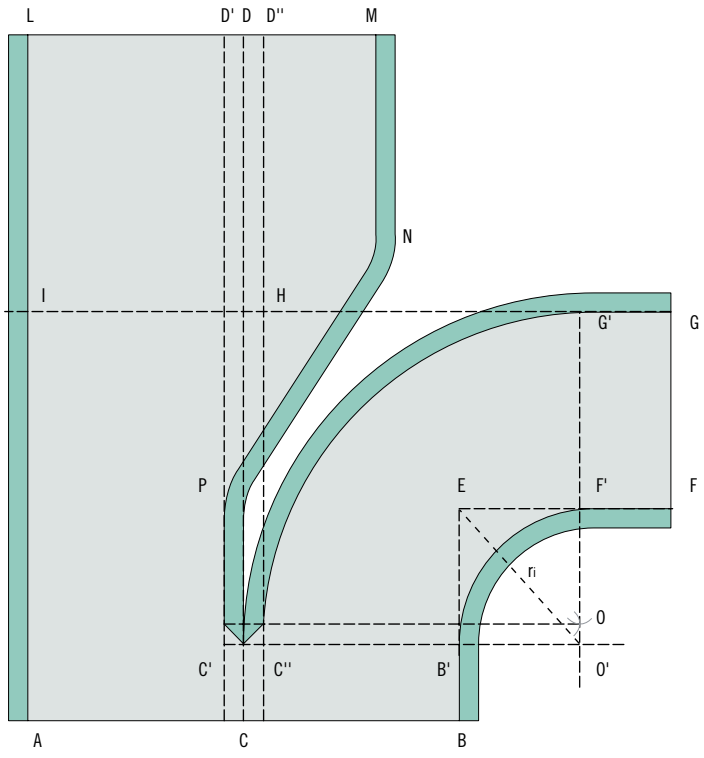


Then, proceed with the pressing, taping and siliconing phases

11. asymmetrical 2-way diverging junction



measuring



1. Draw lines A-B, A-L, B-E, E-F, F-G, G-I. Note: B-E and E-F are in sizes which equal to Ri (see table on page 16) plus the neck (minimum 50 mm)
2. On line A-B draw the construction line C-D with sizes which are proportional to the air flow values.

2a. Draw the construction lines C'-D' and C"-D" – on the left and on the right respectively – at a distance of 20 mm from line C-D (30 mm if the panel being used has a thickness of 30 mm).

3. The inner arc B'-F' may be drawn using the round template if the radius is 150 mm, or with the compass.
4. Place the tip of the compass at H, draw points G' and Q ; the opening radius of the compass is equal to the sum of the inner radius B'-E added to the smaller of the two sizes at the end where air enters C"-B and those at the end where air goes out F-G.
5. Place the tip of the compass at points G' and Q and, with the same opening radius used to determine points G' and Q (see number 4 above), now find point O.

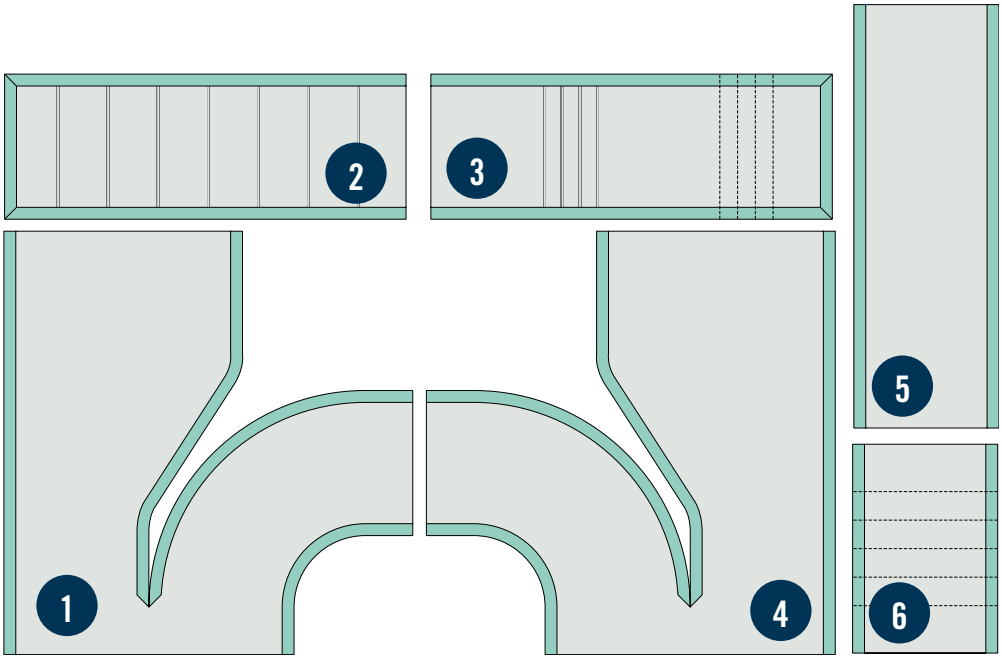
5a. Point O is the same both for the inner radius and for the outer radius if the elbow has a constant section (O=O'). If the elbow is asymmetrical, the two centres for drawing arcs Q-G e B-F will be different (O≠O').

6. Place the tip of the compass at O, open the radius up to G' and draw the arc Q-G'.
7. Draw lines L-M, M-N.
8. To draw line N-P use a T-square at 30°, ensuring that there is a space of at least 45 mm between line N-P and the arc Q-G' (the space should be at least 60 mm if the thickness of the panel being used is 30 mm). This space should make it possible to introduce the central strips.

It should be remembered that the sizes drawn correspond with the inner dimensions of the diverging junctions. As a result, segments B-F, Q-G, R-P, P-N, N-M and A-L should be cut using the jackplane with its blade facing outwards.

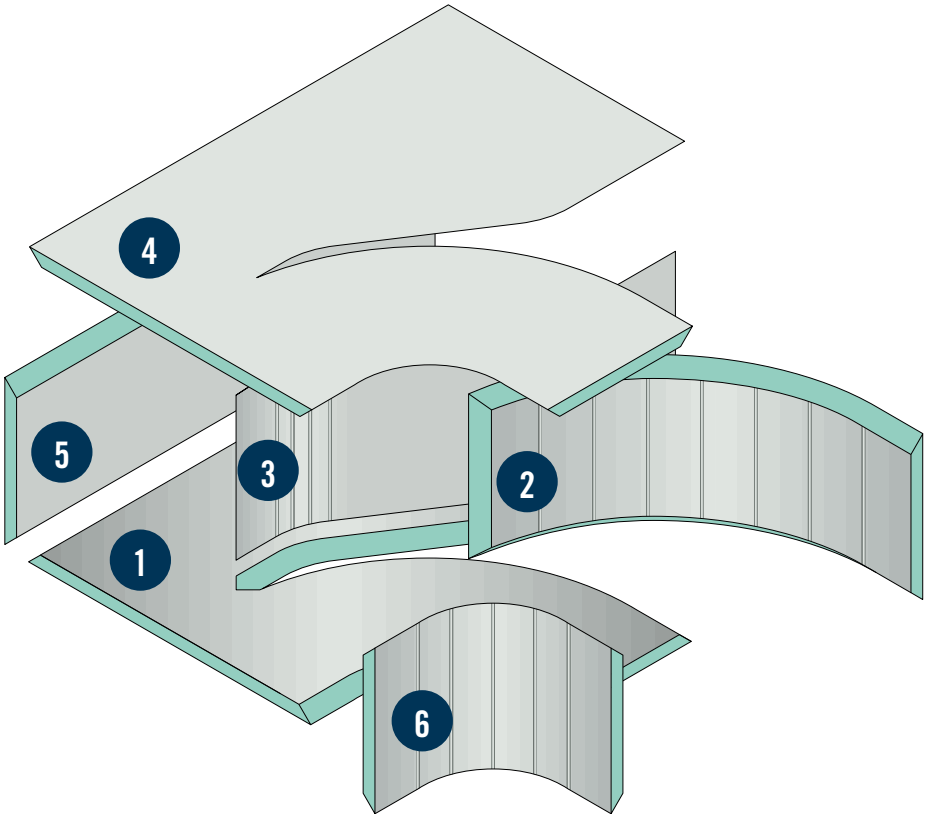
Then proceed with the cutting phase.

components

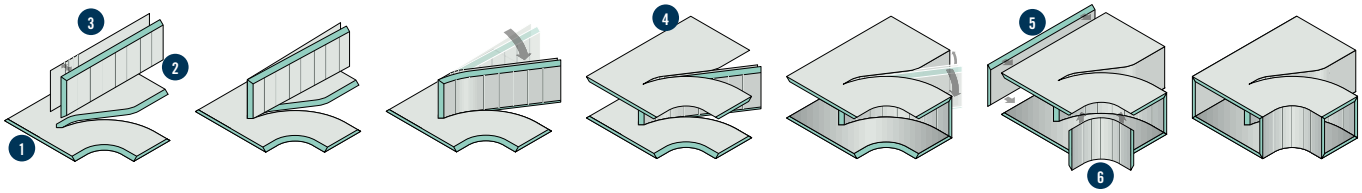


N.B. ribbings on pieces to be bent are realized with an electric plate bending roll or the manual bending machine

assembly

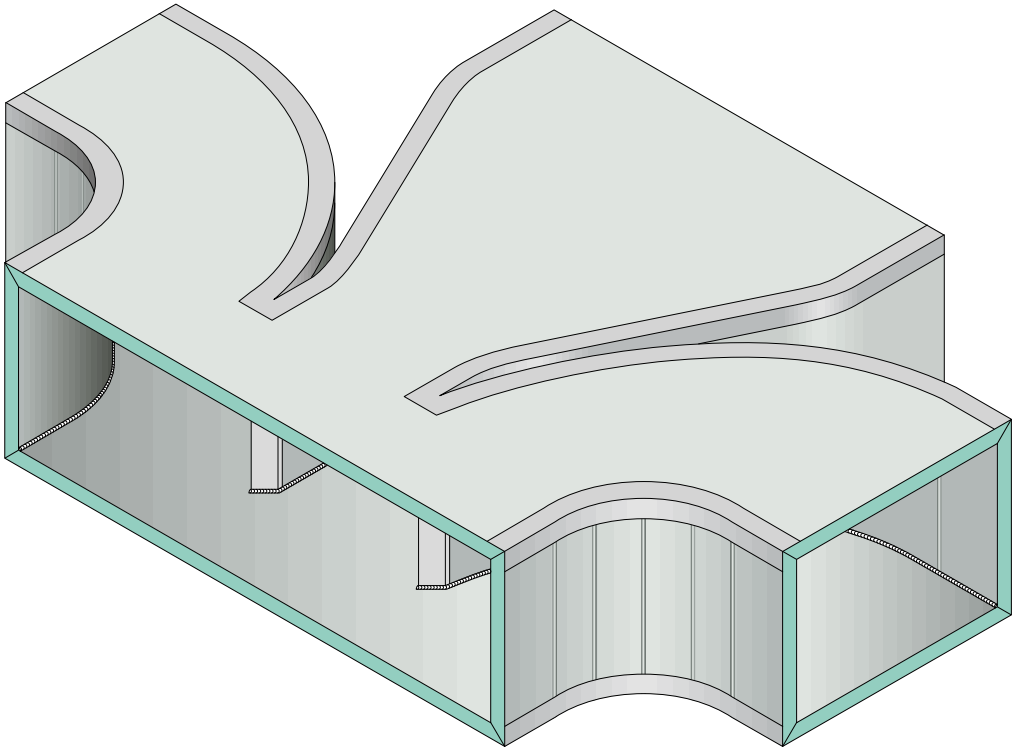


step-by-step assembly

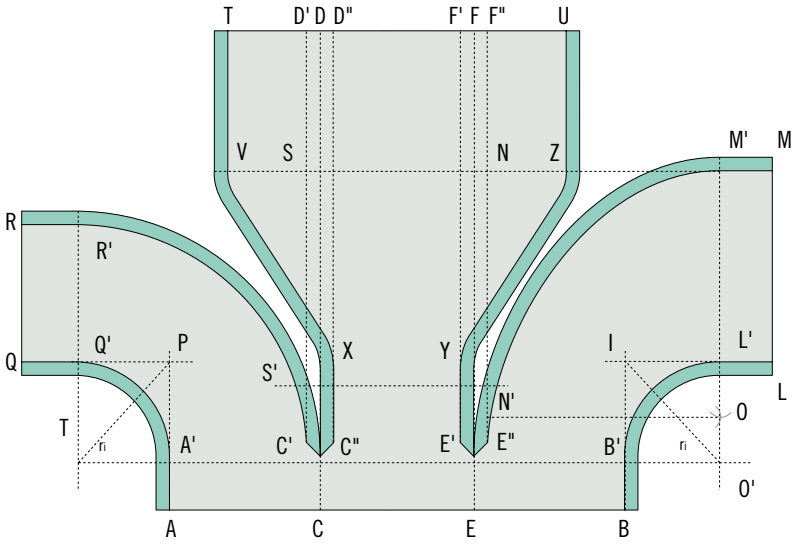


Then, proceed with the pressing, taping and siliconing phases

12. 3-way diverging junction



measuring



1. Draw lines A-B, B-I, I-L, L-M, A-P, P-Q, Q-R e T-U. Note: B-I, I-L, P-Q, P-A are in sizes equivalent to Ri (see table on page 16) plus the neck (minimum 50 mm)

2 On line A-B, draw the construction lines C-D and E-F at distances which are proportional to the air flow values.

2.a Draw lines C'-D', C"-D", E'-F', E"-F", at a distance of 20 mm from lines C-D and E-F (30 mm if the panel being used has a thickness of 30 mm).

3. The inner arc B'-L' may be drawn using the round template if the radius is 150 mm, or using the compass.

4. Placing the tip of the compass at N, draw points M' and N'. The opening radius of the compass is equal to the sum of the inner radius B'-I plus the smallest of the two sizes at the end where air enters E"-B' and those at the end where air goes out L-M.

5. Place the tip of the compass at points M' and N' and, using the same opening radius used to find points M' and N', now find point O.

5a. Point O is the same for the inner and the outer radius if the curve has a constant section (O=O') but if the curve is asymmetrical, the two centres used for drawing arcs E"-M' and B'-L' will be different (O≠O').

6. Place the tip of the compass at O, open its radius to reach N' and draw the arc N'-M'.

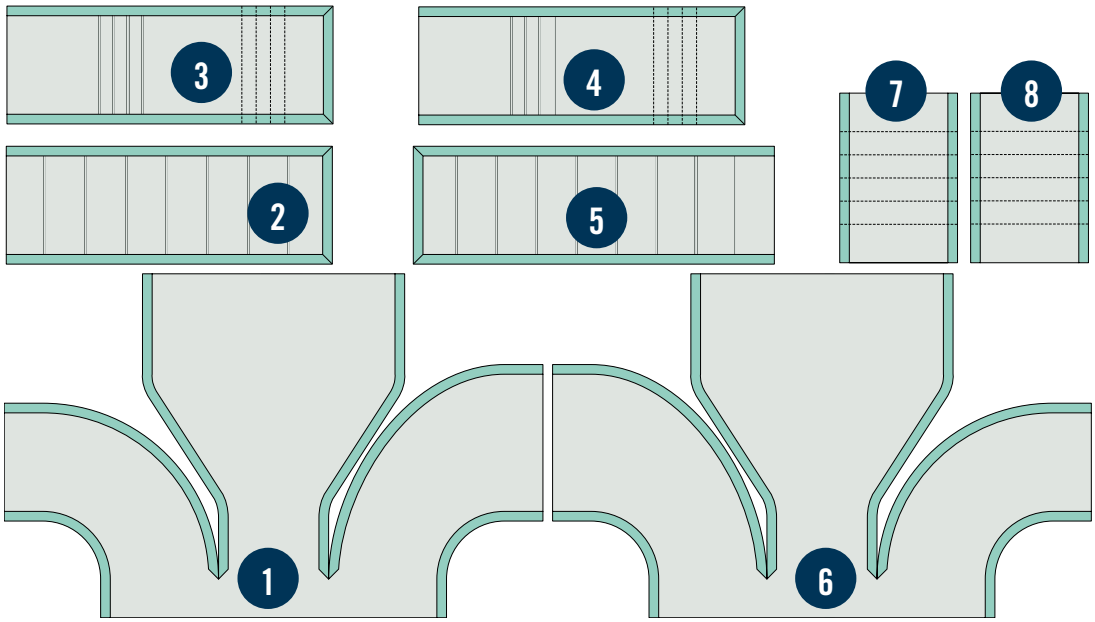
7. To draw segment Z-Y use a T-square at 30°, ensuring that there is a space of at least 50 mm - 70 mm if the panel being used has a thickness of 30 mm - between segment Z-Y and arc M'-E". This space will make it possible to insert the central strips.

8. Follow the same procedure to draw the left diverging junction.

It should be remembered that the sizes drawn correspond with the inner dimensions of the diverging junction. Therefore, segments B-L, M-E", U-Z-Y-E', T-V-X-C", R-C' and Q-A, must be cut using the jackplane with the blade facing outwards.

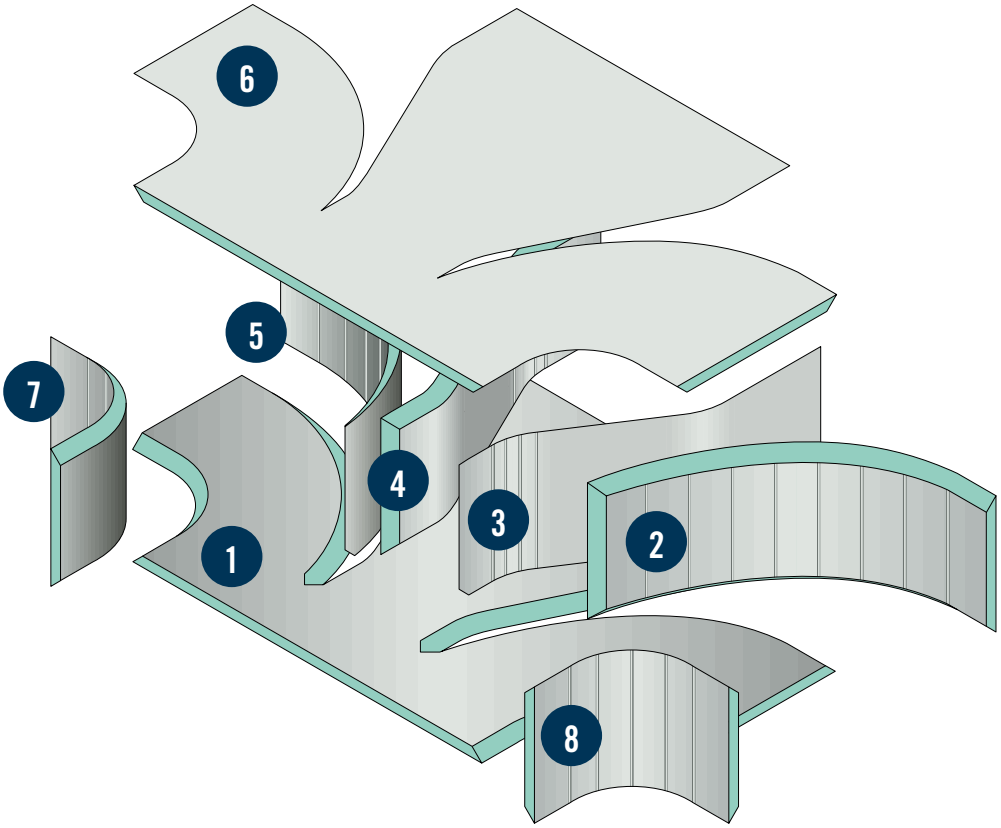
Then proceed with the cutting phase.

