EUROVENT/ CECOMAF

EUROVENT 2/4 - 1996

SHEET METAL AIR DUCTS

STANDARD FOR FITTINGS

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Second edition 1996

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15 rue Montorgueil
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Tel 33 1 40 26 00 85
Fax 33 1 40 26 01 26

FOREWORD

The present document gives recommendations on dimensions of fittings with circular and rectangular cross sections. The previous edition published in 1983 based on various national, manufacturers or contractor standards was used as a basic document for the preparation of the European Standards in the CEN/TC 156.

The relevant European Standards :

- pr EN 1505 : Sheet metal air ducts and fittings with rectangular cross section
- pr EN 1506 : Sheet metal air ducts and fittings with circular cross section

are expected to be published in 1997.

This second edition of the EUROVENT 2/4 is in full accordance with these European Standards.

In addition to the standardised dimensions, the fundamental factors affecting the choice of dimension steps and a number of diagrams intended to facilitate to use of standardised duct dimensions in practical design work are presented.

Dimensions of ducts are given in the EUROVENT 2/3.

CONTENTS

1. SCOPE

This document sets out recommendations for nominal sizes, length and radii for air duct fittings of circular and rectangular cross section.

The standardisation of dimensions will result in more uniformity in aerodynamic properties and in the methods of calculation for pressure drop and sound generation.

The duct fittings considered in this document are intended to be used in air distribution systems in connection with ducts of the nominal sizes and tolerances as describes in EUROVENT 2/3.

2. DEFINITIONS

a, b, c, d	Nominal dimensions for duct fittings of rectangular cross section
d	Nominal diameter of a duct
d_1, d_2, d_3, d_4	Nominal diameter for duct fittings of circular cross section
l, l_1, l_2, l_3	Dimensions with which the fitting contributes to the length of the air distribution system
l_p	Overlap length
r_m	Radius of curvature
r	Throat radius
s	Conical height
α	Angle in degrees For a transformation piece α denotes the biggest angle between two opposite sides.

Linear dimensions are given in mm.

3. FITTINGS FOR CIRCULAR DUCTS

3.1 JOINTS

Overlap length.

Table 1

Nominal diameter	63 - 315	(315) - 800	(800) - 1250
lp	≥ 25	≥ 50	≥ 100

Examples of alternative designs of connections :

Ends of fittings :

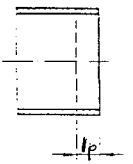


Fig. 1 a: Plain end -

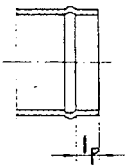


Fig. 1 b: With swage -

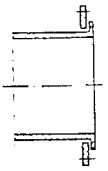


Fig. 1 c: With flange -

Ends of ducts

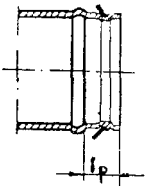


Fig. 1 d With seal

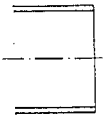
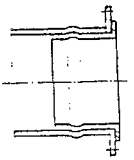
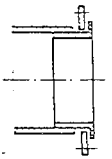


Fig. 2 a: Plain end -



$l_p = 0$

Fig. 2 b: With integral flange, factory assembled



$l_p = 0$

Fig. 2 c: With loose flange (for site assembly)

3.2 - FEMALE AND MALE CONNECTORS

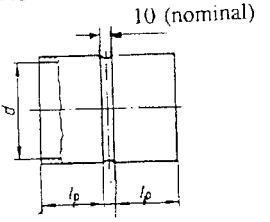


Fig. 3 a: Female connector
For use with fittings

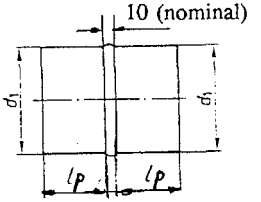


Fig. 3 b: Male connector
For use between ducts

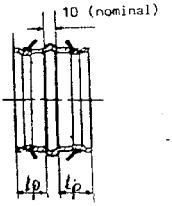


Fig. 3 c: Male connector with seal

3.3 - BENDS

$$l = r_m \cdot \operatorname{tg} \frac{\alpha}{2}$$

d_1	100	> 100
r_m	100	$r_m = d_1$

Table 2 Relation between r_m and d_1

3.3.1 - Pressed bends

d_1 = 63 - 400

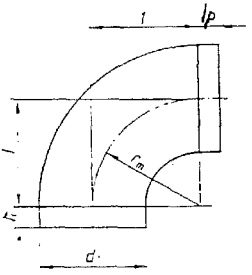
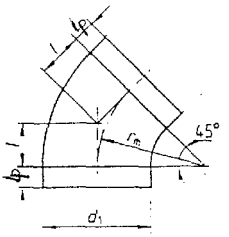


