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Rectangular ducts and fittings

ALNOR reserves the right to modify technical specifications in line with the policy of continuous product improvement.

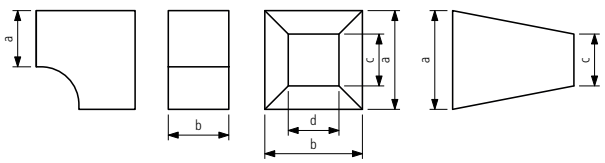
TECHNICAL INFORMATION

System description

This is ALNOR's range of rectangular ducts and fittings for ventilation systems.
This catalogue presents the rectangular ducts and fittings sized in accordance with **EN 1505:2001**, "Ventilation for buildings. Sheet metal air ducts and fittings with rectangular cross-section. Dimensions" and reference standards.
The surface area of ventilation ducts and fittings is measured according to **DIN 18379**, "German construction contract procedures – Part C: General technical specifications for building works – Room ventilation systems". Rectangular ducts and fittings are designed for low- and medium-pressure indoor HVAC systems. Rectangular ducts and fittings made from stainless steel or aluminium are available on request if a higher corrosion protection level is required. Alnor also fabricates custom fittings to individual design requirements.

Dimensions

The nominal size is a conventional dimension used to designate and calculate straight ducts and fittings. It is the internal dimension of sides a and b, where side a is exposed to view (see Fig. 1). The length sizes of the sides at a smaller end of an adapter fitting are designated c and d, where side c is exposed to view.
Dimension L is the effective length of a straight duct, which is added to the overall length of the ductwork system.
Dimension l is the effective length of a fitting, which is added to the overall length of the ductwork system.



The standard dimensions of ducts and fittings range between 130 mm and 2500 mm for any side length. The ducts and fittings below and above these sizes are available on request. Measurements of the surface area and the lead time for custom ductwork orders are subject to separate arrangements.

Tightness

Ducts are made in two air tightness classes according to **PN-B-76001**, "Ventilation ducts. Air tightness, requirements and testing" and **EN 1507**, "Ventilation for buildings. Sheet metal air ducts with rectangular section. Requirements for strength and leakage":
Air tightness class A: standard in normal design versions;
Air tightness class B: design versions with improved air tightness.

The air tightness classes are specified in the table below.

Duct air tightness class	*Leakage rate limit value (f_{max}) $m^3s^{-1}m^{-2}$*	*Limit values of static pressure (p_s) Pa*			
		Vacuum pressure in each class	*Overpressure in each class*		
			1	*2*	*3*
A	$0.027 \times p_{test}^{0.65} \times 10^{-3}$	200	400		
B	$0.009 \times p_{test}^{0.65} \times 10^{-3}$	500	400	1000	2000
C	$0.003 \times p_{test}^{0.65} \times 10^{-3}$	750	400	1000	2000
D*	$0.001 \times p_{test}^{0.65} \times 10^{-3}$	750	400	1000	2000

Special-purpose ventilation ducts

Design

Rectangular ducts and fittings are fabricated from metal sheets which are hemmed and seamed, pressure-welded, or riveted. The ducts and fittings are available in low- and medium-pressure versions (min. vacuum / max. overpressure):
- class N design (low-pressure design):
  standard design from -400 Pa to +1000 Pa
- class S design (medium-pressure design):
  from -1000 Pa to 2500 Pa

The dimensional tolerances and metal sheet thickness are selected according to the following criteria:
- length of the long side of a straight duct,
- the dimension of the longest side of the connection cross-section
  of the fitting.

Table 1 (see below) provides dimensional tolerances and minimum metal sheet thickness sizes.

Dimension of the long side (mm)	*Dimensional tolerance for the duct side (mm)*	*Class N minimum sheet thickness (mm)*	*Class S minimum sheet thickness (mm)*
100-500	0-4	0.6	0.7
501-1000	0-4	0.8	0.9
1001-2000	0-4	1.0	1.1
2001-4000	0-5	1.1	1.2

Rectangular ducts and fittings can be fabricated from stainless steel sheet or aluminium sheet on request (see Table 2).

Dimension of the long side (mm)	*Stainless steel sheet*	*Aluminium sheet*
100-500	0.6	0.8
501-1000	0.6	0.8
1001-2000	0.8	1.0

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System description

The length L tolerance for straight ducts is ±0.005 L.
The angular tolerance is ±2°.
Deviations from dimensions a, b, c, d, e, and f are 0-4 mm.

Dimensions for ducts, including the corresponding cross-sectional area A_c, hydraulic diameter d_h, equivalent diameter d_e, and surface area of 1-metre long duct A_l are listed in Table 3.

Table 3 (see below)
The dimensions and values applicable to ventilation ducts meet the requirements of EN 1505 "Ventilation for buildings. Sheet metal air ducts and fittings with rectangular cross-section. Dimensions".