components

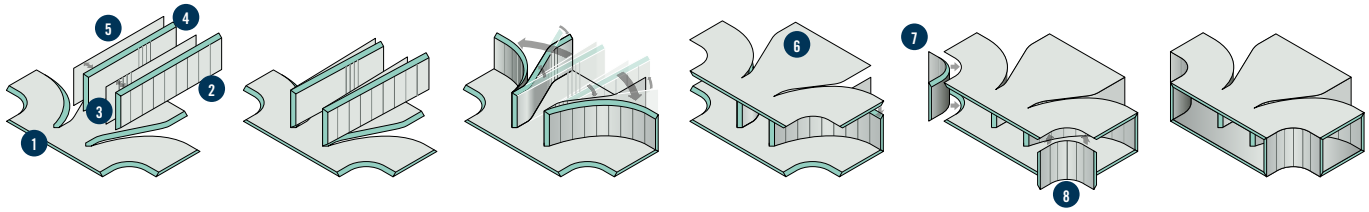


N.B. ribbings on pieces to be bent are realized with an electric plate bending roll or the manual bending machine

assembly

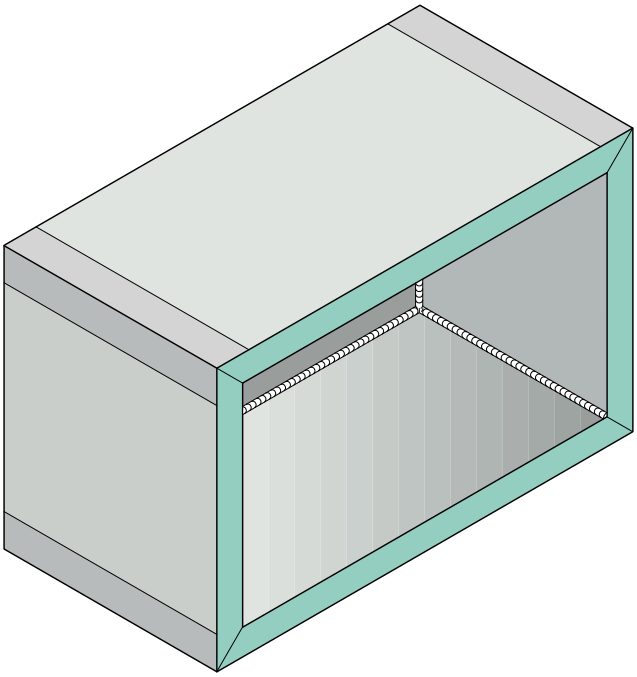


step-by-step assembly

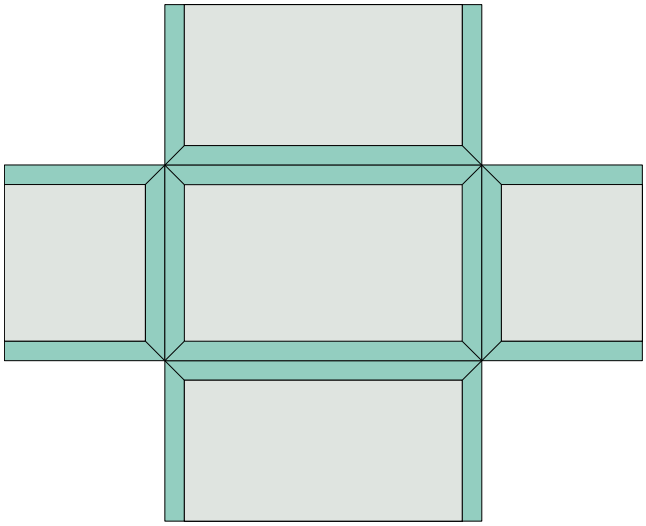


Then, proceed with the pressing, taping and siliconing phases

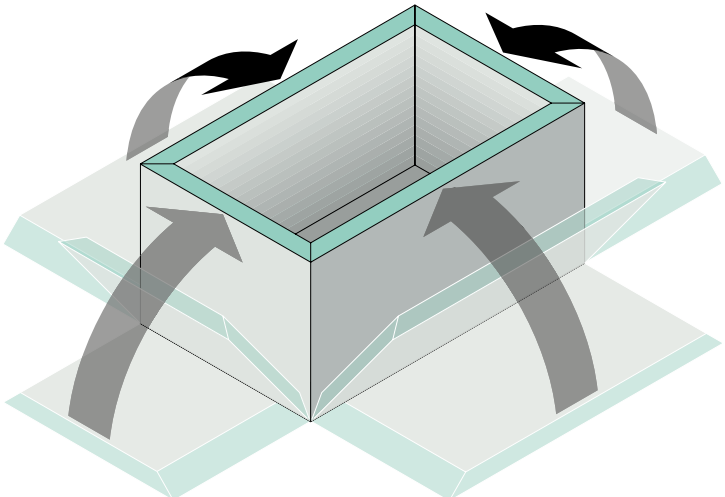
13. plenum



cutting the pieces

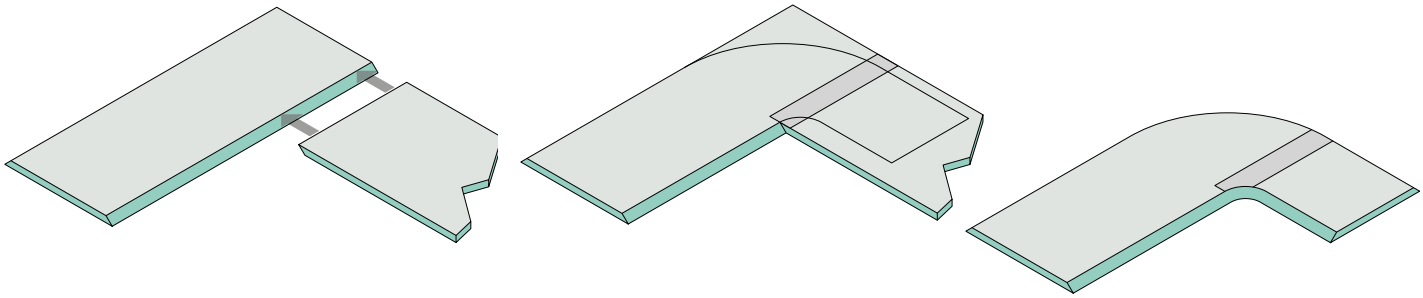


assembly

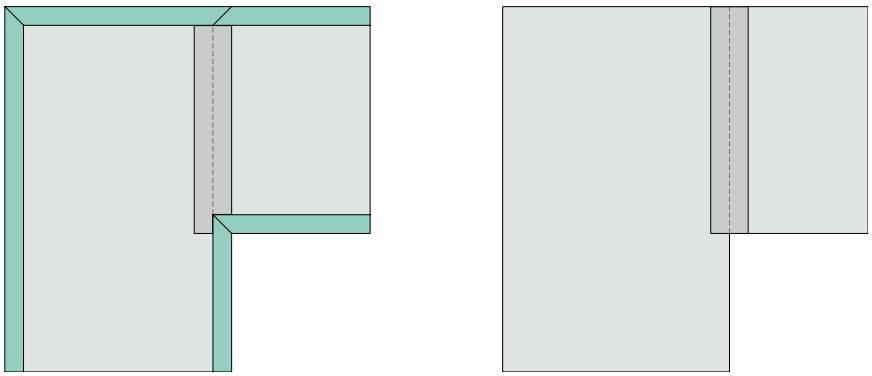


14. construction using the strips method

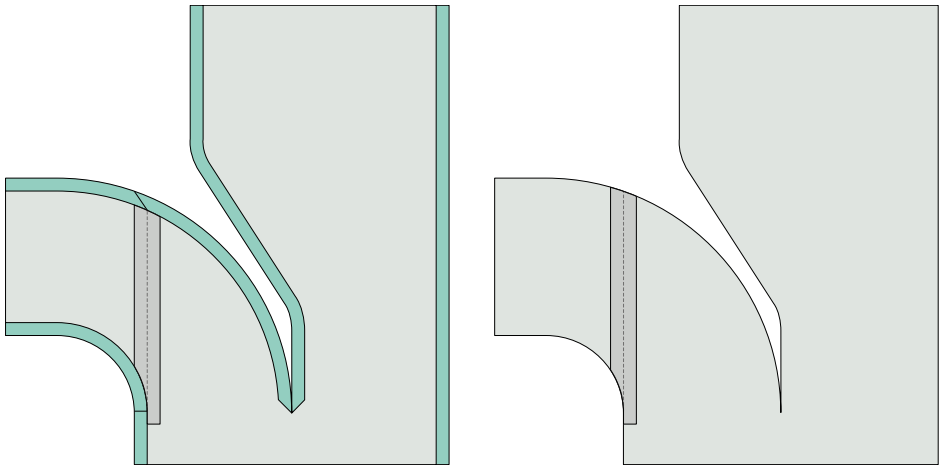
round elbow



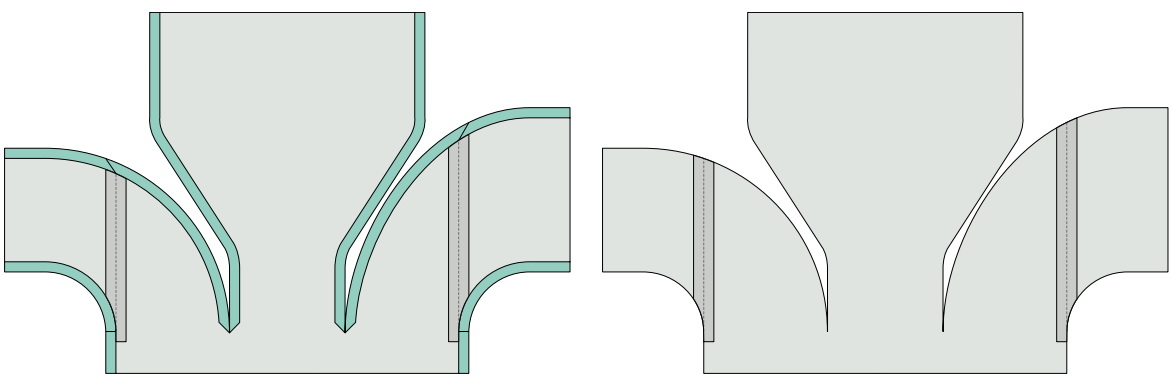
raw edge elbow



2-way diverging junction



3-way diverging junction

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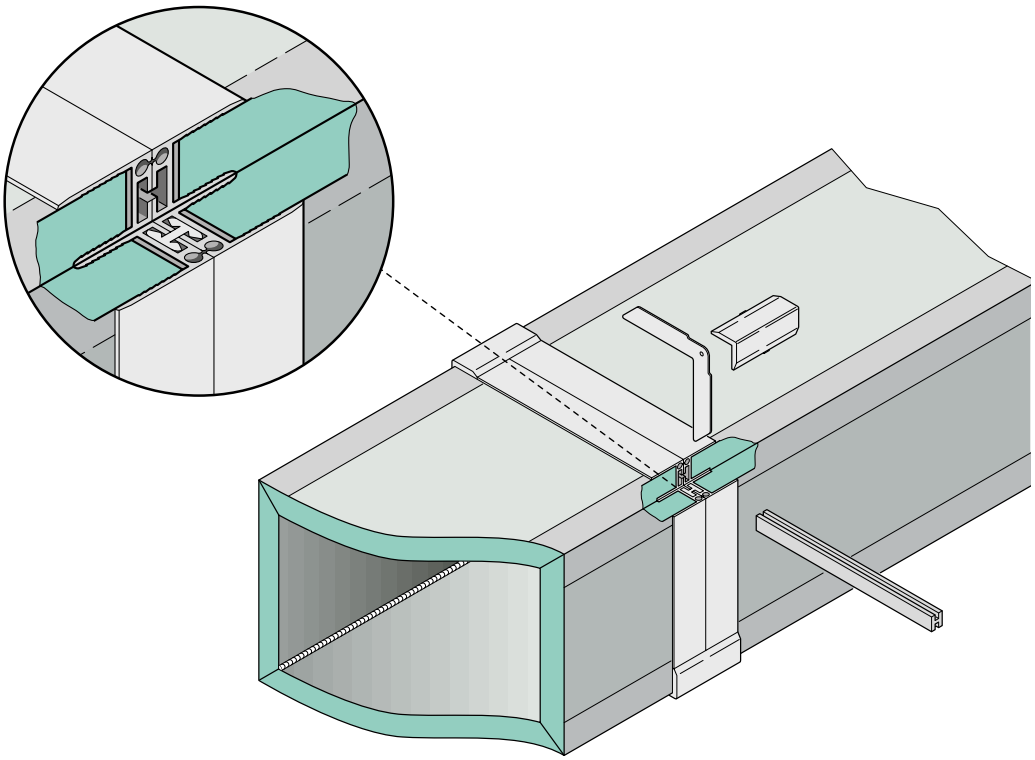
application of accessories

15. invisible flange



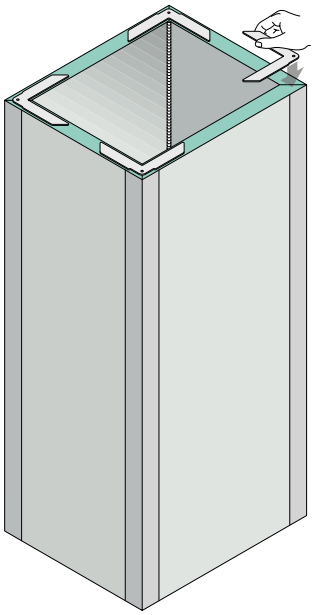
Measuring

Four pieces of invisible flange (cod. 21FN01 for 20 mm aluminium model - cod. 21FN06 for 30 mm aluminium model - cod. 21FN02 for 20 mm pvc model - cod. 21FN09 for 30 mm pvc model).
are necessary for each end of the ducts segment to be joined (each joint will require 8 pieces).
The pieces must be cut in the same size as the inner measure of the duct reduced by 2÷3 mm.
Each joint also requires 4 pieces of PVC bayonet and these must be cut in a size which corresponds with the inner size of the duct.

working phases

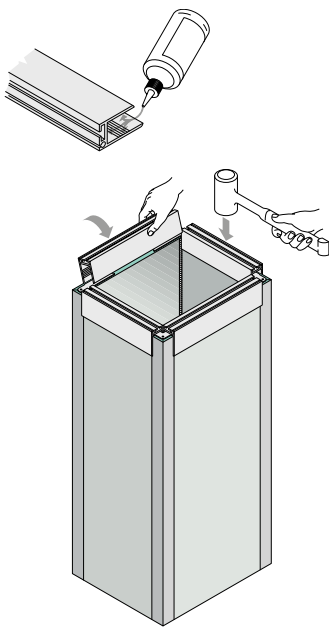
phase 1 » application of reinforcements corners

Before fitting the flanges it is necessary to place the reinforcement corners (cod. 21SQ01 for 20 mm model - code 21SQ02 for 30 mm model).
They must be positioned in the four corners before inserting the flanges (in order to block the reinforcements in between the duct and the flanges).
These corners impart greater rigidity to the duct and eliminate any possible swelling caused by the pressure inside the duct.



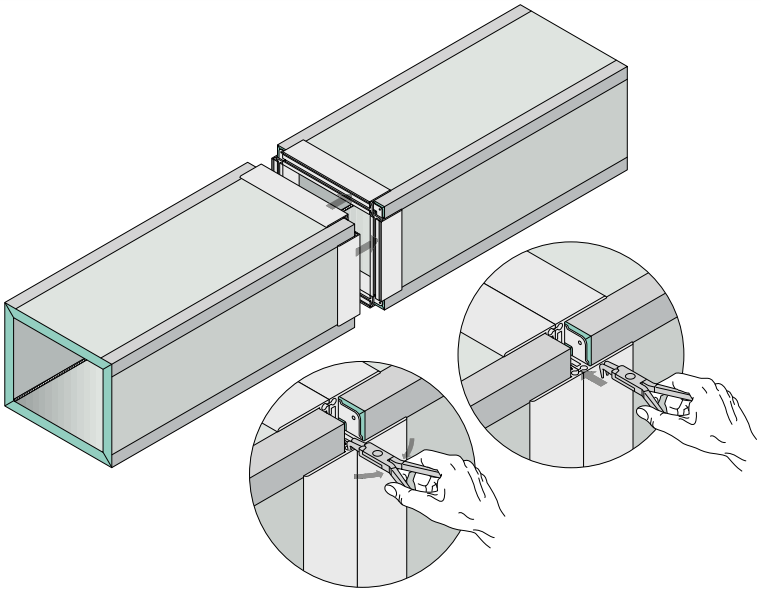
phase 2 » application of the invisible flange on the duct

After applying the glue, proceed to fit the flange.
The segments of the invisible flange must be applied on all four sides of each of the sections of the duct to be joined.
The flange should be inserted turning in the longest side towards the inner side of the of the duct.
To make assembly easier, it is recommended to use the special rubber hammer.



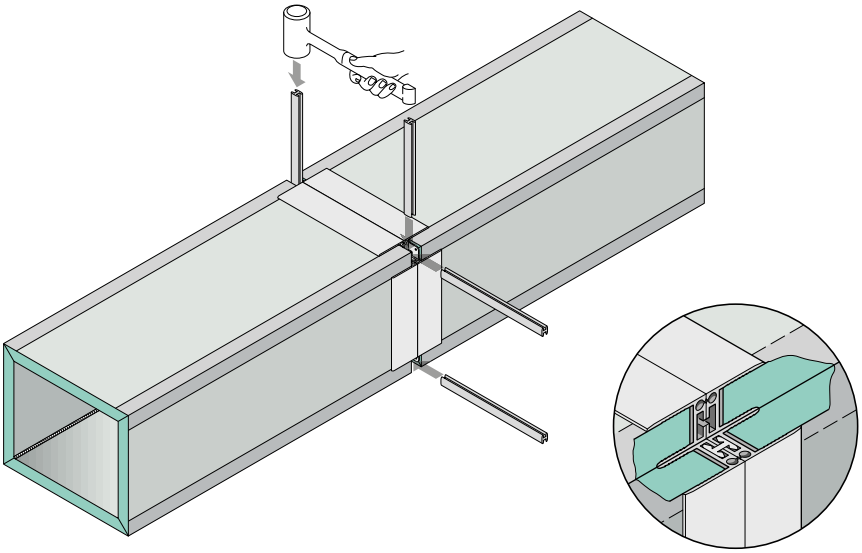
phase 3 » aligning the segments of the duct

In order to join the different segments of the duct it is necessary to align the ends on which the flanges have been fitted.
To make this operation easier, you may use the pliers at 90° and lever on the fissures of the flanges.



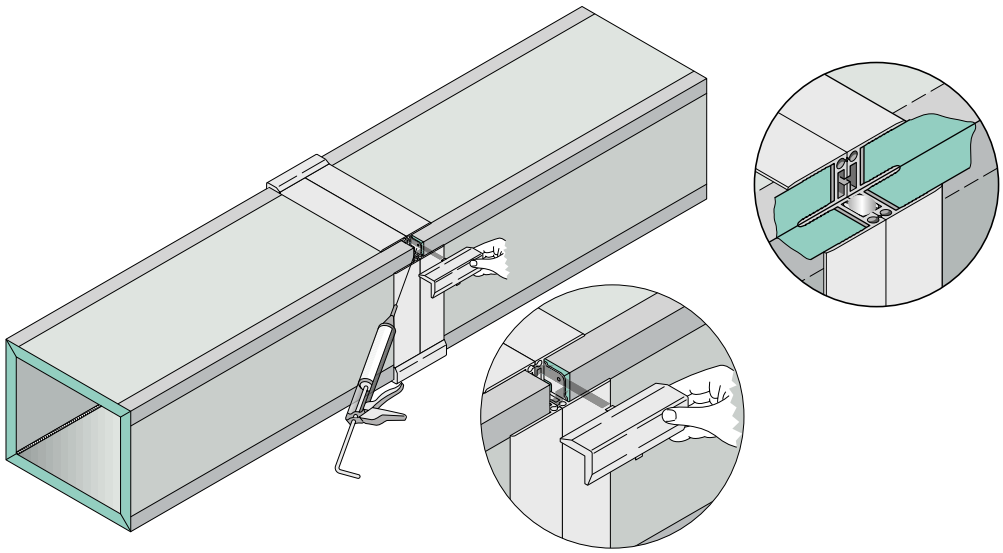
phase 4 » joining the invisible flange with bayonet

Once the flanges have been aligned, you can proceed to join the segments of the duct inserting the fixing PVC bayonet in the H-shaped (cod. 21FN04) in the fissures formed by the flanges themselves.
Running along the flange in its entire length, this bayonet guarantees perfect grip and replaces any type of gaskets which might otherwise be necessary.