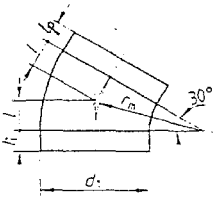
Fig. 4a
90° Bend

$L = r_m$



4b
45° Bend

$L = 0.41\ r_m$



4c
30° Bend

$L = 0.27\ r_m$

3.3.2 - Segmented bends

d_1 = 250 - 1250

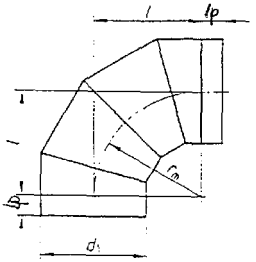
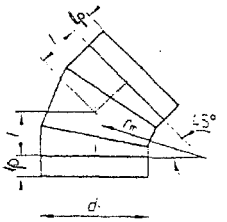


Fig. 5a
90° Bend
Coude
Bogen

$L = r_m$

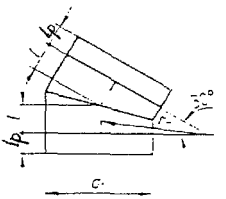
Minimum 3 segments



5b
45° Bend
Coude
Bogen

$L = 0.41\ r_m$

Minimum 2 segments



5c
30° Bend
Coude
Bogen

$L = 0.27\ r_m$

Minimum 2 segments

Note: Bends with 15° and 60° angle are also available.
Note: Des coudes avec angles de 15° et 60° sont également disponibles.
Bemerkung: Bögen mit 15° und 60° sind ebenfalls üblich.

3.4 - BRANCHES AND T-PIECES

The radiused part of a branch or of a T-piece (see fig. 6a) can alternatively be designed as a conical part (see fig. 6b).

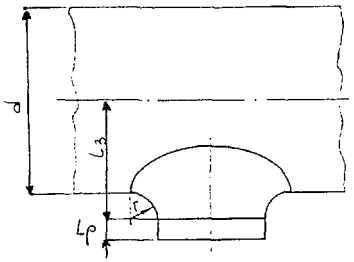
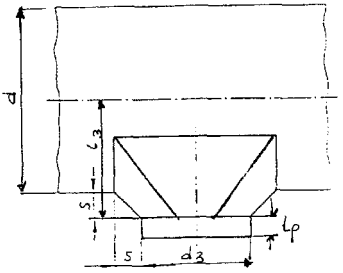


