BRITISH STANDARD

BS EN
13180:2002

Ventilation for buildings — Ductwork — Dimensions and mechanical requirements for flexible ducts

The European Standard EN 13180:2001 has the status of a British Standard

ICS 91.140.30

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National foreword

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Summary of pages

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EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 13180

November 2001

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English version

Ventilation for buildings - Ductwork - Dimensions and mechanical requirements for flexible ducts

Ventilation des bâtiments - Réseau de conduits - Dimensions et prescriptions mécaniques pour les conduits flexibles

Lüftung von Gebäuden - Luftleitungen - Maße und mechanische Anforderungen für flexible Luftleitungen

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Contents

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Foreword

This European Standard has been prepared by Technical Committee CEN/TC 156 "Ventilation for buildings", the secretariat of which is held by BSI.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by May 2002, and conflicting national standards shall be withdrawn at the latest by May 2002.

This standard is one of a series of standards for ductwork used for ventilation and air conditioning of buildings for human occupancy.

The position of this standard in the field of mechanical building services is shown in Figure 1.

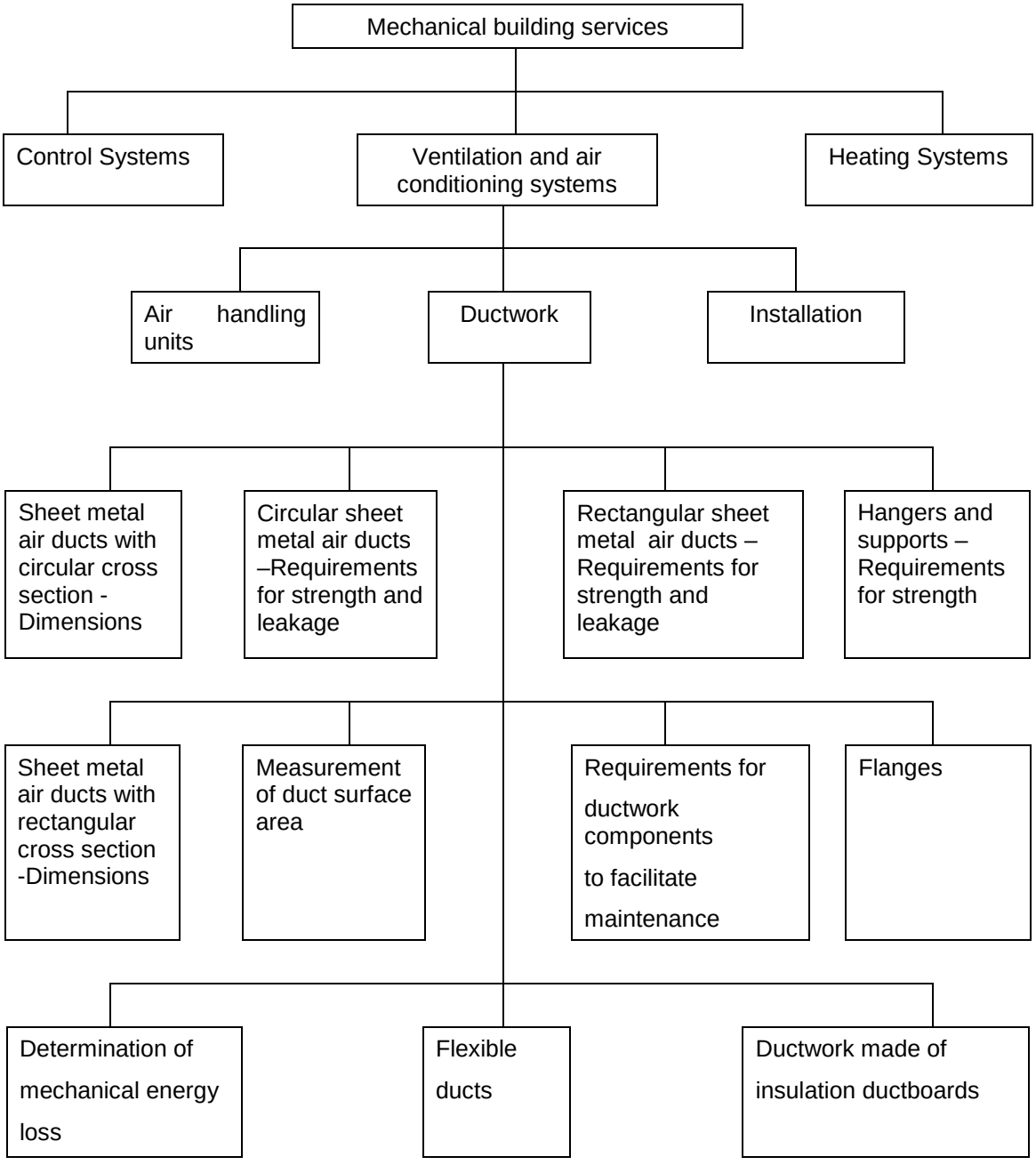

Figure 1 – Position of EN 13180 in the field of mechanical building services

Annex A is informative.