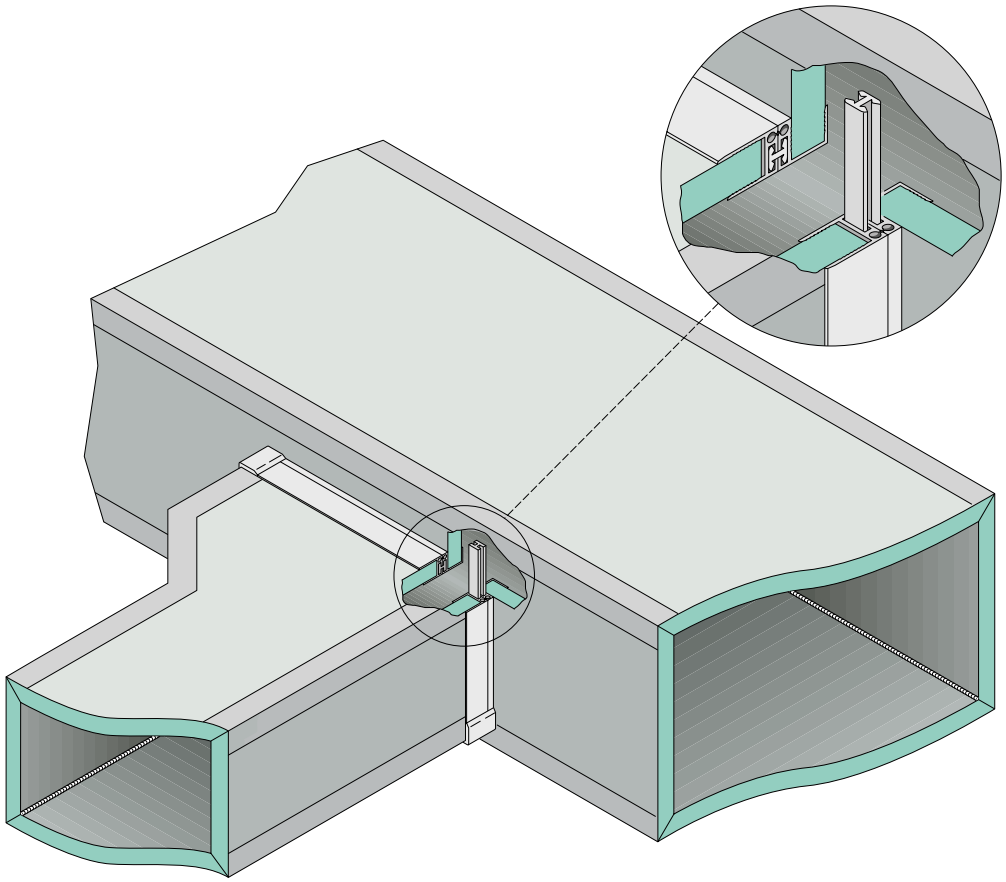


phase 5 » finishing with covering angles

The joint is completed by adding the covering angles (cod. 21FN05 for 20 mm model and cod. 21FN08 for 30 mm model), fitting them in the dedicated holes. This piece will prevent any displacement of the bayonets, thus improving the aesthetic appearance of the finished duct.



16. flange for take-offs



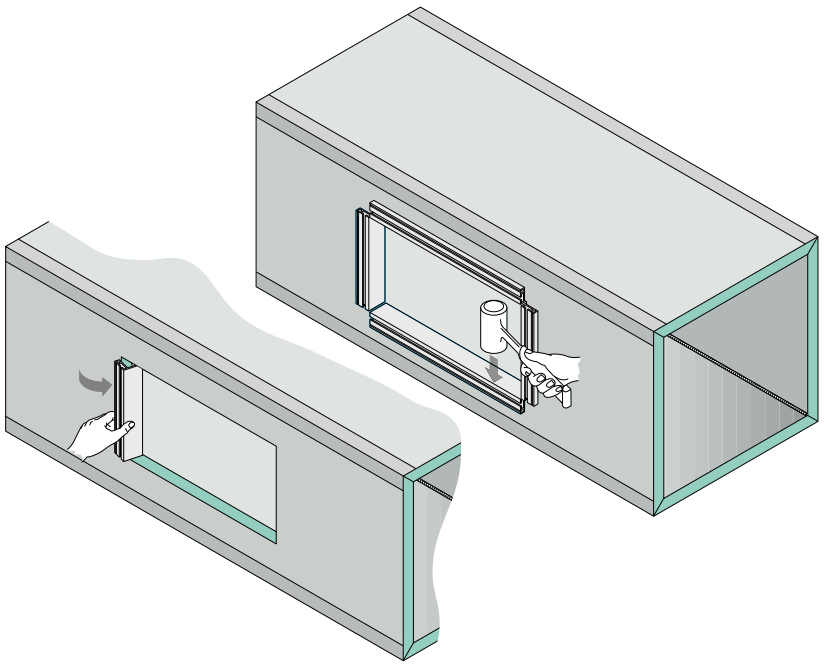
Measuring

Flanges for take-offs make it possible to insert another duct in any other position. Four pieces of flange are needed (cod. 21FN03 for 20 mm model and cod. 21FN07 for 30 mm model) Four pieces of flange are needed for each end of ducts to be joined (4 pieces of flange for take-offs on the side of the hole and 4 pieces of invisible flange for the duct). The pieces should be cut in the same size as that of the inner measures of the duct reduced by 2÷3 mm. For each joint, it is also necessary to have 4 pieces of PVC bayonet and these must be cut in a size which is equal to the inner size of the duct. Then proceed with the cutting of the flange and of the bayonet using the special section-bar cutting machine.

working phases

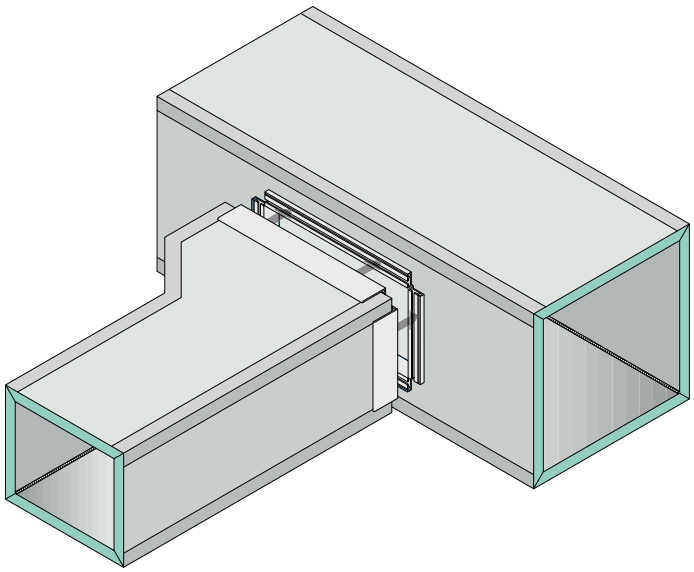
phase 1 » application of flanges

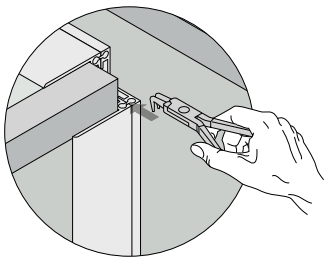
After applying the glue, proceed to fit the flange. The segments of flange for take-offs must be applied along all four sides of the hole (four segments of invisible flange must be applied on the sides of the duct). The flange must be inserted turning in the longest side towards the interior of the duct.
To make fitting easier, it is advisable to use the special rubber hammer.

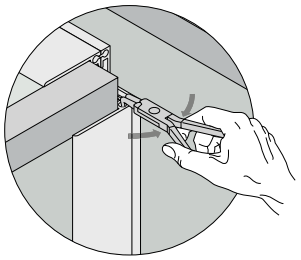


phase 2 » alignment of the segments of the duct

In order to join the various segments of the duct it is necessary to align the ends on which the flanges have been applied.
To make this easier, you may use the pliers at 90° and lever on the fissures of the flanges.

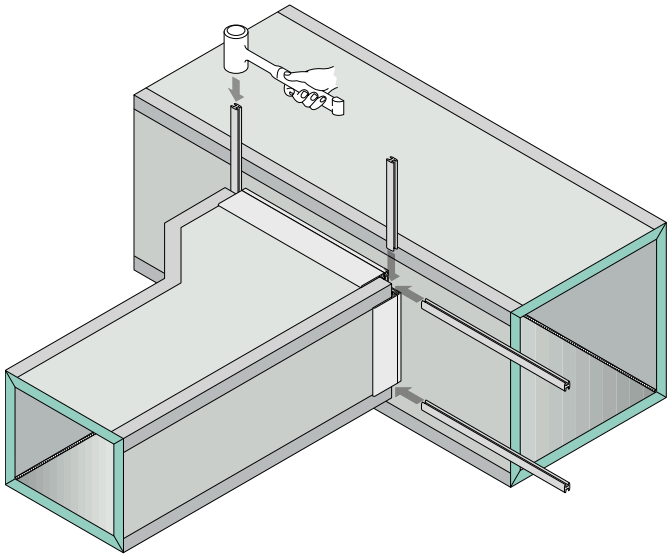


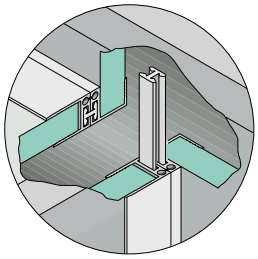




phase 3 » joining the flange for bayonet take-offs

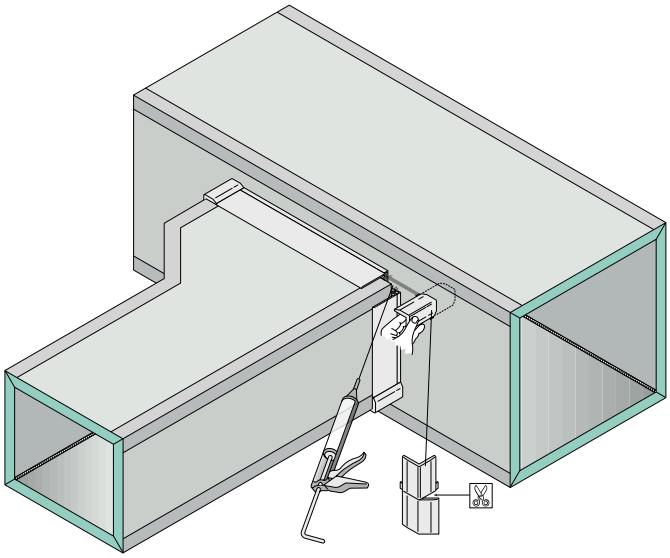
Once the flanges have been aligned, you must proceed to join the segments of the duct inserting the fixing PVC bayonet (cod. 21FN04) in the special H-shaped fissure formed between the flanges.
Running along the flange in its entire length, this bayonet guarantees perfect grip and replaces any type of gaskets which might otherwise be necessary.

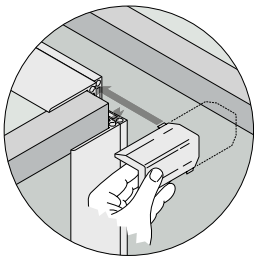




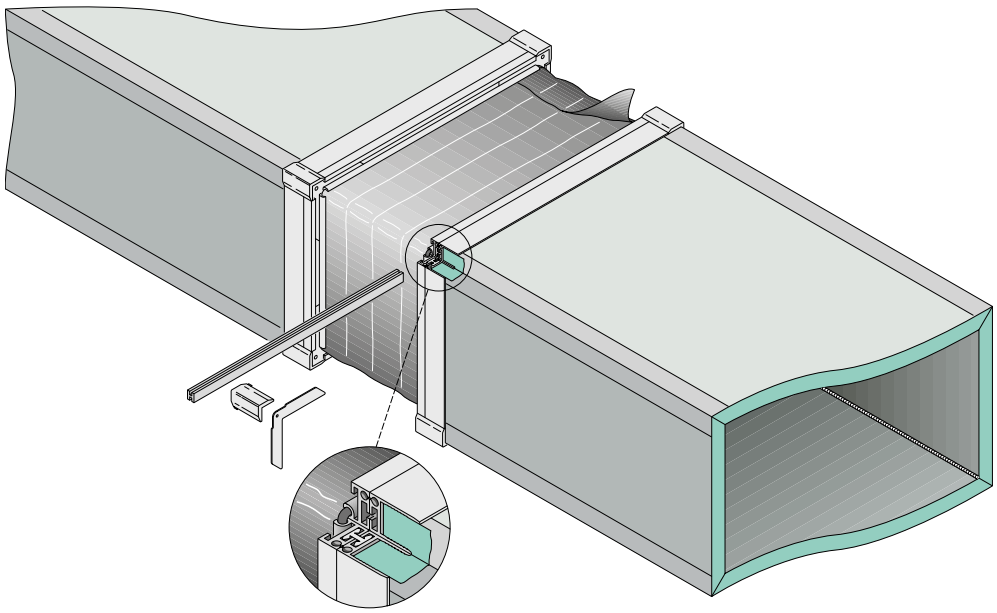
phase 4 » finishing with covering angles

The joint is completed by adding the covering angles (cod. 21FN05 for 20 mm model and cod. 21FN08 for 30 mm model) fitting them in the dedicated holes.
This piece will prevent any displacement of the bayonets, thus improving the aesthetic appearance of the finished duct.





17. anti-vibration joint



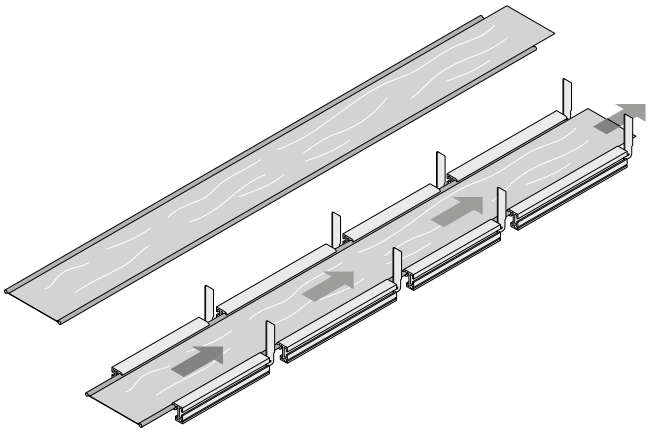
Measuring

To construct a anti-vibration joint it is necessary to use eight segments of anti-vibration sheet-holder profile (cod. 21GN04) - 2 segments for each side of the joint - inside which the special anti-vibration sheet will be inserted. The segments must be cut in the same sizes as each of the sides of the duct reduced by 5 mm in order to ensure perfect adhesion of the edges.
The sides of the joint should be fixed with the angles while the joint will be fitted to the duct by means of the bayonets.

working phases

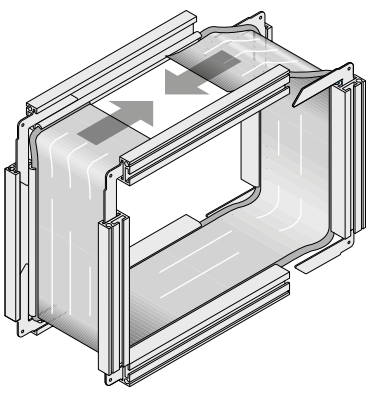
phase 1 » inserting the anti-vibration sheet in the anti-vibration sheet-holder profile

After cutting the segments of the profile, (cod. 21GN04) proceed to insert the anti-vibration sheet (cod. 21GN05).



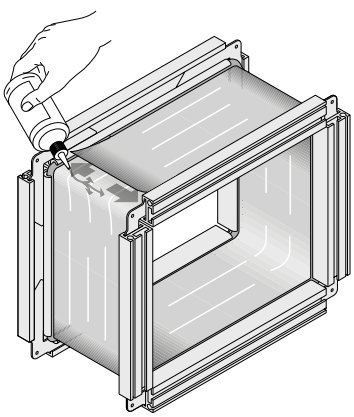
phase 2 » closing the joint

The segments must be joined by means of reinforcement brackets (cod. 21SQ01) which, in this case, will be used as fixing brackets.



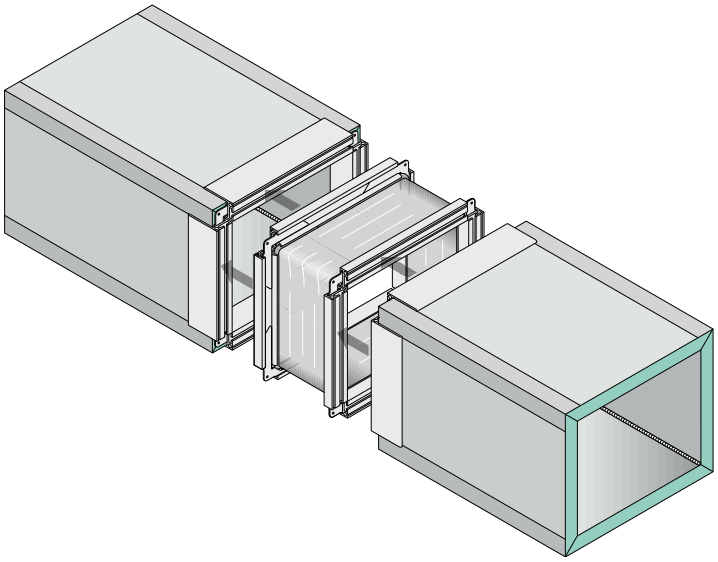
phase 3 » gluing the anti-vibration sheet

The borders of the anti-vibration sheet must be glued in order to ensure maximum stability and resistance.



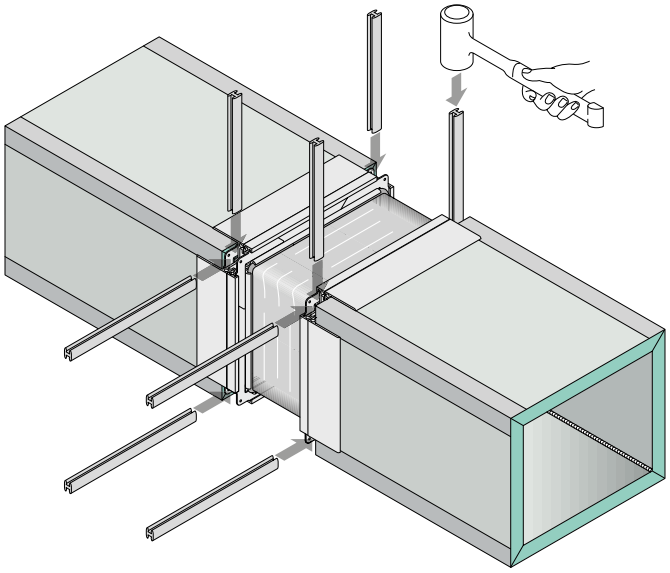
phase 4 » fitting the anti-vibration joint

To bring the anti-vibration joint together with the two segments of the duct, it is necessary to align the ends on which the flanges have been applied.



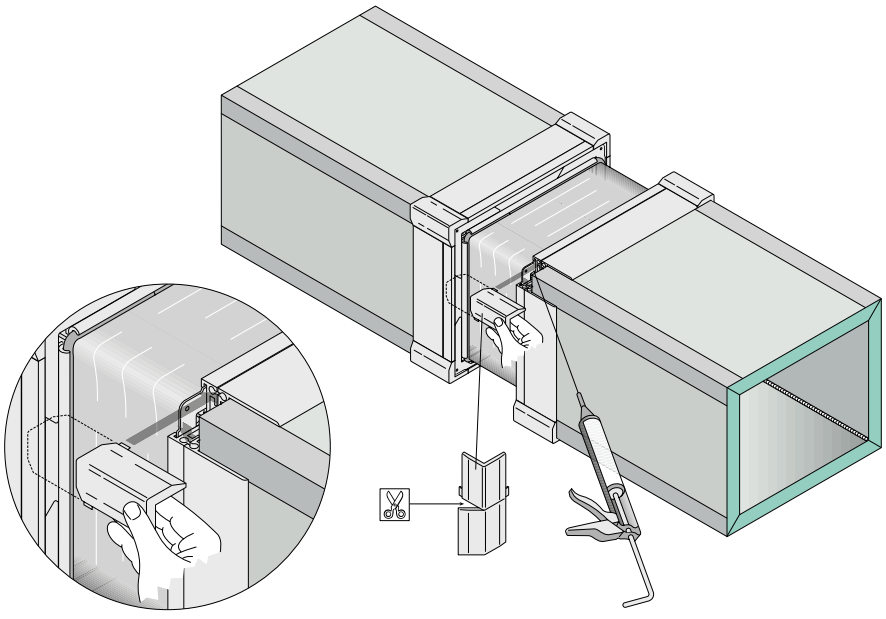
phase 5 » fixing the joint with bayonet

Once the ends have been aligned, you must proceed to join them by inserting inserting the fixing PVC bayonet (cod. 21FN04).
in the H-shaped fissure of the flanges
Running along the flange in its entire length, this bayonet guarantees perfect grip and replaces any type of gaskets which might otherwise be necessary.