Fig. 6a Pressed formed branch
$r \geq 10$ mm
$l_3 > 0{,}5\ d + r$



6b Conical branch
$s > 0{,}15\ d_3$
$l_3 < 0{,}15\ d + s$

3.4.1 - Circular branch

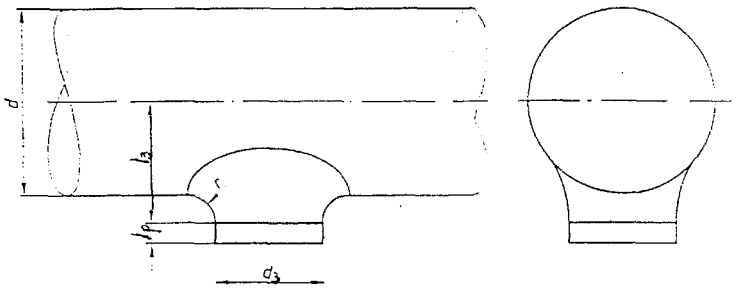


Fig. 7

Circular branch to a circular duct

$r \geq 10$ mm
$l_3 > 0{,}5\ d + r$

3.4.1.1 - T-pieces with concentric press formed branch

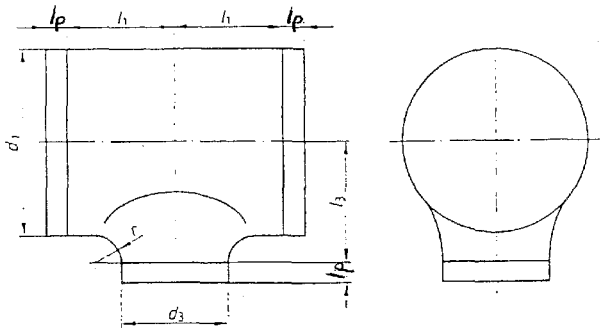


Fig. 8

$l_1 > 0{,}5\ d_3 + r +$

$l_3 > 0{,}5\ d_1 + r$

$r \geq 10$ mm

3.4.1.2 - T-pieces with conical branch (concentric or tangential)

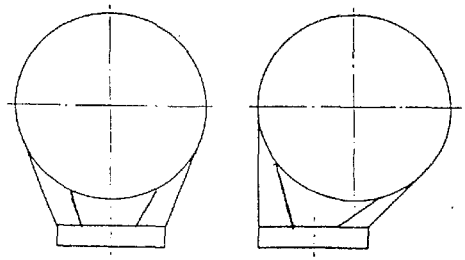
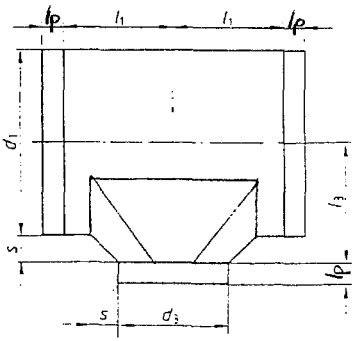


Fig. 9a

Concentric branch

9b

Tangential branch



$l_1 > 0{,}5\ d_3 + s$

$l_3 > 0{,}5\ d_1 + s$

$s > 0{,}15\ d_3$

Table 3 - Dimensions for branches and T-pieces (in mm)

Recommended sizes are indicated with X, additional sizes with Y.

d_3 / d_1	63	80	100	125	150	160	200	250	300	315	355	400	450	500	560	630	710	800	900	1000	1120	1250
80	X	X																				
100	X	X	X																			
125		X	X	X																		
150		Y	Y	Y	Y																	
160		X	X	X		X																
200		X	X	X		X	X															
250		X	X	X		X	X	X														
300			Y	Y	Y	Y	Y	Y	Y													
315			X	X		X	X	X		X												
355				Y		Y	Y	Y		Y	Y											
T-pieces with conical branches																						
400						X	X	X		X	Y	X										
450							Y	Y		Y	Y	Y	Y									
500							X	X		X	Y	X	Y	X								
560								Y		Y	Y	Y	Y	Y	Y							
630							X	X		Y	X	Y	X	Y	X							
T-pieces with pressed branches																						
710										Y	Y	Y	Y	Y	Y	Y	Y					
800										X	Y	X	Y	X	Y	X	Y	X				
900												Y	Y	Y	Y	Y	Y	Y	Y			
1000												X	Y	X	Y	X	Y	X	Y	X		
1120														Y	Y	Y	Y	Y	Y	Y	Y	
1250														X	Y	X	Y	X	Y	X	Y	X

3.4.1.3 - Examples of special pieces

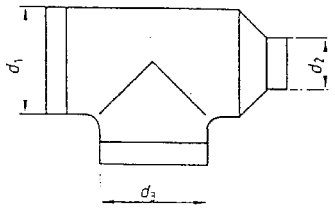


Fig. 10a

T-piece with transformation piece

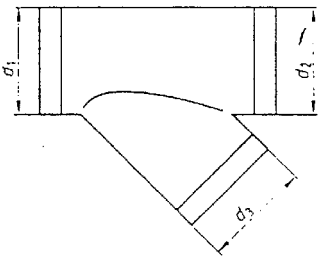


Fig 10b

T-piece with 45° branch

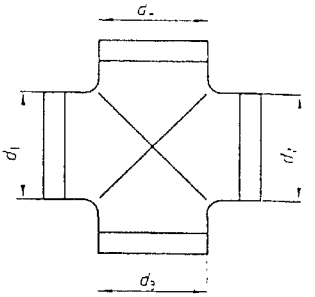


Fig 10c

Cross (X-piece)

