handbook for construction and installation of ducts
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 thickness.
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

The duct is now finished.
3. end-caps

components

assembly

special pieces
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

<table>
<thead>
<tr>
<th>Inner radius (mm)</th>
<th>Height (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>150</td>
<td>&lt;500</td>
</tr>
<tr>
<td>200</td>
<td>500/1000</td>
</tr>
<tr>
<td>250</td>
<td>&gt;1000</td>
</tr>
</tbody>
</table>

### Distance between the ribbing lines according to the curve radius

<table>
<thead>
<tr>
<th>Curve radius (mm)</th>
<th>Distance (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>150-300</td>
<td>25</td>
</tr>
<tr>
<td>301-500</td>
<td>35</td>
</tr>
<tr>
<td>501-800</td>
<td>50</td>
</tr>
<tr>
<td>&gt;800</td>
<td>80</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Duct width A (mm)</th>
<th>N° splitters</th>
<th>Distance between splitters</th>
</tr>
</thead>
<tbody>
<tr>
<td>400-800</td>
<td>1</td>
<td>ca. A/3</td>
</tr>
<tr>
<td>&gt;800 - 1600</td>
<td>2</td>
<td>ca. A/4; ca. A/2</td>
</tr>
<tr>
<td>&gt;1600 - 2000</td>
<td>3</td>
<td>ca. A/8; ca. A/3; ca. A/2</td>
</tr>
</tbody>
</table>

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

Then, proceed with the pressing, taping and siliconing phases.
6. raw edge elbow

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.

Then, proceed with the pressing, taping and siliconing phases.

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 18: turning vanes” for details on how to fit these profiles.
7. reductions

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.

---

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

---

components

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 \( \frac{x}{x} \) 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**

Then, proceed with the pressing, taping and siliconing phases.
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.

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

Then, proceed with the pressing, taping and siliconing phases.

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.

Then, proceed with the pressing, taping and siliconing phases.
11. Asymmetrical 2-way diverging junction

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.

N.B. Ribbings on pieces to be bent are realized with an electric plate bending roll or the manual bending machine.
12. 3-way diverging junction

**components**

**assembly**

**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.

2a. 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.
13. plenum

- cutting the pieces
- assembly

14. construction using the strips method

- round elbow
- raw edge elbow
- reductions
- 3-way diverging junction
application of accessories
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.

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.

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.

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.

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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.

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To make this operation easier, you may use the pliers at 90° and lever on the fissures of the flanges.

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.

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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.

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.

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.

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.
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.

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) in the dedicated holes. This piece will prevent any displacement of the bayonets, thus improving the aesthetic appearance of the finished duct.

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.
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.

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.

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.
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.

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 bayonets. (cod. 21FT03)

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.
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).

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 length equal to the internal diagonal of the raw edge elbow.

The turning vanes must be fixed on a special supporting plate by means of rivets driven through the panel.
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
phase 2  ➔  fixing the profile to the vertical supports

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

phase 2  ➔  application of brackets

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.

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

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

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).
21. Reinforcements

**Types**
The profile for reinforced concrete (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 selection of number of supports to be used.

**Working Phases**

**Phase 1**  » 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.
# 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 realisation 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

working phases

phase 1 » application of corners

Before the F-shaped profile (cod. 21PR03 for 20 mm aluminium model - cod. 21PR07 for 30 mm aluminium model - cod. 21PR13 for 20 mm pvc model) is fitted, it is necessary to place the reinforcement corners. (cod. 21SQ03 for 20 mm model - cod. 21SQ04 for 30 mm model). These must be applied - sometimes glued or fixed with self-threading screws in the dedicated hole – on the four angles of the duct, so that the corner itself is fitted in position between the profile and the duct.

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.

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.

phase 3 » fixing the duct to the machine

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.
24. grilles

**Solution 1 - Application of a grille to the plenum**

**Phase 1 >> Application of reinforcement corners**

Before fitting the profile (cod. 21PR04) it is necessary to proceed to apply the reinforcement corners (cod. 21SQ01). These must be fitted – sometimes glued or fixed with self-threading screws – at the four angles so that the corner is held in position between the flange and the duct.

**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.
**24. grilles**

**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. 21PR90). To make this operation easier, it is recommended to use the special rubber hammer.

**phase 2 >> application of collars**

**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.

**phase 2 >> application of a grille**

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

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 (code 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.
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

**Product:** P3ductal Outdoor

**Code:** 15HS31

<table>
<thead>
<tr>
<th>Code</th>
<th>Size</th>
<th>Technical data</th>
</tr>
</thead>
<tbody>
<tr>
<td>15HS31</td>
<td>40x120 cm</td>
<td>Thickness: 4 mm, density: 48 ± 2 kg/m³, thickness of alum.: 8 mm, thermal conduct. in.: 0.022 W/(m °C) at 10 °C, class of rigidity: 900.000</td>
</tr>
</tbody>
</table>

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 and 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:** 21CL09

<table>
<thead>
<tr>
<th>Code</th>
<th>Glue</th>
<th>Stocking temp</th>
<th>Duration</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>21CL09</td>
<td>Profiles Outdoor</td>
<td>5+25 °C</td>
<td>6 months</td>
<td>Temperature for application &gt; 15 °C. Drying time 3 hours at 20 °C, spray water to speed up drying</td>
</tr>
</tbody>
</table>

This rubbery sheath having remarkable elastic 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 UV rays. Gum Skin proves particularly suitable at temperatures ranging between -15 °C and + 80 °C.

This rubbery sheath with remarkable elastic 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 duct 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 proved particularly suitable at temperatures ranging between -15 °C and + 80 °C.

**Gum Skin Proofs:**

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

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 may 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.

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28. repairs and modifications

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