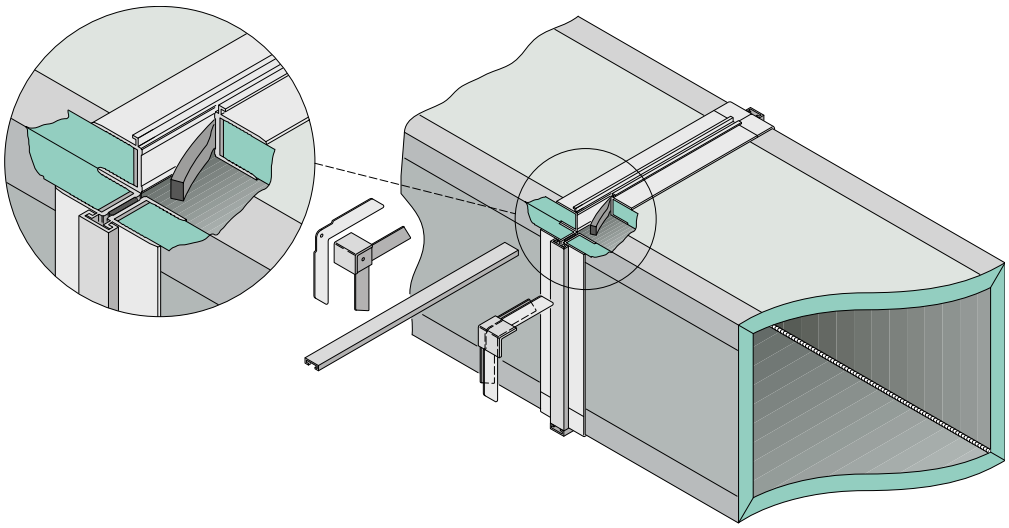


phase 6 » finishing with covering angles

Fitting of the anti-vibration joint is completed by adding the covering angles (cod. 21FN05 for 20 mm model), fitting them in the dedicated holes. This piece will prevent any displacement of the bayonets and also improves the aesthetic appearance of the finished duct.



18. traditional flange



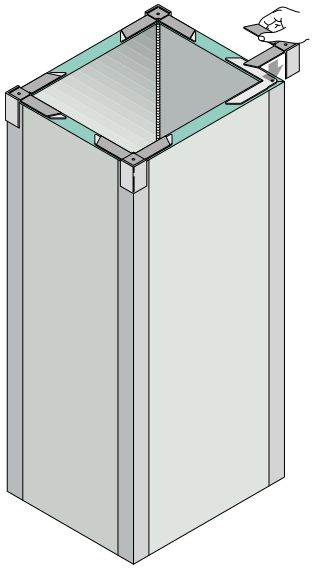
Measuring

Four pieces of traditional flange (cod. 21FT01 for 20 mm model, cod. 21FT06 for 30 mm model) are necessary for each end of the ducts segment to be joined (each joint will require 8 pieces).
The pieces must be cut in the same size as the inner measure of the duct reduced by 3 mm.
Each joint also requires 4 pieces of bayonet. (cod. 21FT03). The length of the vertical bayonets is equal to the outer measure of the duct. The length of the horizontal bayonets is equal to the outer measure of the duct increased by 20 mm.

working phases

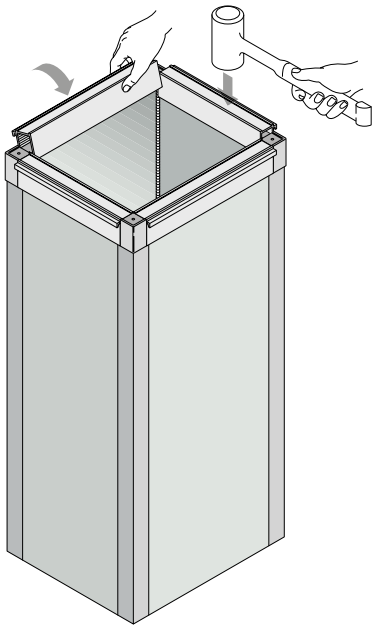
phase 1 » application of reinforcement corners

Before fitting the flanges it is necessary to place the reinforcement corners (cod. 21FT05 for 20 mm model - cod. 21SQ05 for 30 mm model).
They must be positioned in the four corners before inserting the flanges (in order to block the reinforcements in between the duct and the flanges)
These corners impart greater rigidity to the duct and eliminate any possible swelling caused by the pressure inside the duct.



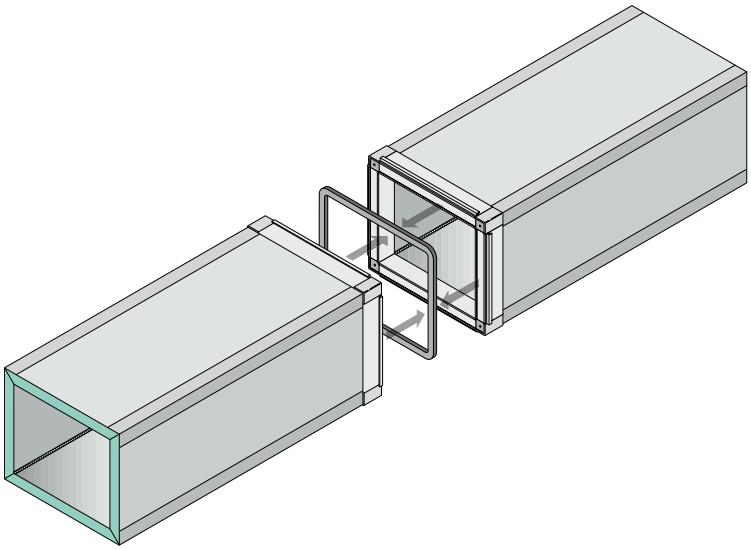
phase 2 » application of a flange on the duct

The segments of flanges must be applied along the four sides of the sections of the duct to be joined. The flange must be inserted turning its longest side towards the interior of the duct.
To make fitting easier it is advisable to use the special rubber hammer.



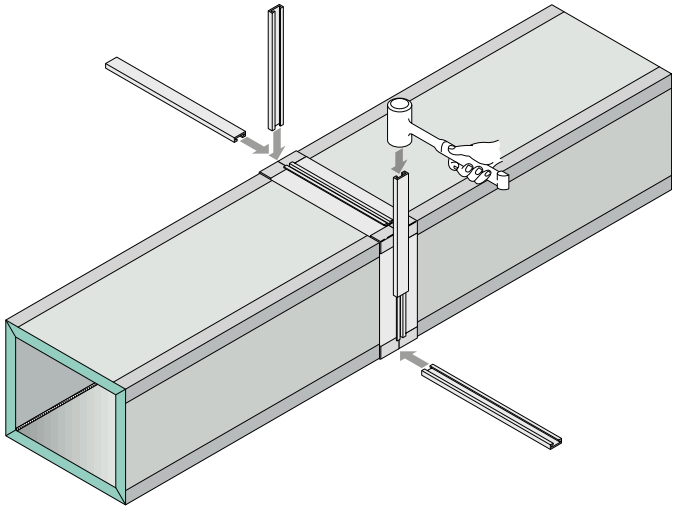
phase 3 » application of self-adhesive gasket

A special self-adhesive gasket (cod. 21GR01). may be applied in order to eliminate any possible dispersion due to leakage in the joints.
This gasket must be inserted in the contact area between the two traditional flanges.

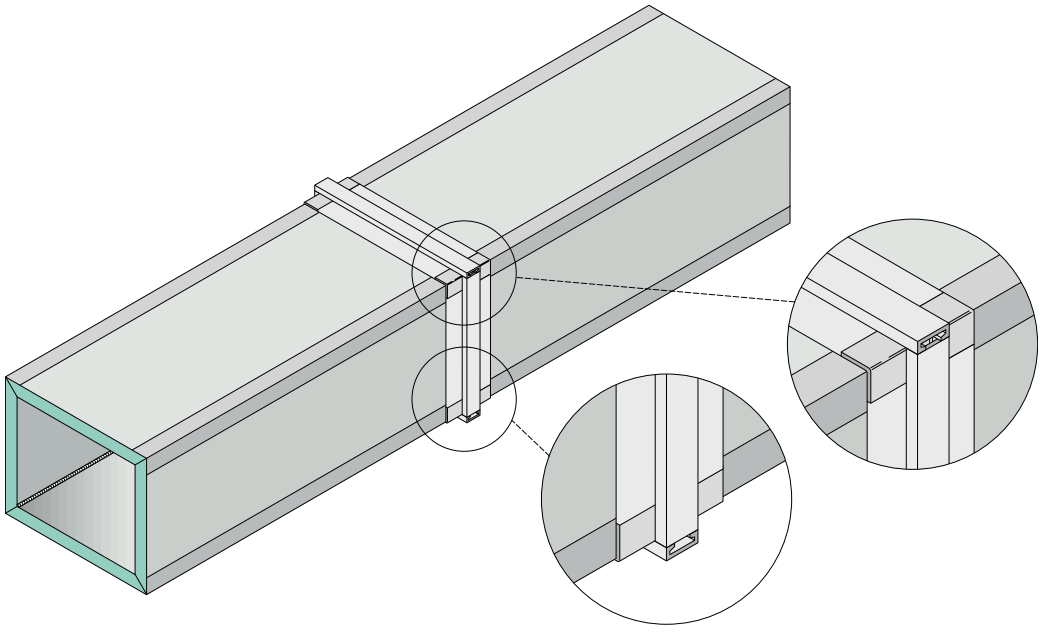


phase 4 » fixing the traditional flange with the bayonet

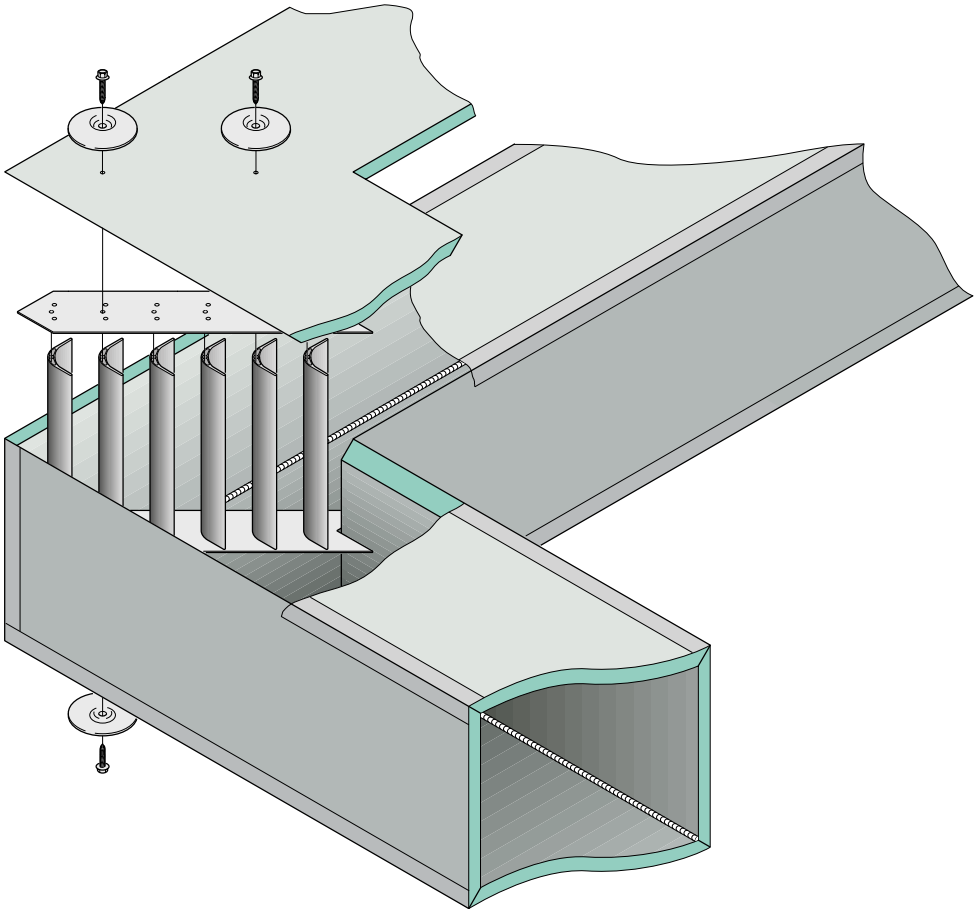
Once the flanges have been aligned, you have to join the segments of the duct fixing them in position by means of the C-shaped bayonet. (cod. 21FT03)



» traditional flange once fitted



19. turning vanes



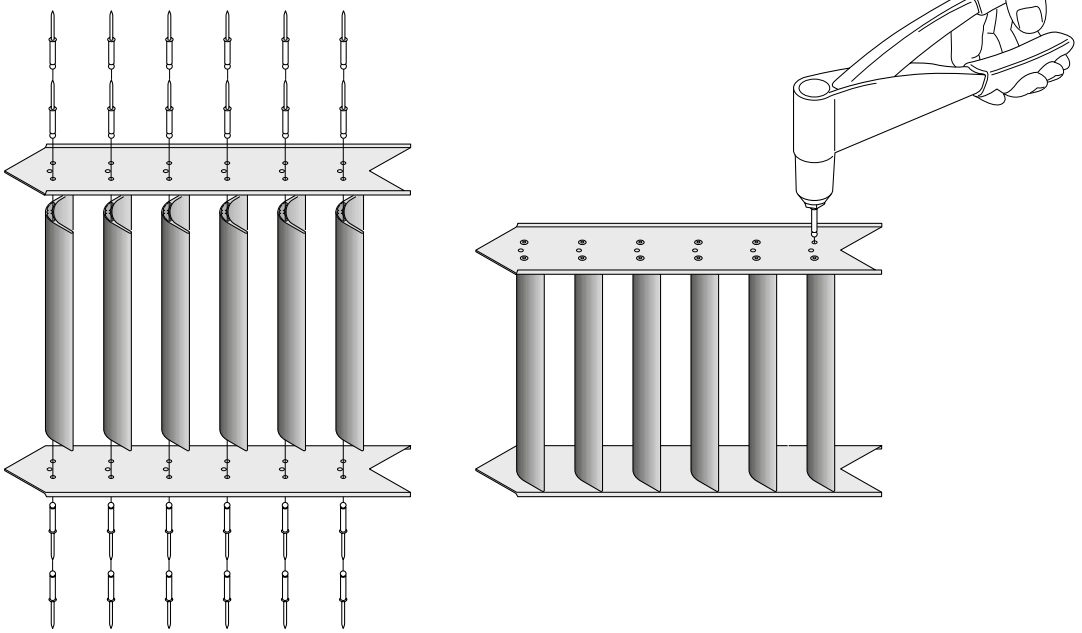
Measuring

Turning vanes (code 21CP03) are connected to the specific flat guide for turning vanes fastening (code 21CP04).
Turning vanes are cut with a height equal to the internal height of the duct minus the thickness of the upper and lower guide for turning vanes fastening (approximately 4 + 4 mm)
The guide will have to be dove-tail cut at extremities, with a lenght equal to the internal diagonal of the raw edge elbow.

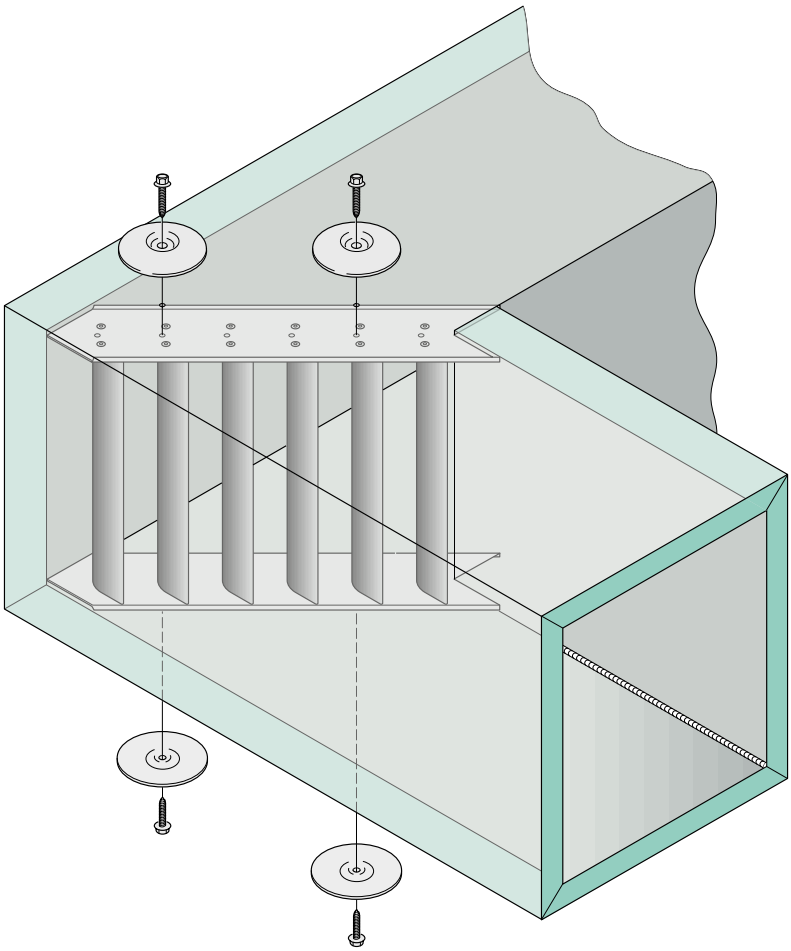
working phases

phase 1 » fixing the turning vanes with rivets to the drive

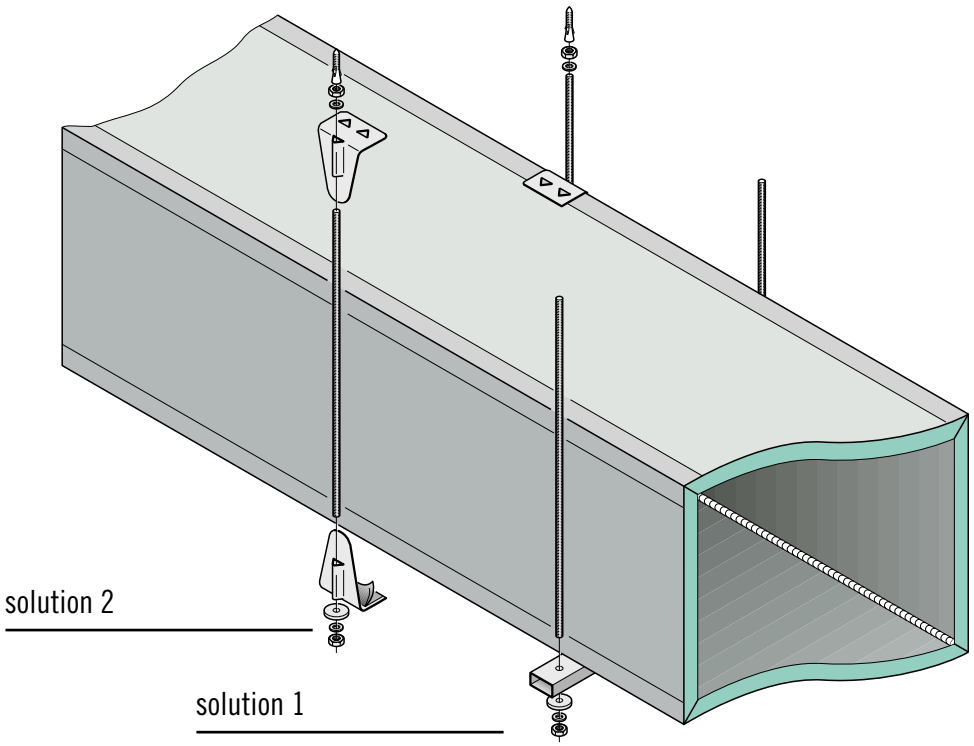
The turning vanes must be fixed on a special supporting plate by means of rivets driven through the panel.



the fixing of the unit to the elbow is done by screws (code 21RF03). To improve the seal and avoid damages, the screw will be fixed with the made on purpose reinforcement disk (code 21RF01).