3.5 - TRANSFORMATION PIECES

3.5.1 - Tapered transformation pieces with two male ends

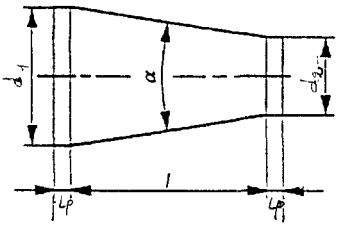


Fig. 11a

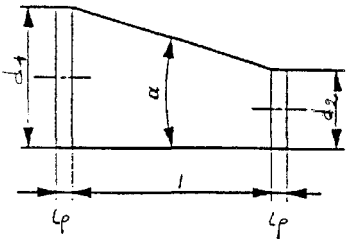


Fig. 11b

a) concentric

$$l = \frac{d_1 - d_2}{2} \cdot \cot \frac{\alpha}{2}$$

b) eccentric

$$l = (d_1 - d_2) \cdot \cot \alpha$$

$$15\ ° < \alpha < 60$$

For pressed transformation pieces $q_{max} = 90°$.

Transformation pieces with female ends and combination of male and female ends are also available.

3.5.2 - Abrupt transformation piece between fitting and duct

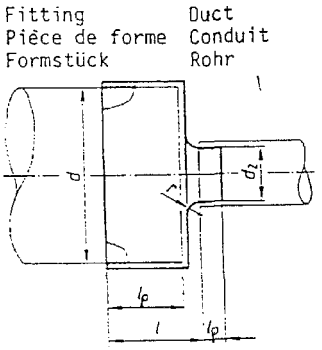
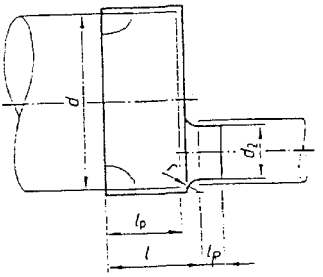


Fig. 12a

Female - male
concentric



12b

Female - male
eccentric

$$l = l_p + r$$

$r \geq 10$ mm

3.5.2.1 - Examples of installations

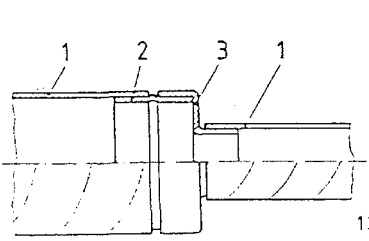
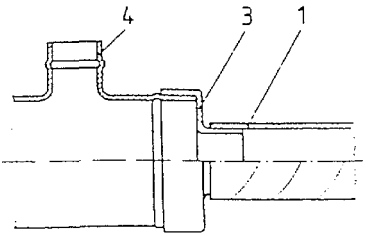


Fig. 13a



13b

1 Duct 2 Male connector 3 Transformation piece 4 Branch

Table 4 - Dimensions for transformation pieces

Recommended sizes are indicated with X, additional sizes with Y.

d_3 / d_1	63	80	100	125	150	160	200	250	300	315	355	400	450	500	560	630	710	800	900	1000
80	X																			
100	X	X																		
125	X	X	X																	
150		Y	Y	Y																
160		X	X	X																
200			X	X		X														
250				X		X	X													
300					Y	Y	Y	Y												
315						X	X	X												
355							Y	Y		Y										
	Pressed transformation pieces																			
400								X		X	Y									
450										Y	Y	Y								
500											Y	X	Y							
560												Y	Y	Y						
630													Y	X	Y					
710														Y	Y	Y				
800															Y	X	Y			
900																Y	Y	Y		
1000																	Y	X	Y	
1120																		Y	Y	Y
1250																			Y	X

3.6- CLOSURES

The nominal diameter of the closures are given in EUROVENT 2/3, table 1.