Marking

ALNOR products carry the Polish conformity mark B for construction products and product codes as shown in the technical specifications listed in this catalogue.

Rectangular ducts and fittings are certified for compliance with hygiene standards:
a) made from aluminium sheet:
HK/B/1652/03/2007
b) made from galvanized or stainless steel sheet:
HK/B/1652/01/2007

Side length (mm)	*100*	*150*	*200*	*250*	*300*	*400*	*500*	*600*	*800*	*1000*	*1200*	
200	0.02	0.03	0.04									A_c
	133	171	200									d_h
	149	186	218									d_e
	0.6	0.7	0.8									A_l
250	0.025	0.038	0.05	0.063								A_c
	143	188	222	250								d_h
	165	206	241	273								d_e
	0.7	0.8	0.9	1								A_l
300	0.03	0.045	0.06	0.075	0.09							A_c
	150	200	240	273	300							d_h
	180	224	262	296	327							d_e
	0.3	0.9	1	1.1	1.2							A_l
400	0.04	0.06	0.08	0.1	0.12	0.16						A_c
	160	218	267	308	343	400						d_h
	205	255	299	337	373	436						d_e
	1	1.1	1.2	1.3	1.4	1.6						A_l
500		0.075	0.1	0.13	0.15	0.2	0.25					A_c
		231	286	333	375	444	500					d_h
		283	331	374	413	483	545					d_e
		1.3	1.4	1.5	1.6	1.8	2					A_l
600		0.09	0.12	0.15	0.18	0.24	0.3	0.36				A_c
		240	300	353	400	480	545	600				d_h
		307	359	406	448	524	592	654				d_e
		1.5	1.6	1.7	1.8	2	2.2	2.4				A_l
800			0.16	0.2	0.24	0.32	0.4	0.48	0.64			A_c
			320	381	436	533	615	686	800			d_h
			410	463	511	598	675	745	872			d_e
			2	2.1	2.2	2.4	2.6	2.8	3.2			A_l

Tolerances and deviations

Table 3, cont.
Dimensions and values for ducts

Side length (mm)	*100*	*150*	*200*	*250*	*300*	*400*	*500*	*600*	*800*	*1000*	*1200*	
1000				0.25	0.3	0.4	0.5	0.6	0.8	1		A_c
				400	462	571	667	750	889	1000		d_h
				512	566	662	747	825	965	1090		d_e
				2.5	2.6	2.8	3	3.2	3.6	4		A_l
1200					0.36	0.48	0.6	0.72	0.96	1.2	1.44	A_c
					480	600	706	800	960	1091	1200	d_h
					614	719	812	896	1049	1184	1308	d_e
					3	3.2	3.4	3.6	4	4.4	4.8	A_l
1400						0.56	0.7	0.84	1.12	1.4	1.68	A_c
						622	737	840	1018	1167	1292	d_h
						771	871	962	1125	1270	1403	d_e
						3.6	3.8	4	4.4	4.8	5.2	A_l
1600						0.64	0.8	0.96	1.28	1.6	1.92	A_c
						640	762	873	1067	1231	1371	d_h
						819	925	1022	1195	1350	1491	d_e
						4	4.2	4.4	4.8	5.2	5.6	A_l
1800							0.9	1.08	1.44	1.8	2.16	A_c
							783	900	1108	1286	1440	d_h
							976	1078	1261	1424	1573	d_e
							4.6	4.8	5.2	5.6	6	A_l
2000							1	1.2	1.6	2	2.4	A_c
							800	923	1143	1333	1500	d_h
							1024	1131	1323	1494	1650	d_e
							5	5.2	5.6	6	6.4	A_l

The cross sectional area is the length of side a multiplied by the length of side b.
The duct surface area is the the inner circumference multiplied by the length of the duct.
Hydraulic diameter: for a rectangular duct - diameter of a round duct which has the same pressure loss as the rectangular duct at the same air flow rate and coefficient of friction.

Formula: $d_h = 2 \times a \times b/a + b$.

Equivalent diameter: for a rectangular duct - diameter of a round duct which has the same pressure loss as the rectangular duct at the same air flow rate and coefficient of friction.

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TECHNICAL INFORMATION

Rigidity

Rectangular ducts and fittings are braced by transverse embossing of the metal sheet.
The ducts are additionally braced with galvanized baffle/strut tubes as shown in Fig. 2.

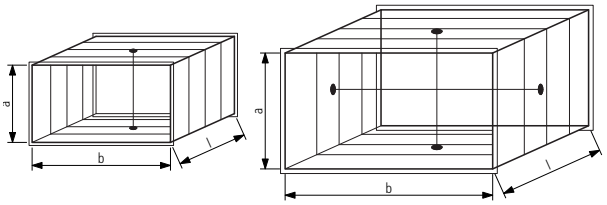

Fig. 2.