20. bracketing



Types

Two types of supports are used depending on the size and weight of the duct:

1. With a supporting profile (cod. 21PR05)

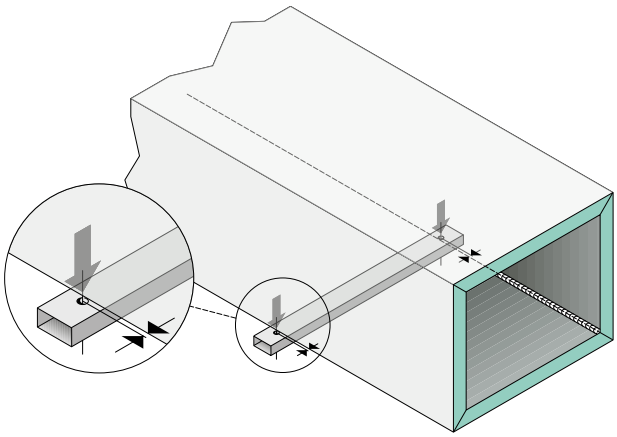
This is generally used in the case of ducts having a size which is greater than 600 mm. Dimensioning of the supporting profile must be adequate in order to prevent any bending.

2. With a fixing bracket (cod. 21SS01/05)

This is normally used for small ducts. Also self-adhesive or hooked brackets may be used.

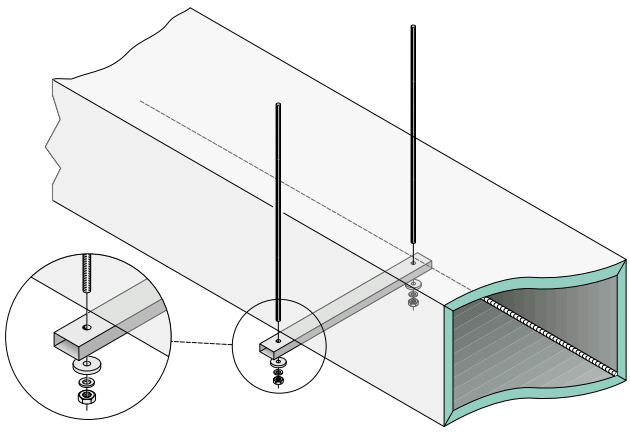
solution 1 – fixing system with a bracketing profile

phase 1 » drilling holes in the bracketing profile



Use an ordinary drill to bore the holes for the threaded zinc-plated bars for vertical support (as an alternative, the vertical support may be used in conjunction with steel cords or zinc-plated chains).
The supporting profile (cod. 21PR05) must stick out of the duct in such a way as to guarantee easy fixing to the vertical support.

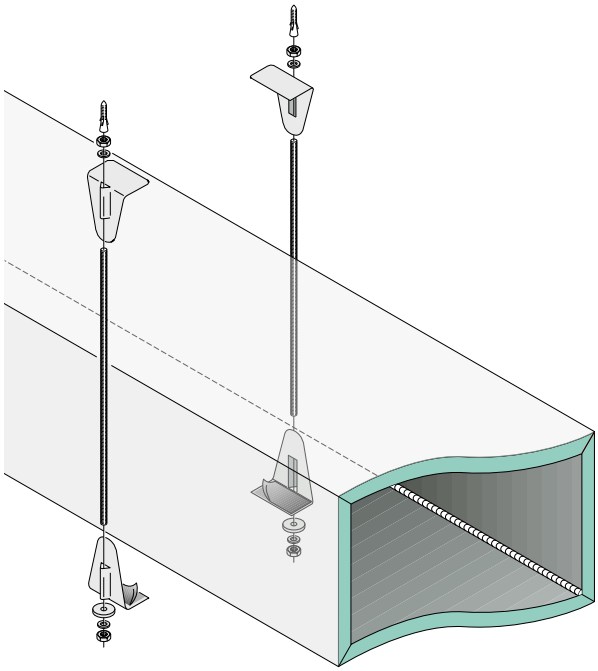
phase 2 » fixing the profile to the vertical supports

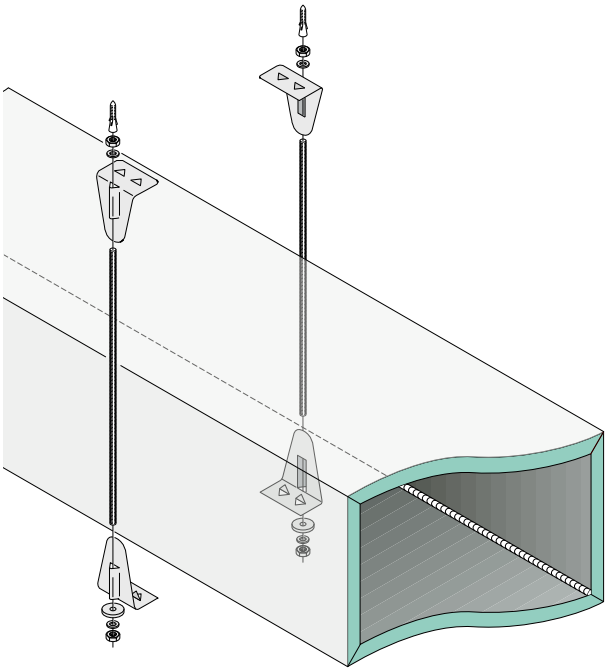


Ordinary bolts must be used for fixing the bracketing profile to the vertical supports.

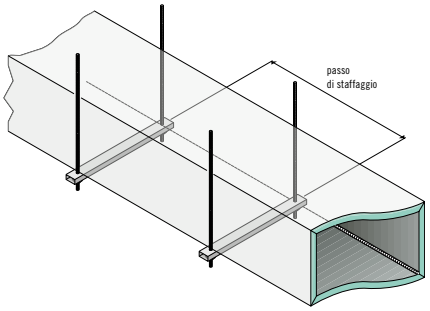
solution 2 – fixing system with self-adhesive or hooked bracket

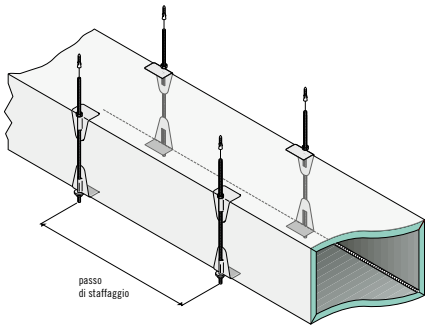
phase 2 » application of brackets

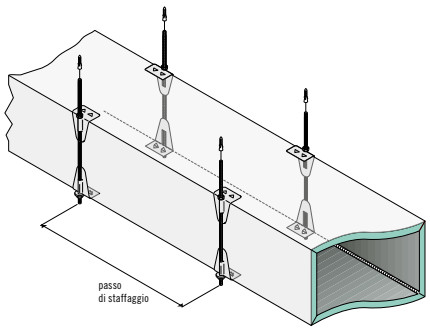


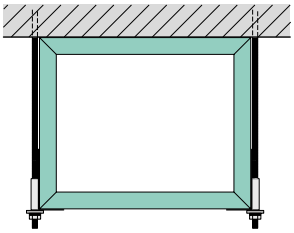


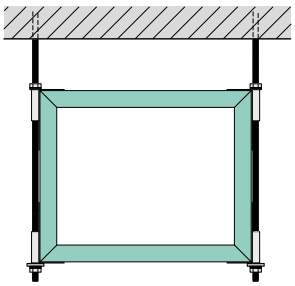
spacing between hangers









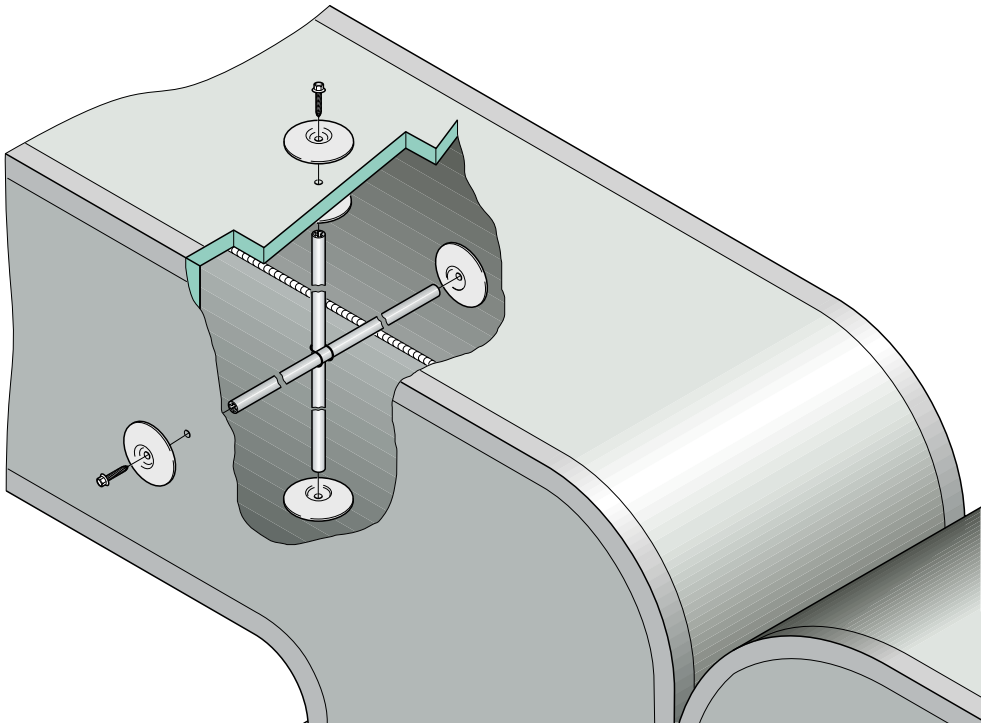


measure of the longer side	spaces between brackets
< 1000 mm	4000 mm
> 1000 mm	2000 mm

Whenever ducts are not installed in contact with the ceiling, it will be necessary to fix to the suspension tie rod also upper brackets installed. For outdoor installations the spacing is of 2 meters as well (see page 60).

N.B. whenever possible, apply hangers in intermediate points between flanging

21. reinforcements



Types

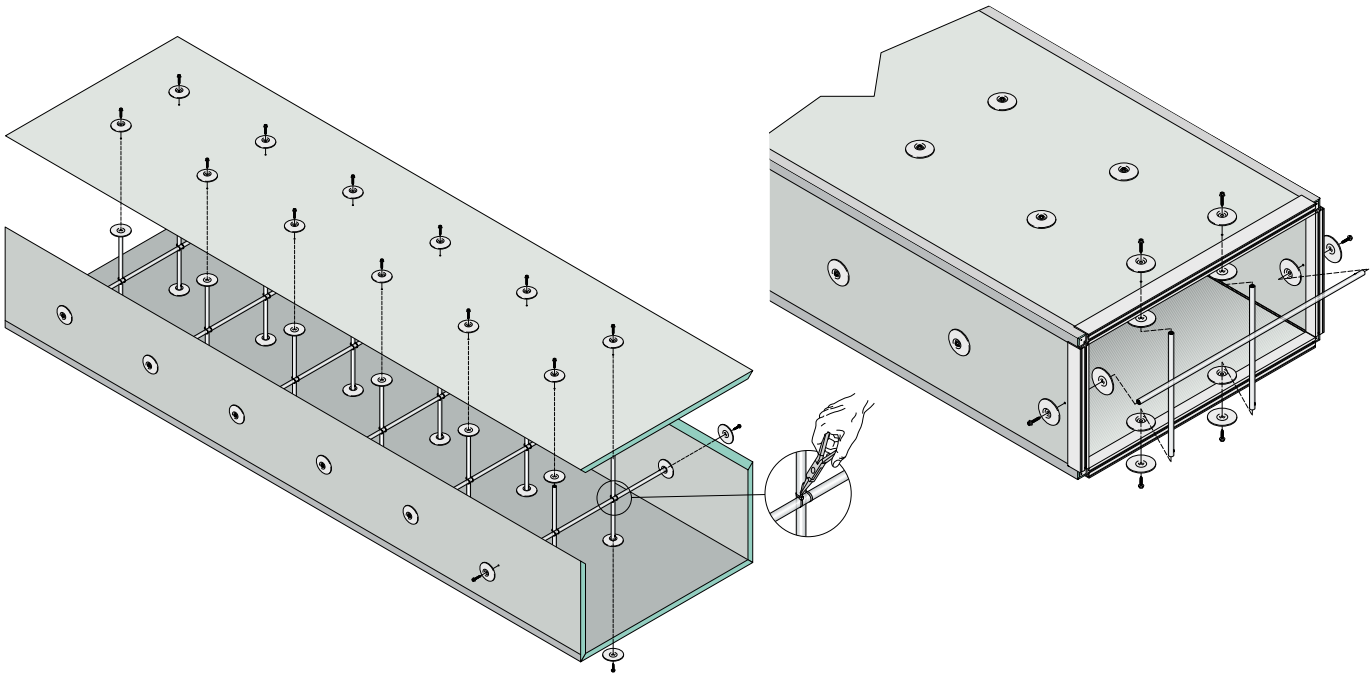
The profile for reinforcement (cod. 21RF02) has to be cut in such a way to guarantee the perfect insertion of the same (together with the relevant aluminium shaped disk code 21RF01) inside the duct.

Reinforcements have to be cut with a length equal to the internal dimensions of the duct minus the thickness of the upper and lower disk (6 + 6 mm).

Maximum attention has to be given to procedures to be followed for the correct insertion and right selection of number of supports to be used.

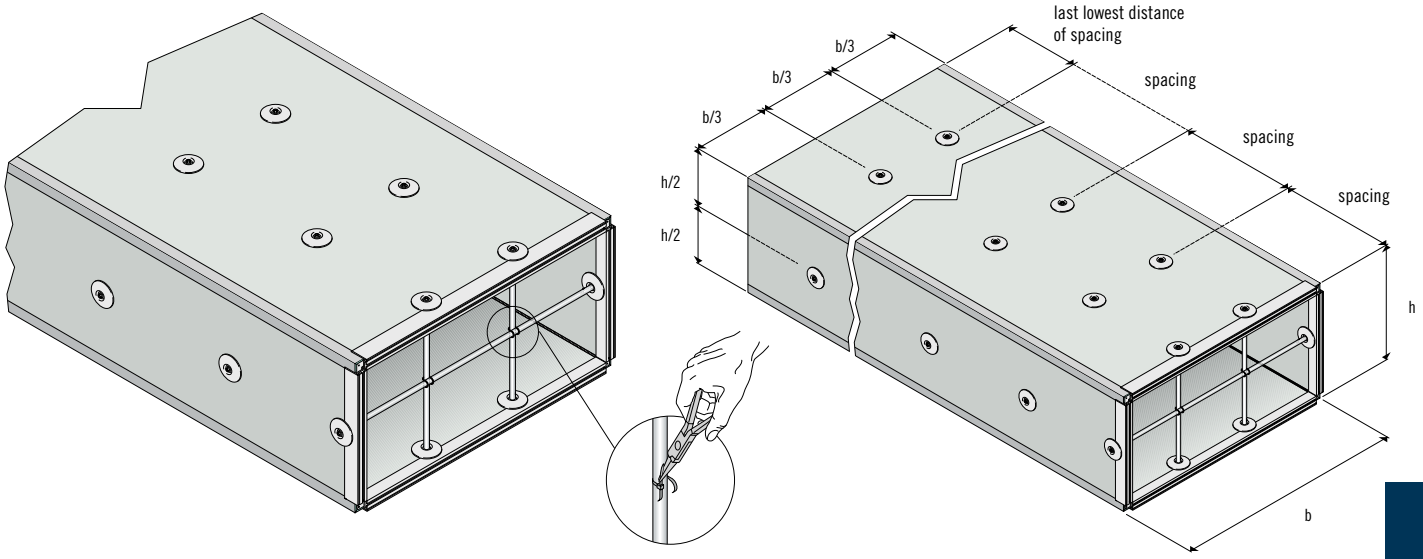
working phases

phase I ›› insertion of profiles and fixing by means of a reinforcement disc

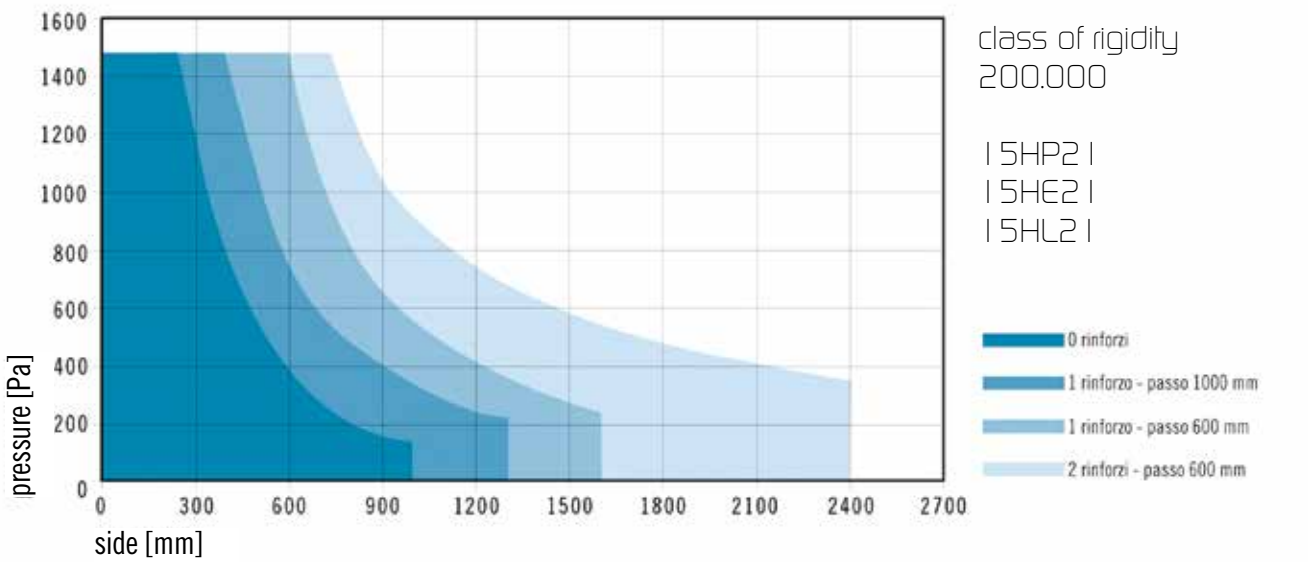


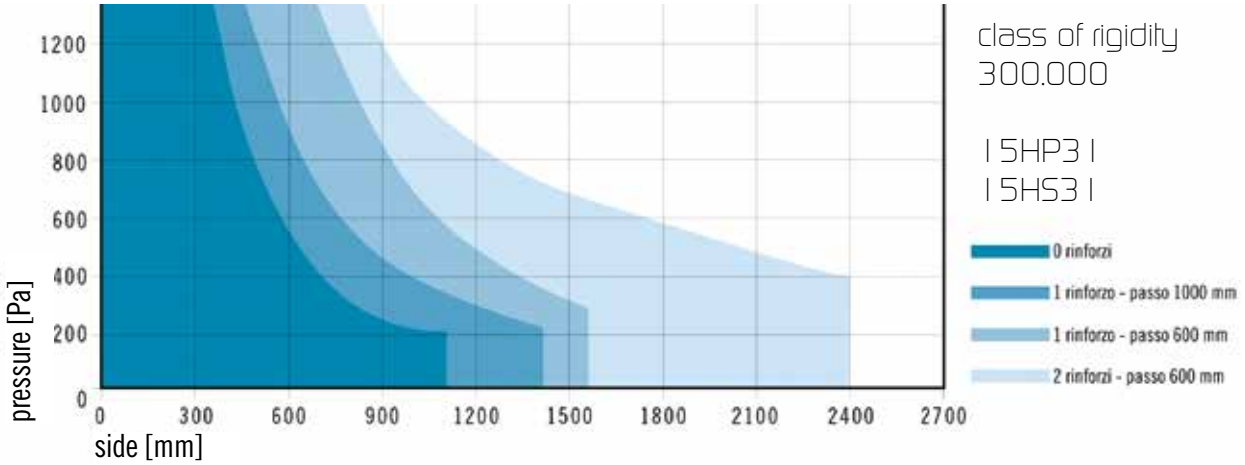
The reinforcement profile must be inserted inside the duct at points which will be determined during the measuring phase. At both ends, the profile is fitted in the dedicated recess of the shaped discs. In case of intersections it is recommended to fix two tubes. The profile and the inner disc are fixed by means of self-threading screws (applied from the external side). To improve the fixing you can make use of shaped discs also on the external side.

fixing of crossed reinforcements and spacing between reinforcement points.