Examples of closures are shown in figure 9.

a) Plug end (for ducts and female ends) b) Cap end (for male ends)

Figure 14 : Examples of closures

4. FITTINGS FOR RECTANGULAR DUCTS

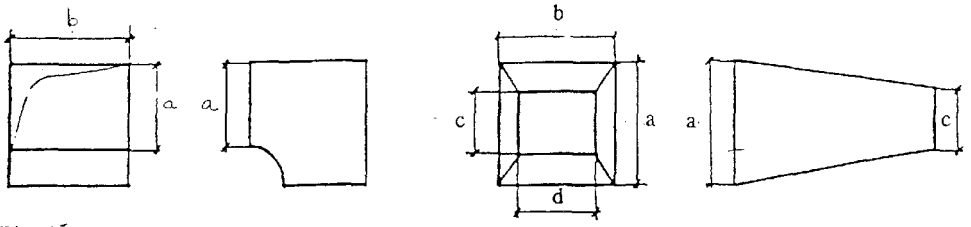
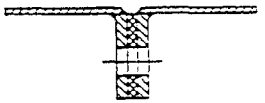


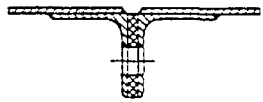
Fig. 15 Denominations for the nominal size of fittings

4.1 - CONNECTIONS

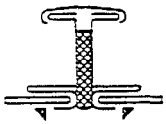
Fig. 16 Examples of alternative designs of connections



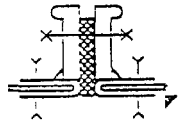
a) Rolled steel angle flanged joints with welded corners



b) Rolled steel flat flanged joint with welded corners

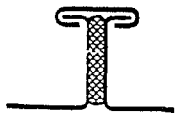


c) Reinforced flange cleat with C - clear

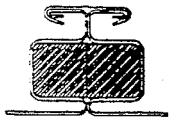


d) Slide on flange

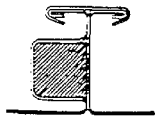
e) Slide on flange



f) Integral standing flanged with C-cleat



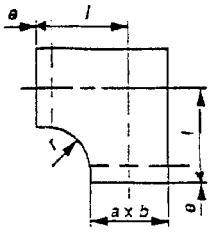
g) Standing flange with double rubber gasket and C-cleat



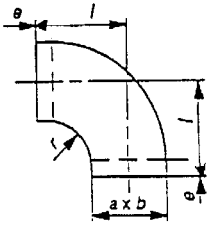
h) Standing flange with single rubber gasket and C-cleat

4.2 - BENDS

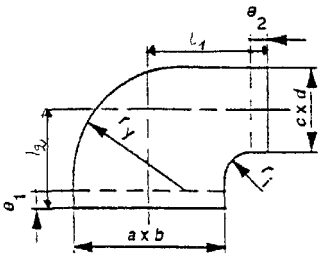
Figure 17



a)



b)



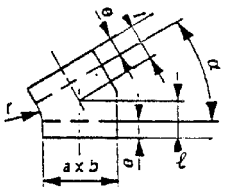
c)

90 ° bend

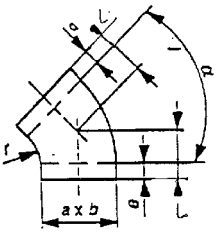
$e \geq 25$ mm
$r \geq 100$ mm
$l = 0{,}5\ a + r$

90 ° transformation bend

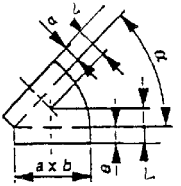
e_1 and $e_2 \geq 25$ mm
$r_i \geq 100$ mm
$r_v = c + r_i$
$l_1 = 0{,}5\ a + r_i + e_2$
$l_2 = 0{,}5\ c + r_i + e_1$



d)



e)



f)