See Table 4 for the rules of bracing ventilation ducts.

Table 4
Rules for bracing ventilation ducts with tubes

A (mm)	*B (mm)*	*L (mm)*	*Number of braces*
<1000	<1000	<1000	0
<1000	>1000	<1000	1
<1000	1000-1500	<1000	2
<1000	1500-2000	1500-2000	4
1000-1500	1000-1500	<1000	1 cross brace
1000-1500	1000-1500	1000-1500	2 cross braces

Bends and elbows are braced with vanes according to **EN 1505**, "Ventilation for buildings. Sheet metal air ducts and fittings with rectangular cross-section. Dimensions".
Elbows are recommended for low air velocity and/or low-pressure ventilation systems and smaller sizes of side a ≤ 400 mm.
Bends and elbows set at ≤ 45° require no vanes.
The vane alignment is shown in Table 7 and Fig. 3.

Duct surface area

The surface area of rectangular ducts is measured according to **DIN 18379**, "German construction contract procedures – Part C: General technical specifications for building works – Room ventilation systems".
The ducts with a surface area < 1.0 m² are calculated as 1.0 m² fittings.
The fittings with a surface area < 1.0 m² are calculated as 1.0 m² fittings.

of connection

The ventilation duct connections are fabricated in accordance with **PN-B-76002** "Ventilation. Connections of ventilation equipment, ducts and fittings made of metal sheets".
Rectangular ducts are connected to ventilation equipment using frames made of sheet angles and corner straps.
The sheet angle size depends on the side length of the rectangular duct.
The rules for using sheet angle frames in rectangular ducts and fittings are shown in Table 5.

Table 5
Rules for using sheet angle frames in ventilation rectangular ducts and fittings in the standard version with galvanized steel sheet

Side length (mm)	≤ 1000	> 1000	> 2500
Sheet angle size (mm)	P20	P30	P40

Corner straps and sheet angles are made air-tight using sealants.

Stainless steel sheet angles and corner straps are the standard accessories for stainless steel ducts and fittings. Aluminium angles and corner straps are the standard accessories for aluminium ducts and fittings.
The rules for using sheet angle frames in rectangular ducts and fittings are shown in Table 6.

Table 6
Rules for using sheet angle frames in standard ventilation rectangular ducts and fittings made from stainless steel or aluminium sheet

Side length (mm)	≤ 1000	> 1000	> 2500
Sheet angle size (mm)	PQ20	PQ30	PQ30

Table 7
The vane alignment is according to **EN 1505**, "Ventilation for buildings. Sheet metal air ducts and fittings with rectangular cross-section. Dimensions".

Duct width a (mm)	*Number of vanes*	*L (mm)*	*Vane spacing (mm)*		
			a_1	a_1	a_1
> 400 ≤ 800	1	a/3			
> 800 ≤ 1600	2	a/4	a/2		
> 1600 ≤ 2000	3	a/8	a/3	a/2	

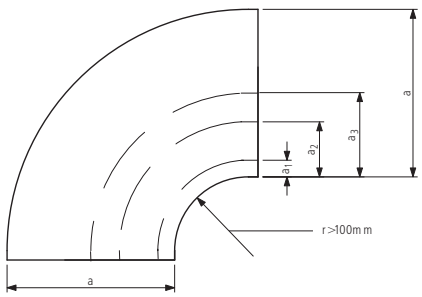

Fig. 3.

TECHNICAL INFORMATION

Design

AlnorCAM is a software suite designed for selecting rectangular components for ventilation ductwork.
AlnorCAM provides a full summary of selected ventilation ductwork components, including the number of ducts and fittings to be ordered plus their surface areas in square metres and fabrication models. The programme reduces the time to fabricate a ready-to-use ventilation ductwork system and helps eliminate errors due to inaccurate dimensioning. Ducts and fittings plotted in AlnorCAM are displayed in the form of 3D models and engineering drawings. The programme automatically calculates the surface areas of ducts and fittings, including the required quantity of thermal insulation if included in the design. The automatically generated summary saves time and makes normal designing and calculation work much easier.
An extensive product database includes insulated and pre-insulated ductwork components. The programme also calculates the required quantity of mineral wool for insulated ducts and fittings. Three thermal insulation thickness sizes are available: 30, 50 and 100 mm.
Additionally, the cladding and inner ducts can be made from different materials as required (galvanized steel sheet, aluminium sheet, or stainless steel sheet).

Benefits of AlnorCAM

- minimizes errors in the processing of engineering documentation,
- significantly reduces fabrication lead times while maintaining competitive pricing and quality,
- precision, reliability and flexibility: you always know how many metres of ductwork are needed, which helps to avoid confusion on site,
- maximum benefits when AlnorCAM is used for B2B ordering
- AlnorCAM is a freeware design suite.
- Available in Polish and English

Download and install AlnorCAM