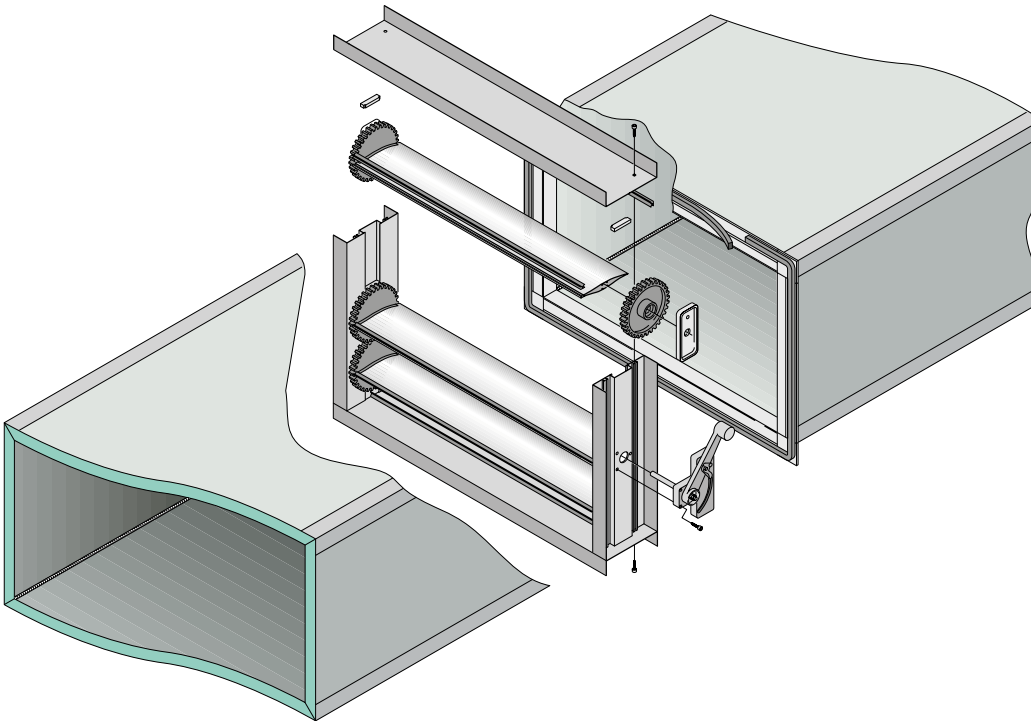


choice of reinforcements





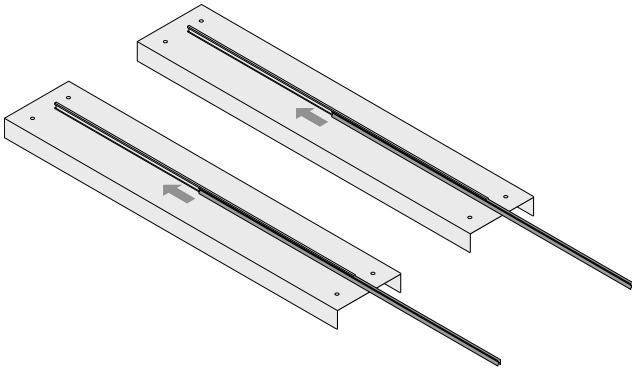
22. dampers



The great availability of profiles allows the easy construction of the damper.
Particularly, “C” profiles (code 21SR03) and omega profiles (code 21SR02) will have to be used for the realization of the frame of the damper. For the positioning of the flaps the made on purpose profile (code 21SR01) will have to be used.

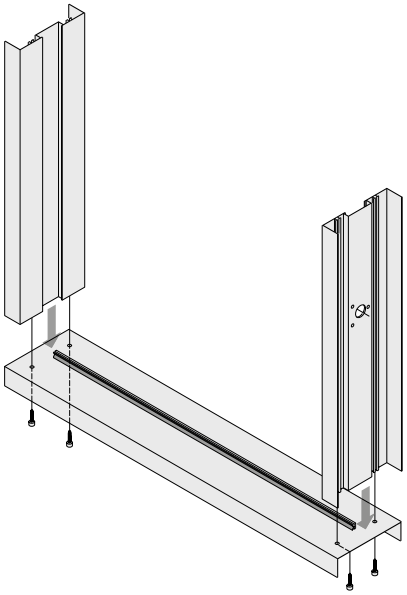
working phases

phase 1 » application of gasket on C-shaped profile



Insert the gasket in the special groove in the profile. The gasket ensures perfect hold of the damper when the flaps are closed.

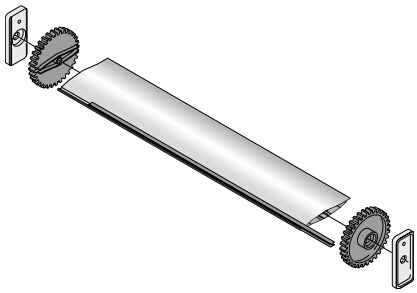
phase 2 » fixing the omega profiles

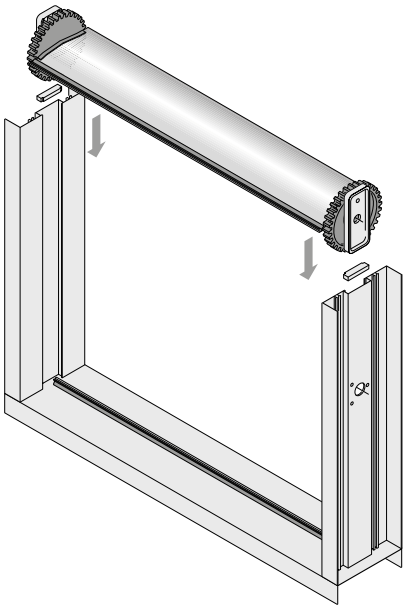


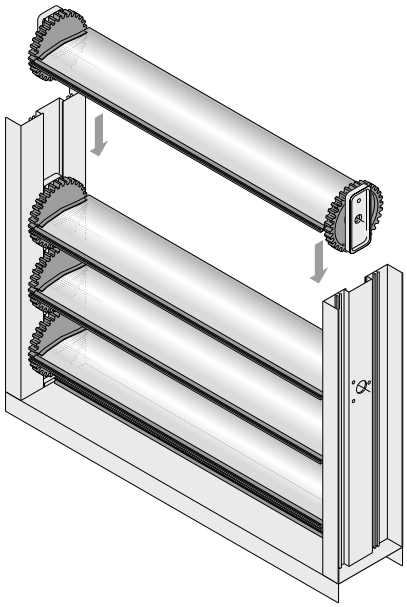
Use the screws to fix the omega profiles to the C-shaped profile, which will act as a base. The frame will thus be formed.

phase 3 » preparation of flaps

The flaps must be prepared by applying on the sides the gearing (cod. 21SR04) and the gear-holding slide (cod. 21SR05). Then, proceed to insert the flaps (cod. 21SR01) running the lateral slides into the special housing in the two vertical omega profiles.

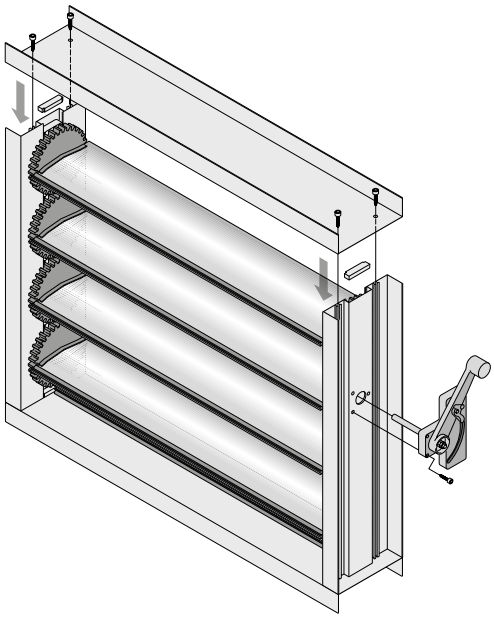






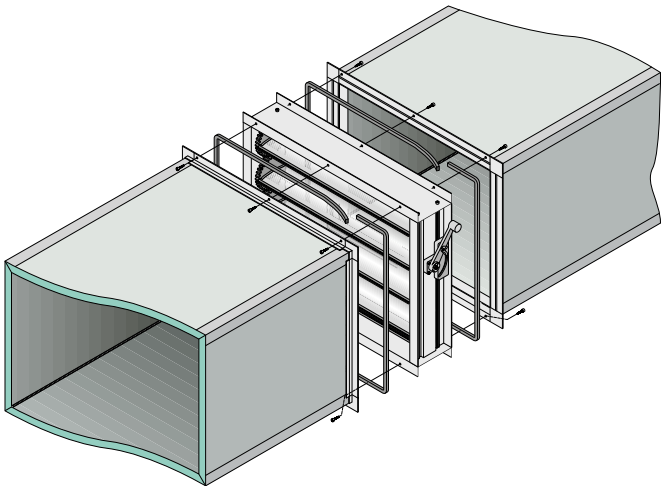
phase 4 » closing the dampers and application of a control mechanism

After inserting all the flaps, go on to complete the frame by fixing the upper C-shaped profile.
On the sides, and using the special slot, apply the opening and closing mechanism for the flaps (cod. 21SR07).

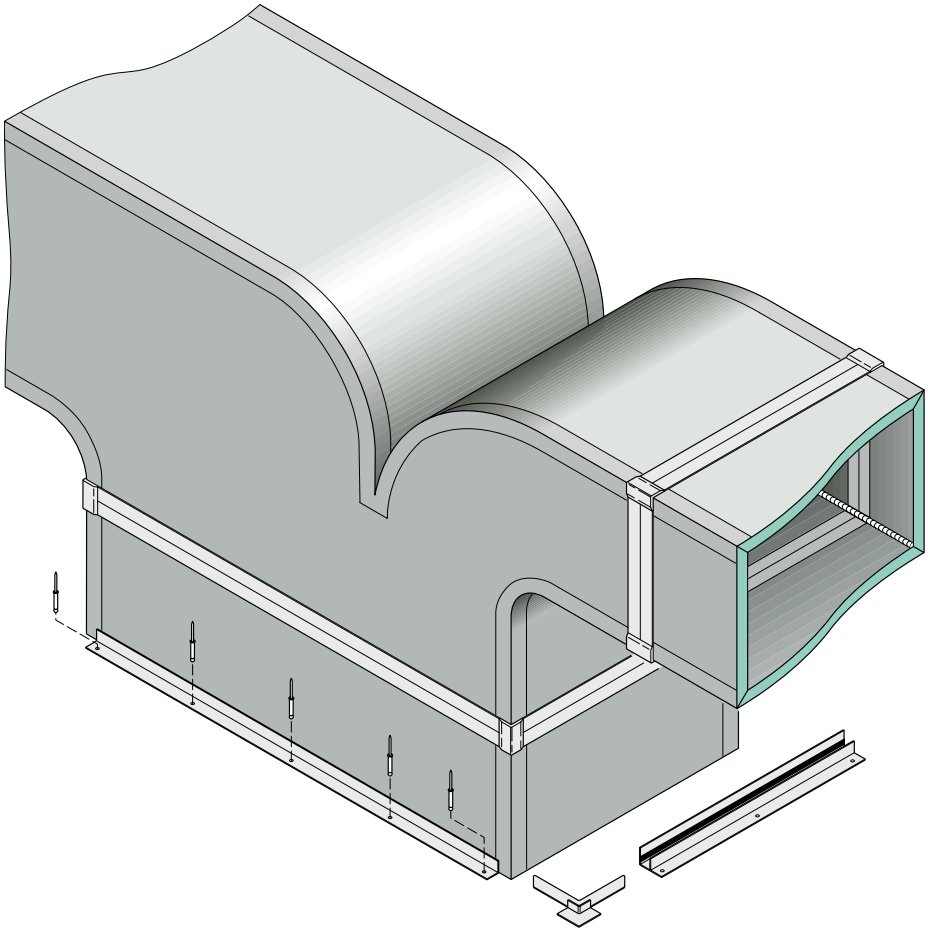


phase 5 » joining the damper to the duct

To fix the damper to the two segments of the duct you have to apply the appropriate profile (20 mm seat profile cod. 21PR02 - 30 mm seat profile cod. 21PR15 - 30mm U profile cod. 21PR01 - 20 mm U profile cod. 21PR14 30 mm F profile cod. 21PR03 - 20 mm F profile cod. 21PR07) on both sides. In order to prevent any air leakage, proceed to apply the gasket.
Use rivets or screws to fix the frame of the damper onto the profiles in the duct's segments.



23. connection to the machines



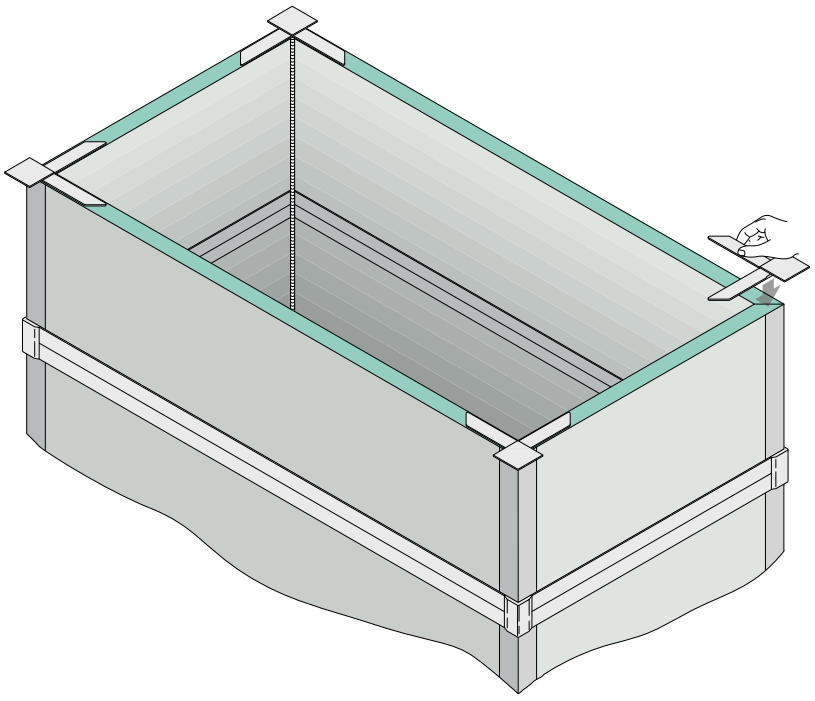
Types

For each end of the segments of the ducts system to be joined to the machine, four F-shaped pieces of profile are required.(cod. 21PR03 for 20 mm aluminium model - cod. 21PR07 for 30 mm aluminium model - cod. 21PR13 for 20 mm pvc model). The pieces must be cut in the same sizes as the inner measure of the duct with 3 mm reduction

working phases

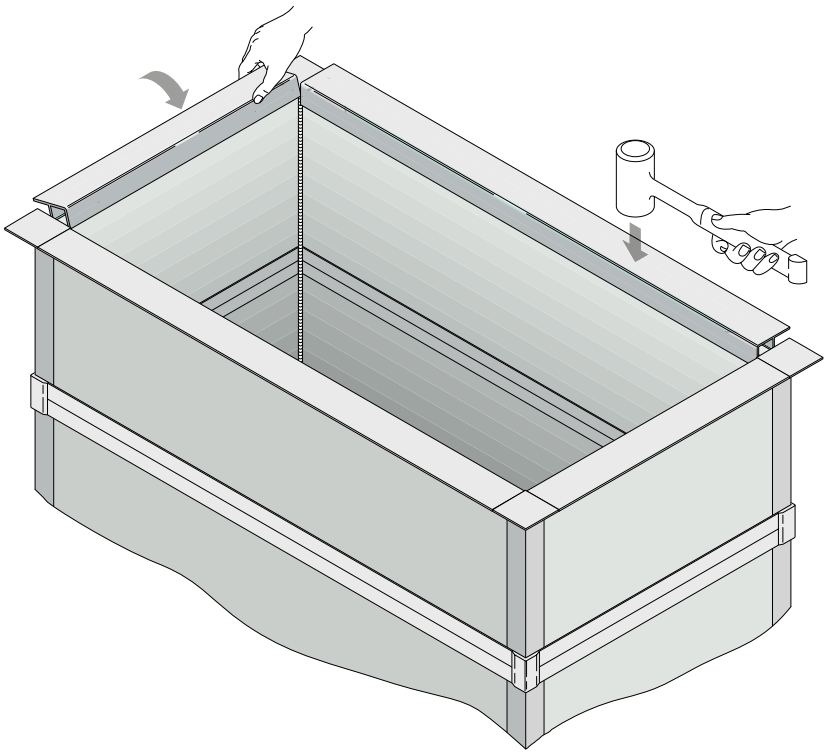
phase I » application of corners

Before the F-shaped profile (code 21PR03 for 20 mm aluminium model - code 21PR07 for 30 mm aluminium model - code 21PR13 for 20 mm pvc model) is fitted, it is necessary to place the reinforcement corners. (code 21SQ03 for 20 mm model - code 21SQ04 for 30 mm model). They must be positioned in the four corners before inserting the flanges (in order to block the reinforcements in between the duct and the profiles).



phase 2 » application of an F-shaped profile to the duct

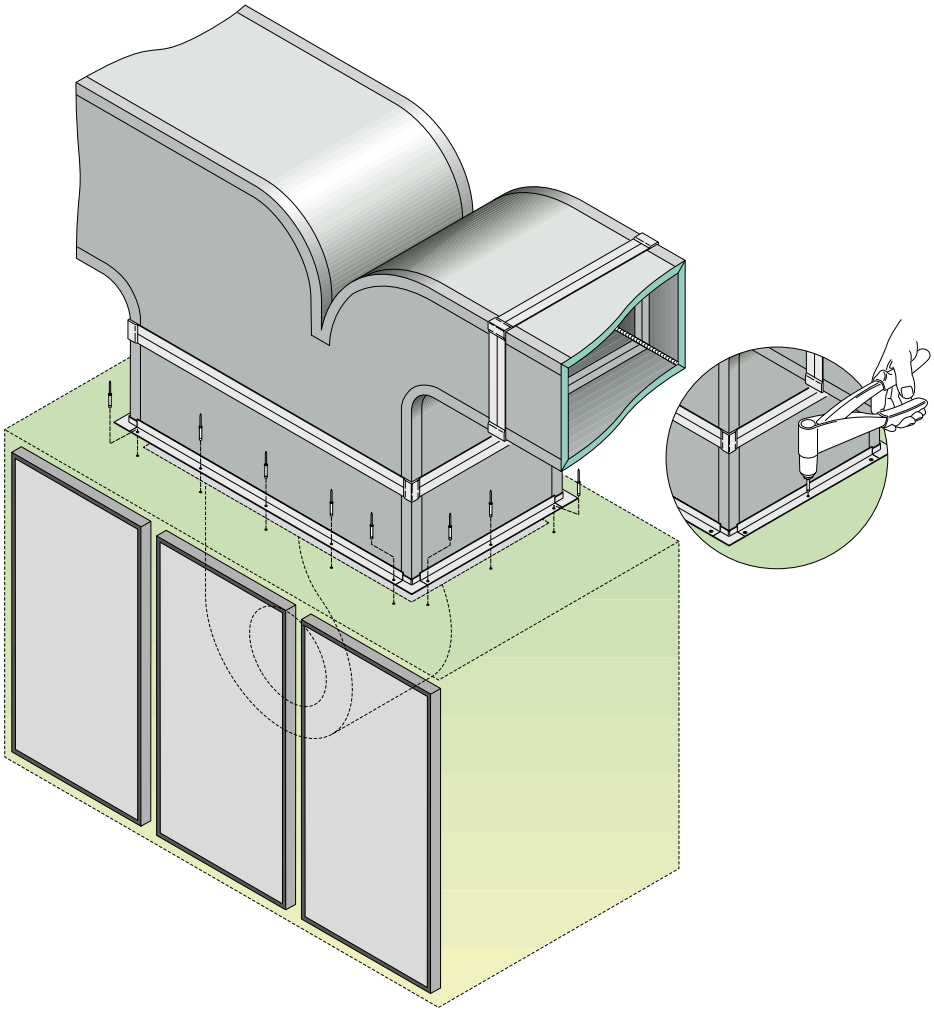
The segments of the F-shaped profile must be applied on all four sides of the duct. The profile must be inserted in such a way that the edge of the longest side is left out. To make installation easier, it is advisable to use the special rubber hammer.