bends, $\alpha \leq 90$ °

$e \geq 25$ mm
$r_i \geq 100$ mm
$l = (0{,}5\ a + r)\ \mathrm{tg}\ \alpha/2$

4.3 - TRANSFORMATION BRANCH

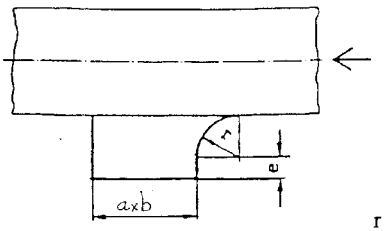


Figure 18a

e ⩾ 25 mm
r and f see table 5

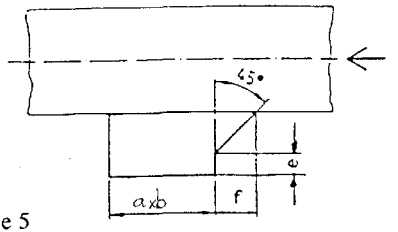


Figure 18b

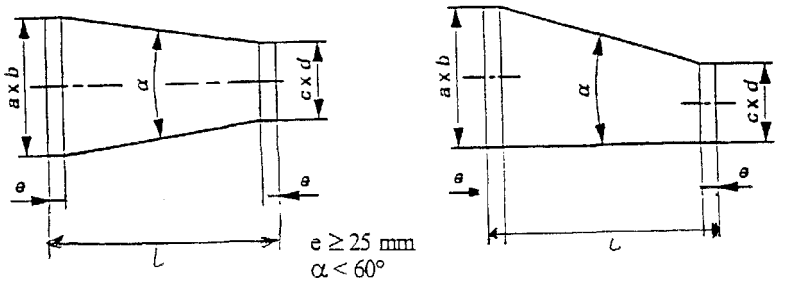
Transformation mounted on the side wall of a duct

Table 5 - Dimensions r and f dependant on branch duct width b

Branch duct width a (mm)	r mm	f mm
a < 200	≥ 100	≥ 100
200 < a < 300	≥ 100	≥ 100
300 < a < 400	≥ 150	≥ 125
400 < a < 600	≥ 150	≥ 150
a > 600	≥ 150	≥ 200

4.4 - TRANSFORMATION PIECES

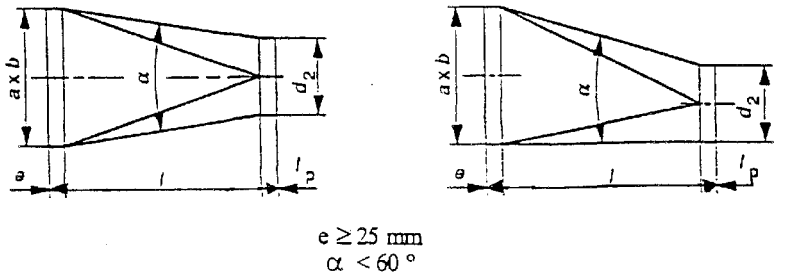
4.4.1 - Transformation : duct - duct



a) concentric b) eccentric

Figure 19 - **Transformation between ducts with rectangular cross section**

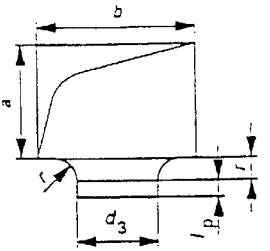
4.4.2 - Transformation : Duct - circular duct



a) concentric b) eccentric

Figure 20 - **Transformation between one duct with rectangular, and one with circular cross section**

4.5 - CIRCULAR BRANCH



10 mm ≤ r ≤ 25 mm

Figure 21 - Branch with circular cross section as a transformation piece to a duct with rectangular cross section

Comments and notes to clause 4

General

It is recommended that splitters are positioned in accordance with the examples given in table. Designers should take account of individual system requirements regarding acoustics, velocity and pressure when selecting duct fittings.
NOTE 1. The bend shown in figure 17a is only recommended for use on low pressure/velocity systems and smaller dimensions of ducts.

NOTE 2. For bends shown in figures 17b and 17c with radius r less than 100 mm, splitters are recommended in accordance with table 6 and figure 21. If alternatively r is increased to 0.5a splitters may be omitted.

NOTE 3. For bends shown in figures 17d, 17e and 17f, with angles ≤ 45° splitters are not required but for angles > 45° splitters are recommended.

NOTE 4. For transformation pieces as shown on figures 19 and 20 which are large or are used on high velocity systems the slope angle α should be reduced.

Table 6 : positioning of splitters

Duct width a mm	Number of splitters	Distance between splitters, mm (approximate)		
		a_1	a_2	a_3
> 400 ≤ 800	1	a/3		
> 800 ≤ 1600	2	a/4	a/2	
> 1600 ≤ 2000	3	a/8	a/3	a/2

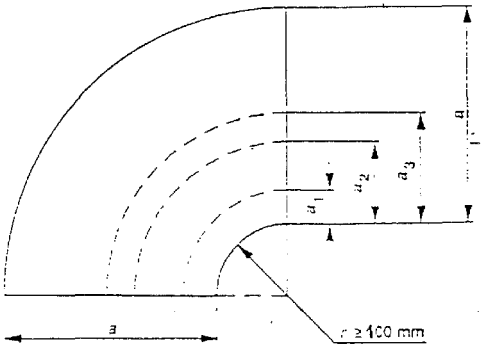


Figure 22 : positioning of splitters

5. TOLERANCES AND DEVIATIONS

The tolerance of angles is 2°.

The deviation of a, b, c, d, e, f, is 0

- 4 mm

The deviation l, l_p r, r_m and s is given in table 3.

Table 7 - Deviation of l, l_p, r, r_m and s

l, l_p, r, r_m, and s (mm)	Deviation (mm)
≤ 15	0 - 2
> 15 ≤ 100	0 - 5
> 100	0 - 10

Tolerances for straight ducts see EUROVENT 2/3.

6. BIBLIOGRAPHY

(1)	EUROVENT 2/3	Sheet metal air ducts - standard for dimensions
(2)	SIS 82 72 07	Ventilating sheet metal ducts
(3)	HVCA DW/142 + Addendum A	Specification for sheet metal duct work Low, medium and high velocity/pressure air systems
(4)	DIN 24 147	Lufttechnische Anlagen, Formstücke. Obersicht, allgemeine Grundlagen
(5)	DIN 24 191	Kanalbauteile für lufttechnische Anlagen. Kanalformstücke, gefalzt, geschweißt.
(6)	ISO 7807:1983	Air distribution - Straight circular sheet metal ducts with a lock type spiral seam and straight rectangular sheet metal ducts - Dimensions.
(7)	pr EN 150	Rectangular sheet metal air ducts and duct fittings, standard for dimensions
(8)	pr EN 150	Circular sheet metal air ducts and fuct fittings, standard for dimensions

LIST OF THE MEMBER ASSOCIATIONS

BELGIUM	***ITALY***
FABRIMETAL	**ANIMA - CO.AER**
21 rue des Drapiers - B-1050 BRUXELLES	Via Battistotti Sassi, 11 - I-20133 MILANO
Tel 32/2/5102518 - Fax 32/2/5102562	Tel 39/2/73971 - Fax 39/2/7397316
GERMANY	***NORWAY***
FG ALT im VDMA	**NVEF**
Postfach 710864 - D-6000 FRANKFURT/MAIN 71	P.O.Box 850 Sentrum - N-0104 OSLO
Tel 49/69/66031227 - Fax 49/69/66031218	Tel 47/2/413445 - Fax 47/2/2202875
SPAIN	***SWEDEN***
AFEC	**KTG**
Francisco Silvela, 69-1°C - E-28028 MADRID	P.O. Box 55 10 - S-11485 STOCKHOLM
Tel 34/1/4027383 - Fax 34/1/4027638	Tel 46/8/20800 - Fax 46/8/6603378
FRANCE	***SWEDEN***
UNICLIMA (Syndicat du Matériel Frigorifique,	**SWEDVENT**
Syndicat de l'Aéraulique)	Box 17537 - S-11891 STOCKHOLM
Cedex 72 - F-92038 PARIS LA DEFENSE	Tel 46/8/6160400 - Fax 46/8/6681180
Tel 33/1/47176292 - Fax 33/1/47176427	
UNITED KINGDOM	***FINLAND***
FETA (HEVAC and BRA)	**FREA**
Sterling House - 6 Furlong Road - Bourne End	PL 37
GB-BUCKS SL 8 5DG	FIN-00801 HELSINKI
Tel 44/1628/531186 - Fax 44/1628/810423	Tel 358/9/759 11 66 - Fax 358/9/755 72 46
NETHERLANDS	***FINLAND***
VLA	**AFMAHE**
Postbus 190 - NL-2700 AD ZOETERMEER	Etalaranta 10 - FIN-00130 HELSINKI
Tel 31/79/531258 - Fax 31/79/531365	Tel 358/9/19231 - Fax 358/9/624462
NETHERLANDS	***TURKEY***
NKI	**ISKID**
Postbus 190 - NL-2700 AD ZOETERMEER	ARCELIK S.A.
Tel 31/79/3531258 - Fax 31/79/3531365	Klima Isletmesi - 81719 TUZLA ISTANBUL
	Tel 90/216 3954515 - Fax 90/216 4232359