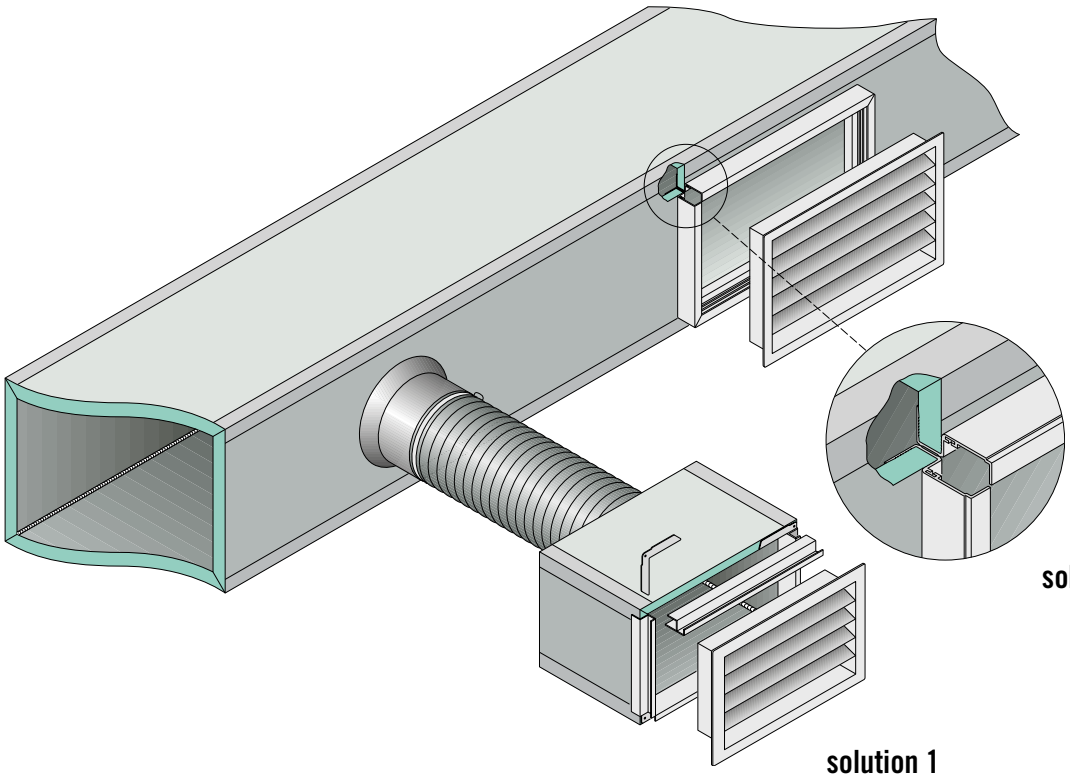
phase 3 » fixing the duct to the machine

Once combined with the F-shaped profile, the duct is fixed to the machine by means of fixing rivets which must be applied by drilling holes in the profile and on the edge of the machine.

The installer will evaluate, time by time, whether to use rivets, bolts or screws for the fixing of duct to the machine, also according to laying conditions.



24. grilles



The great availability of profiles allows the easy installation of the grilles. These can be applied directly on the duct or through the use of a plenum.

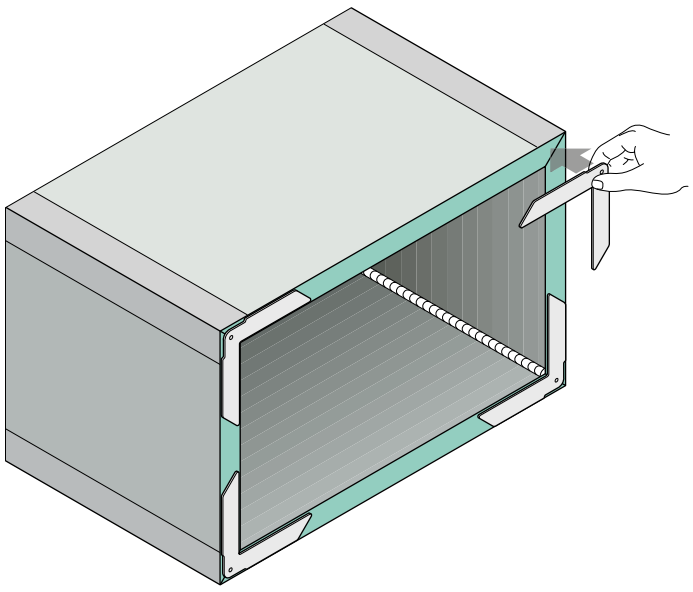
solution 2

solution 1

solution 1 - application of a grille to the plenum

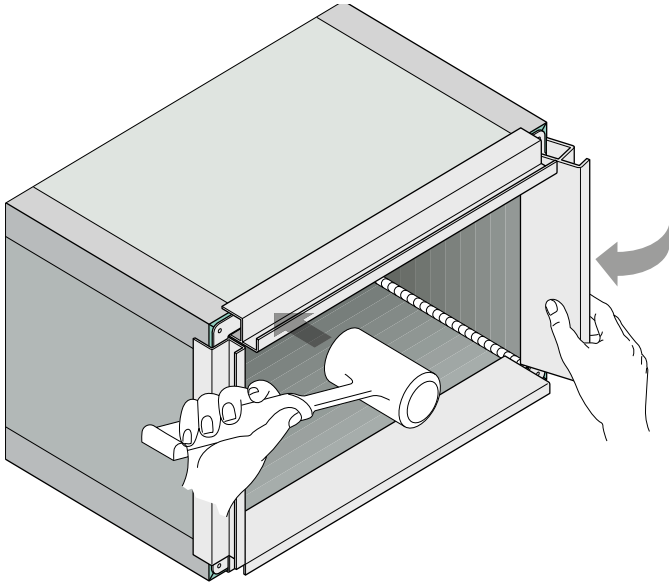
phase 1 ›› application of reinforcement corners

Before fitting the profile (code 21PR04) it is necessary to place the reinforcement corners (code 21SQ01 for 20 mm model - code 21SQ02 for 30 mm model).
They must be positioned in the four corners before inserting the flanges (in order to block the reinforcements in between the duct and the profiles).



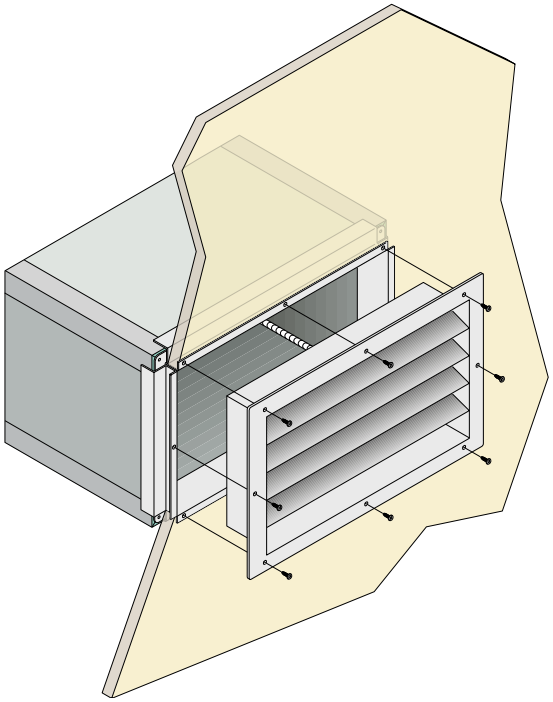
phase 2 » application of the grille profile to the plenum

The profile is to be inserted with its shortest edge outwards. To make fitting easier, it is advisable to use the special rubber hammer.



phase 3 » application of a grille

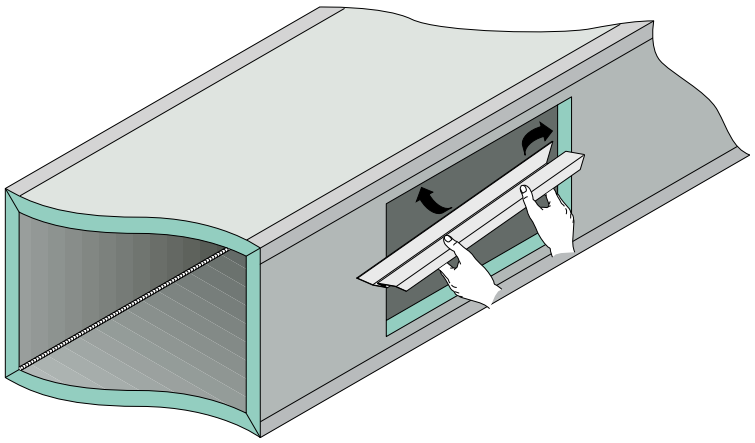
The grille must be applied by means of screws to the small edge that sticks out. The space between the two edges may serve to place the finishing of the wall or of the double ceiling.

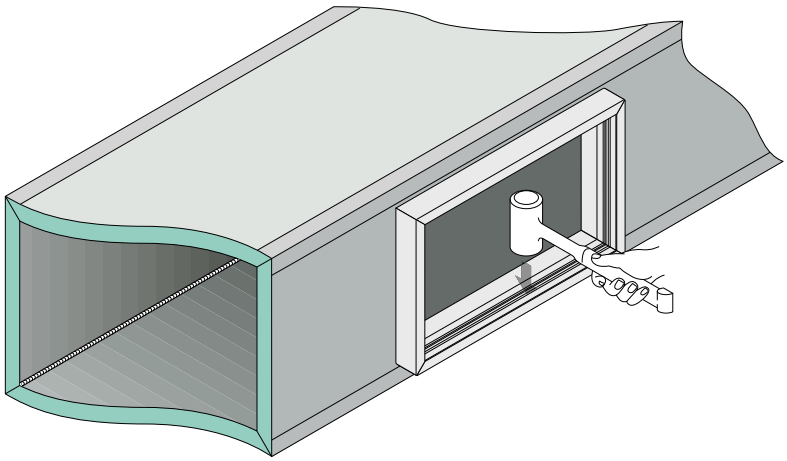


solution 2 - direct application on the duct

phase 1 » application of the grille profile to the duct

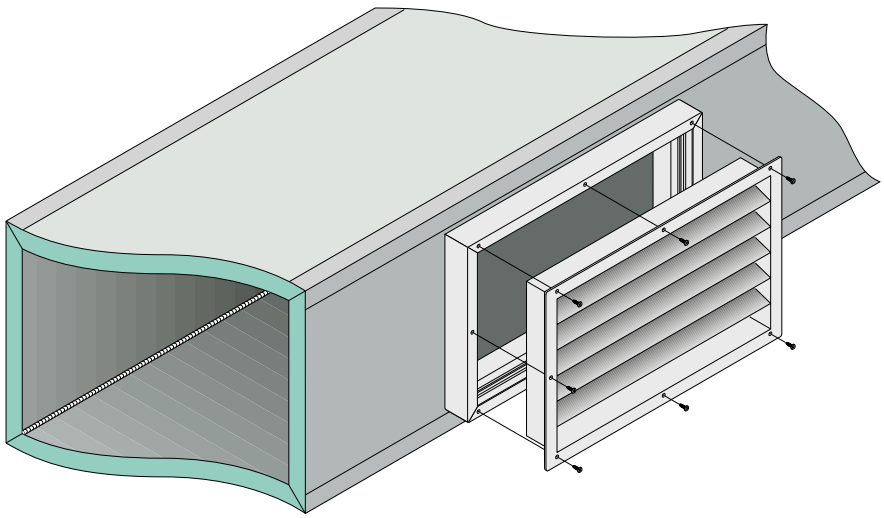
After spreading the glue, proceed to fit the “S” profile (cod. 21PR06). To make this operation easier, it is recommended to use the special rubber hammer.





phase 2 » application of a grille

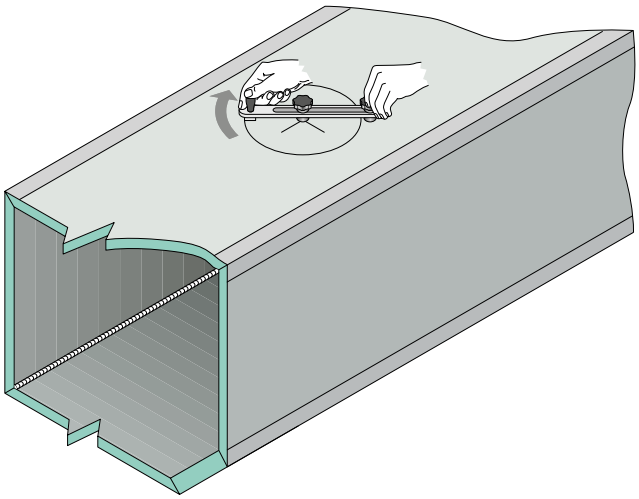
The grille must be applied by means of screws to the small edge that sticks out.



application of collars

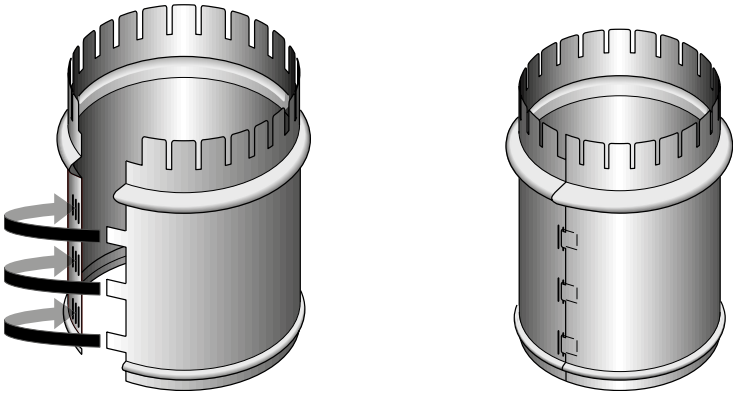
phase 1 » drilling a round hole

Use the special compass for round holes to drill a hole on the panel.



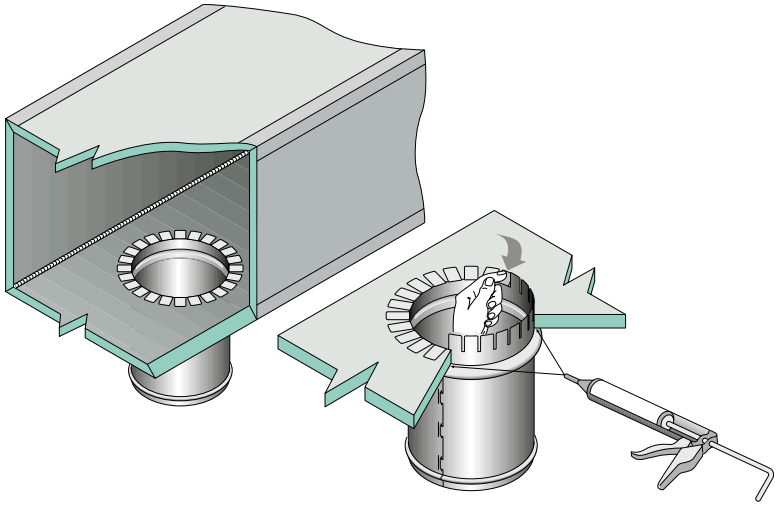
phase 2 » preparation of the collars

Make the collar (cod. 21CRxx) by folding the piece upon itself around the circular edge. Use the flaps to close the collar.

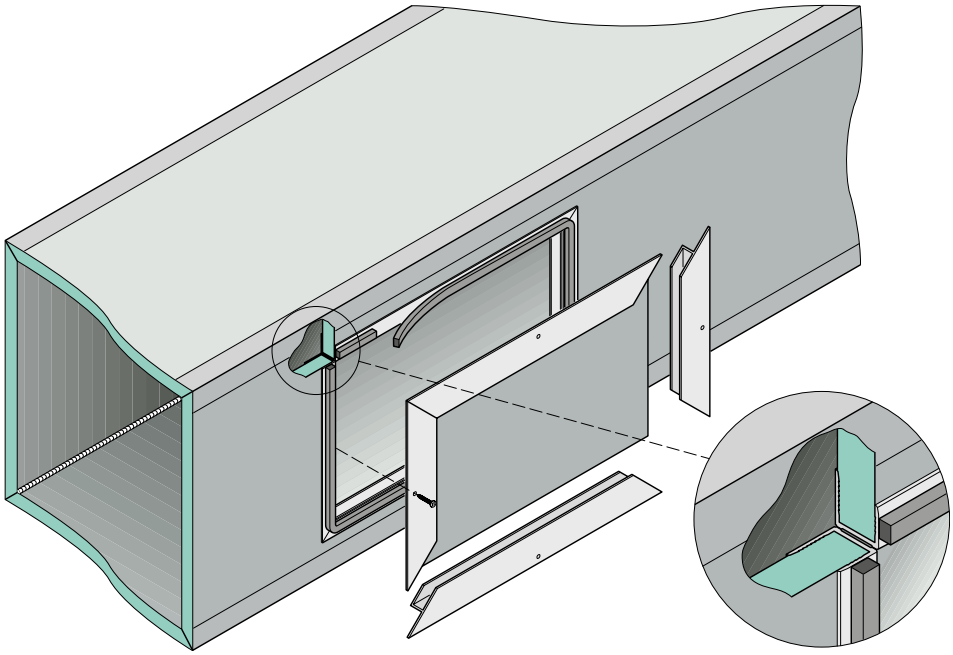


phase 3 » application of a collar

Insert the collar in the hole and clinch the flaps to fit it in position. Add silicone to improve grip.



25. inspection doors

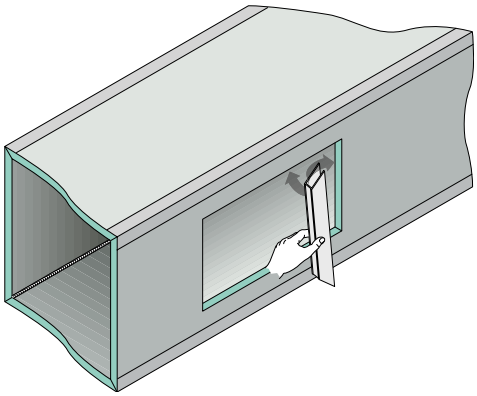


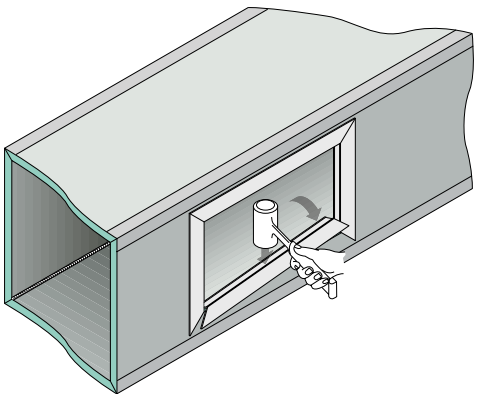
Types
Inspection doors can be realized according to two different techniques
solution 1- traditional: using the made on purpose “U” profile (available in aluminium code 21PR01 for 20 mm and code 21PR14 for 30 mm thick panels and in pvc code 21PR11 for 20 mm thick panels)
solution 2 – P3ductal inspection door: using the made on purpose inspection door specifically designed by P3 (code 21IP01)

solution 1 - traditional doors

phase 1 » application of a U-shaped profile

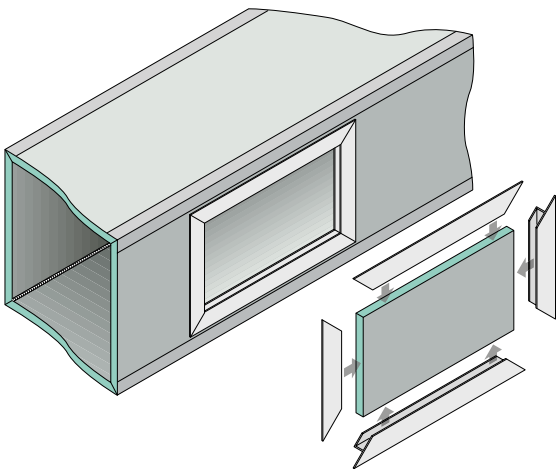
After drilling the hole on the duct using the special cutter, proceed to apply the “U” profiles cut at 45° on the extremities.
This must be applied directly on the duct along the perimeter of the inspection hole.
To make this operation easier, it is advisable to use the special rubber hammer.





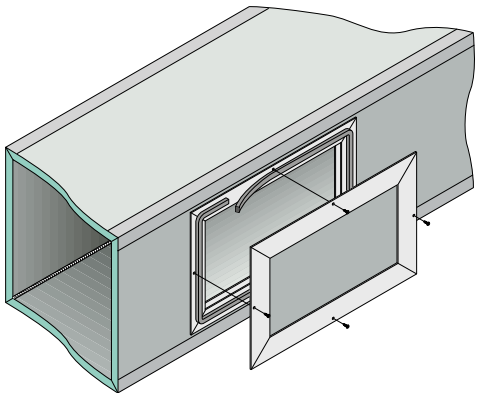
phase 2 » making an inspection door

The inspection door is made by bordering with the chair-shaped (cod. 21PR02 for 20 mm aluminium model - cod. 21PR15 for 30 mm aluminium model - cod 21PR12 for 20 mm pvc model) profile the portion of the duct obtained by drilling the first hole.



phase 3 » application of a gasket and fitting the door

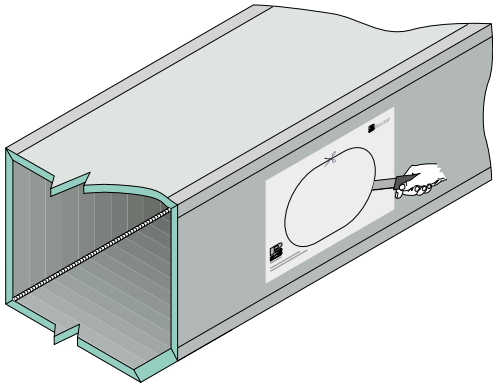
To enhance the grip in areas close to the inspection hole, it is possible to apply the special gasket along the external perimeter of the U-shaped profile.
The door will then be fitted on the outer edge of the U-shaped profile by using the special screws.



solution 2 - P3ductal doors

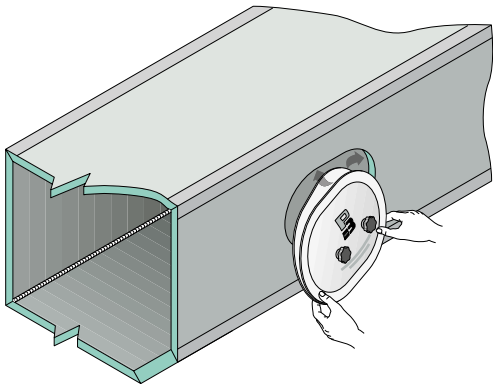
phase 1 » drilling the hole

To drill a hole in the panel fast and easily you can use the special cutter and the template.



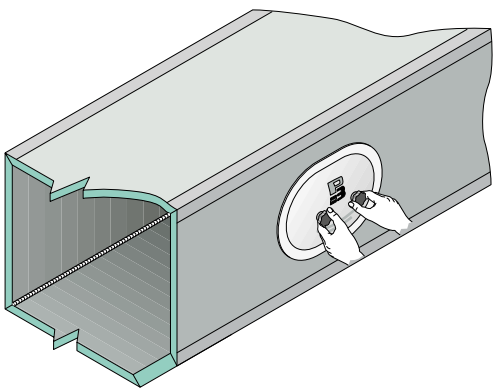
phase 2 » insertion of the door

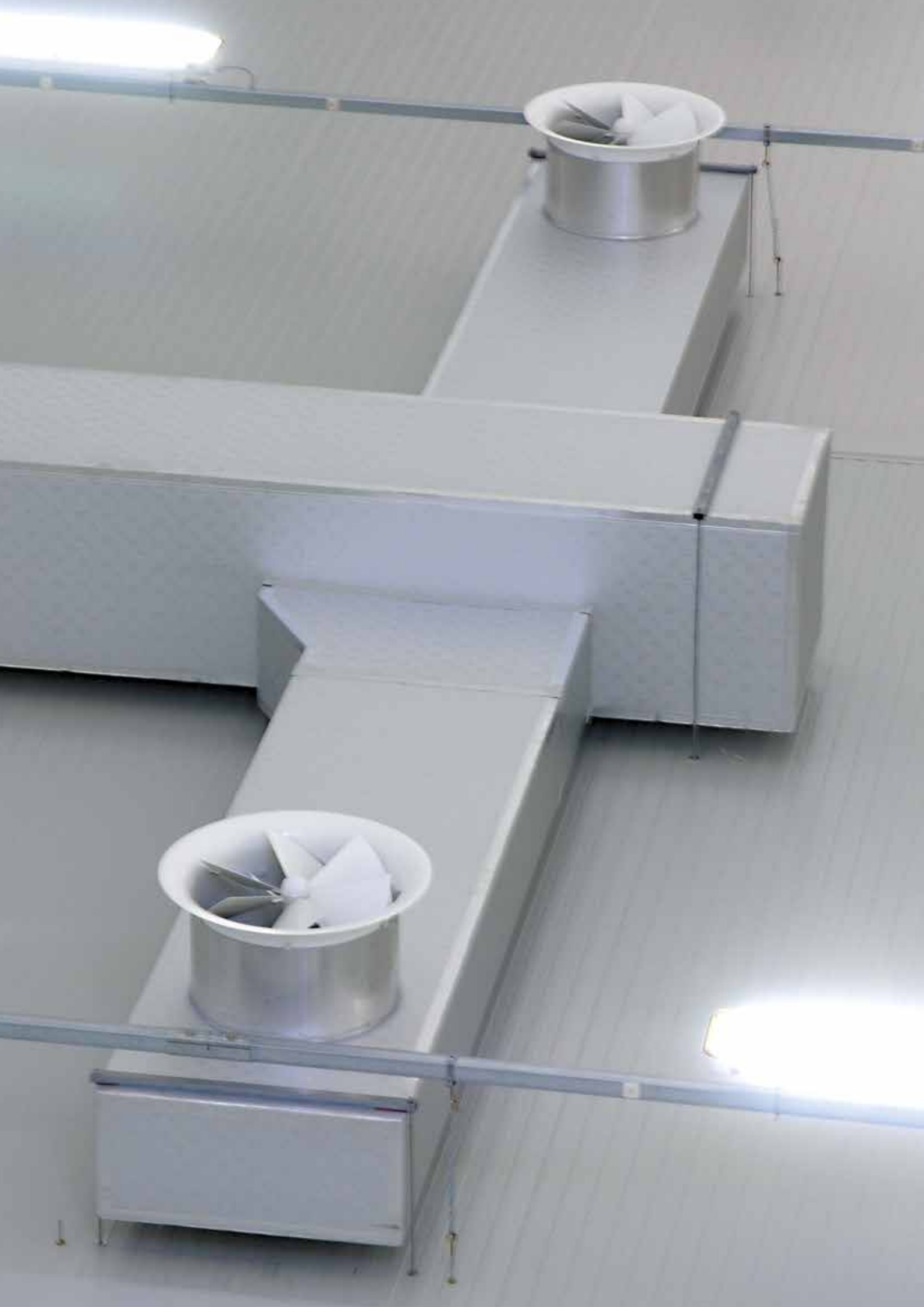
Insert the door in the hole immediately after it has been drilled.



phase 3 » fixing the door

Fit the door using the external fixing screws.





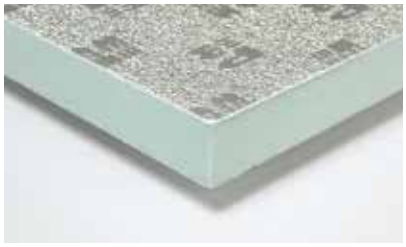
special applications and interventions

26. outdoor applications

On account of both technical and aesthetic reasons, the design of air-handling systems relies more and more often on the development of outdoor solutions, even partial ones. Therefore, ducts must comply with technical and constructional requirements aimed at guaranteeing perfect functionality, even in particularly critical conditions. As a consequence, besides such traditional aspects as thermal insulation, reduced losses from leakage, safety and environmental compatibility, optimal solutions must take into account other more specific aspects, such as high resistance to atmospheric agents, to accidental shock and to factors related to wind and snow. In order to respond to these parameters in the best of ways, P3 has created, together with the P3ductal Indoor system intended for indoor installations, P3ductal Outdoor, a new system for the construction and on-site laying of pre-insulated aluminium ducts specifically designed for outdoor applications.

specific products of the P3ductal outdoor system

code 15HS31 » piral Hd Hydrotec Outsider panel



The particular constructional features of this panel make it particularly rigid and resistant to shock and to accidental perforations, which may always occur in outdoor applications. The Piral HD Hydrotec Outsider panel is made of foamed polyurethane of **a density of 48 ± 2 kg/m3 and 30 mm thickness,** coated with **embossed aluminium of a thickness of 200 microns on one side** and 80 microns thickness on the other. The aluminium is protected by 2 g/m2 of polyester-based anti-oxidant lacquer. Thanks to the high number of closed cells, in fact over 95%, the polyurethane foam in the panel offers an initial thermal conductivity of 0.022 W/(m °C) at 10 °C. The panel may be used within a temperature range of -30 °C to + 65°C.

Code	Size		Technical data			
	bxh	thickness	density	thickness of alum.	thermal conduct. in.	class of rigidity
15HS31	400x120 cm	3 cm	48 ± 2 kg/m3	200/80 µm	0,022 W/m°C a 10 °C	900.000

code 21CL09 » profiles outdoor glue

In the P3ductal outdoor system, **both the profiles and the flanges are applied using the special Profiles Outdoor glue (code 21CL09).** This mono-component polyurethane adhesive has particular technical and chemical features which offer high performance in terms of seal and tightness, even in outdoor situations and in particularly aggressive conditions.
This glue does not require dilutants and ensures extremely quick drying (about 5 minutes in normal conditions and approximately 2 minutes if water is sprayed).

Code	Glue	Stocking temp	Duration	Notes
21CL09	Profiles Outdoor	5÷25 °C	6 months	Temperature for application > 15 °C. Drying time 3 hours at 20 °C, spray water to speed up drying

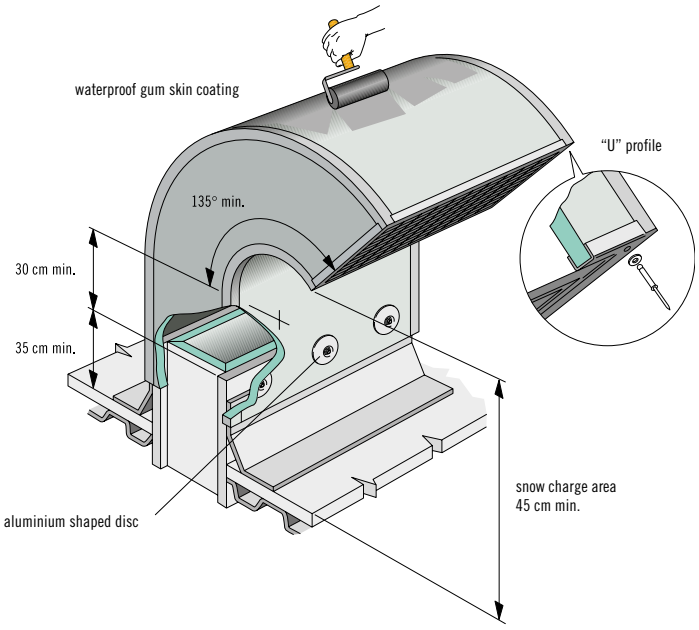
code 21GS01 » waterproofing gum skin

This rubbery sheath having remarkable elastomeric properties is also resistant to UV rays and to freezing and thawing. The special inner-action fungicidal, bacterial and plasticizing additives make the product inalterable over time, even in conditions of industrial pollution of medium degree. Gum Skin ensures that the ducts system enjoys **elevated protection against the formation of algae and fungi as well as protection against corrosive atmospheric agents** (acid rain, sulphur dioxide, carbon dioxide) **and against UV radiation.** Gum Skin proves particularly suitable at temperatures ranging from -15 °C to + 80 °C.

Specific weight	1300 g/l c.a.
Bonding agent	plasticized styrene-acrylic co-polymer
Solvent	water
Ph value	8 approx.
Appearance of the product once dried	opaque, pigmented

Working temperature	-15 °C ÷ +80 °C
Temperature for application	+10 °C ÷ + 35 °C
Waterdilution	max 10 % in volume
Consumption	0,5 ÷ 0,8 l/m^2 (two-coat cycle)
Colour	standard grey RAL 7004, other colours available upon request

Constructional specifications



In order to ensure maximum resistance to atmospheric agents, P3 has created a special waterproofing and protective coating: Gum Skin. This special rubbery sheath with remarkable elastomeric properties imparts resistance to UV rays and shows excellent performance in the freezing/thawing cycle. Besides, the special inner-action fungicidal, antibacterial and plasticizing additives make this product inalterable over time, even in conditions of industrial pollution of medium degree. Gum Skin is made up of a plasticized styrene-acrylic copolymer which makes it possible to obtain a continuous coating of great elasticity, waterproofing and resistance to micro fissures. This product guarantees that the ducts system **enjoys adequate protection against the formation of algae and fungi and against corrosive agents** (acid rain, sulphur dioxide, carbon dioxide) **and UV rays.** Gum Skin proves particularly suitable at temperatures ranging between -15 °C and + 80 °C.

1. Application of a flange using profile outdoor glue

After the duct has been constructed following the standard procedures of plotting, cutting, gluing and shaping, proceed to the flanging phase and apply the flanges by using the special glue for outdoor applications. The product is ready for use. Clean the surface thoroughly and then spread the glue using the special pistol. Before assembly, allow some minutes for drying.

2. Application of gum skin

After laying the ducts system, proceed to apply the first layer of gum skin. Clean the surfaces thoroughly and then dilute gum skin in water (up to 10% in volume). Use a roller or a brush to spread Gum Skin or apply it by spraying. Protect the surfaces which are not being treated and do not apply the product in very windy weather.

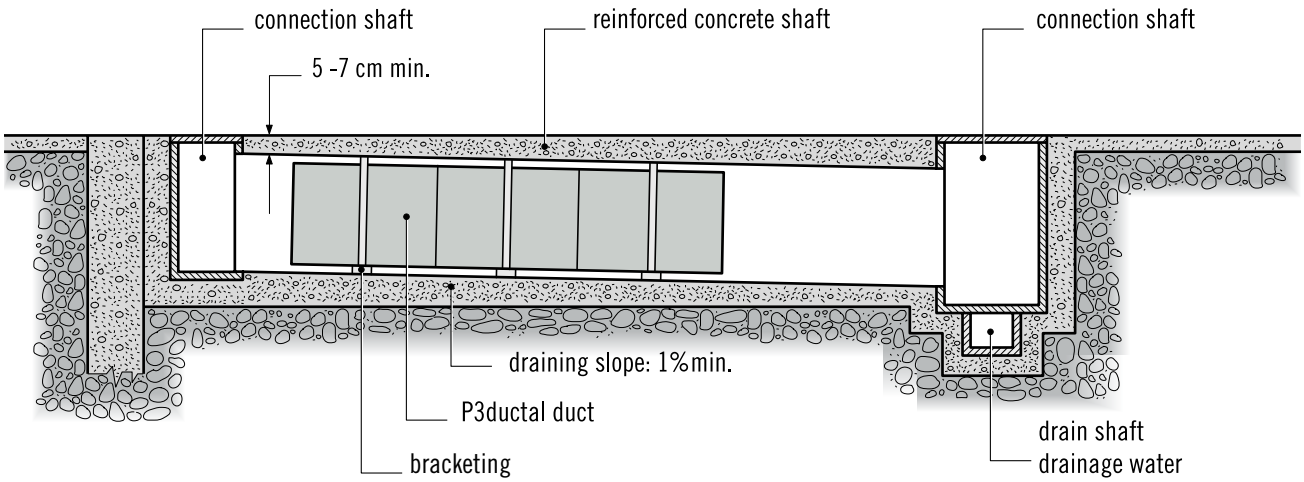
3. Application of a gauze

Apply the reinforcement gauze close to the joining flanges. Lay the gauze immediately after the first layer of gum skin has been spread, i.e. while this product is still fresh. Cover an area of about 30 cm. The edges of the reinforcement tissue should be overlapped by at least 5 cm. After application, protect the surfaces from direct rain for at least 24 hours.

4. Application of a second layer of gum skin

Once the first layer has dried (about 24 hours in normal weather conditions) go on to apply the second layer of gum skin following the instructions mentioned at point 2.

27. underground applications



P3ductal ducts may be installed below ground level or below the level of the paved surface. For this purpose, follow the instructions shown in the drawing. In particular, care should be taken to prevent the weight of the filling material – either earth or sand – from pressing against the walls of the duct. It is also necessary to ensure that the reinforced concrete shaft provides appropriate drainage of the water, which might otherwise filter in.
In the case of underground ducts, it is preferable to use panels of the P3ductal outdoor series (code 15HS31), as the aluminium offers extra resistance to any possible accidental shocks which might occur during installation.

28. repairs and modifications

A duct may sometimes be damaged by accidental shock and the risk is certainly higher when it is subject to handling (loading and unloading from vehicles, installation and so on).
Once laid, especially if installation is outdoors, it is best to protect the ducts from shock due to falling branches, particularly violent atmospheric phenomena such as hail, heavy snow, etc.
Accidental shocks are always likely to occur in the case of ducts fitted at floor level, in areas with frequent passage of people, vehicles, etc.
On building sites, if the ducts must be laid before the installation of technological systems in areas shared by both, the installers must make sure that the scaffolding or any other building equipment does not produce any damage in the ducts.
In any case, it is always best to identify with precision what type of damage the duct has had. Below is a list of the different types of damage that ducts are subjected to and the best solutions that can be applied in each case.

>> Denting or scraping of the surface aluminium sheet which mat affect the appearance of the duct but not its functionality or its features may be corrected by gluing the aluminium sheet again or by repairing it using aluminium tape.

>> Big holes or cave-in of the ducts walls. Localised holes may be repaired by using plugs having the same height as that of the duct's wall.
More serious damage affecting larger surfaces may be solved by replacing the whole side in all the length of the duct's branch.
If the damage affects the front or rear part of the duct in particular, insertion of a flange should be considered as this will make it possible to reconstruct only the damaged part in its entirety.

Especially during installation, it is always possible to make quick on-site modifications or adjustments to suit the actual conditions of the place where the system is fitted.

note

note

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