This standard includes a Bibliography.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

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Introduction

This standard has been prepared to:

- specify dimensions and tolerances for flexible ducts;
- give methods for the performance testing of flexible ducts;
- and enable assessment of minimum technical requirements.

However because of the different types of flexible ducts and the various requirements in each application, some technical characteristics are presented as classes and may differ depending on the materials used.

This standard can be used for the following applications:

- testing of components during and after manufacturing;
- attestation purposes.

Temperature characteristics are supplied by the manufacturer.

1 Scope

This standard specifies requirements and test methods for the technical characteristics of flexible ducts used in ventilation and air conditioning installations in buildings for human occupancy.

This standard identifies the following parameters which shall be tested or inspected:

- dimensions and tolerances;
- mechanical resistance.

Acoustic, thermal, reaction to fire, and pressure loss properties of flexible ducts are not covered in this standard.

2 Terms and definitions

For the purposes of this European Standard, the following terms and definitions apply.

2.1

flexible duct
duct which can be manually longitudinally compressed or decompressed and flexed without permanently damaging the cross section area

2.2

air leakage factor
air tightness expressed as the air leakage rate per unit envelope area

2.3

crushing strength
load, at right angles to the axis of the duct, per unit deflection up to a maximum of 10 % deformation

2.4

positive rated operating pressure
tested maximum positive pressure at which the duct is rated

2.5

negative rated operating pressure
tested maximum negative pressure at which the duct is rated

2.6

nominal length of a flexible duct
actual length of a flexible duct after decompression and in an unstressed state

2.7

sag
angle of deflection of one end of a flexible duct when extending in the air beyond the horizontal support of the remainder of the flexible duct

2.8

test pressure (p_s)
static gauge pressure measured in the duct being tested

3 Dimensions for ducts

3.1 Ducts with circular cross section

The deviations depending on the nominal diameter shall conform to Table 1 when verified in accordance with 5.2. The nominal diameters shall also apply to fittings.

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Table 1 – Nominal diameters and deviations

Nominal diameter *d* **mm**	**Deviations** **mm**	
	Class A	**Class B**
63		
80	+ 1	+ 3
100	0	0
125		
150		
160		
200	+ 2	+ 4
250	0	0
300		
315		
355		
400		
450	+ 3	+ 6
500	0	0
560		
630		
NOTE Figures in bold indicate recommended sizes in accordance with EN 1506		

Where a nominal diameter other than those given in Table 1 is specified by the client, the deviations used shall be those applicable to the nearest smaller nominal diameter given in Table 1.

3.2 Ducts with non-circular cross section

The nominal dimensions and tolerances shall be as specified by the manufacturer.

4 Mechanical properties and requirements

4.1 General

The sample shall not rupture, and all joining material shall remain intact during and after each of the tests specified in 5.1 to 5.9.

4.2 Nominal length

Some flexible ducts are compressible and can be delivered in a compressed form for ease of transportation, the flexible duct then being extended for use.

After decompression in accordance with 5.4, the measured length shall be not more than 3 % shorter than manufacturer's quoted nominal length.

4.3 Sag

Where required, the sag shall be measured in accordance with 5.5.

4.4 Bending capability

The sample shall be bent by hand three times, at its nominal diameter or at the bending radius quoted by the manufacturer, whichever is smaller, in accordance with 5.6. The initial height of the duct shall not reduce or expand by more than 20 % at the center line of the test former at any time during the test.

4.5 Pressure

Flexible ducts shall be capable of withstanding 2,5 times the manufacturer's quoted positive pressure [p_r+] and negative rated pressure [p_r -] when tested in accordance with 5.8.

The height of the duct shall not reduce or expand by more than 20 % of the initial height at any time during the test. After a maximum of 5 min recovery time, the deformation shall not exceed 5 % of the initial height.

4.6 Crushing strength

4.6.1 Compressed duct

Flexible ducts delivered in compressed form shall remain undamaged. They shall resist loads perpendicular to their axis. The crushing strength property to assess the mechanical resistance shall be specified according to the application. The minimum characteristics can be imposed at the national level.

4.6.2 Uncompressed duct

A flexible duct can be subject to a load perpendicular to its axis. The crushing strength property to assess the mechanical resistance shall be specified according to the application. The minimum characteristics can be imposed at the national level.

4.7 Air leakage

The test shall be conducted in accordance with 5.9. The maximum air leakage factor, f_{max} for the appropriate air tightness class is given in Table 2.

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Table 2 – Air tightness class

Air tightness class	f_{max} $l \cdot s^{-1} \cdot m^{-2}$
A	$0{,}027 \times p_s^{0{,}65}$
B	$0{,}009 \times p_s^{0{,}65}$
C	$0{,}003 \times p_s^{0{,}65}$

5 Test methods

5.1 Test element

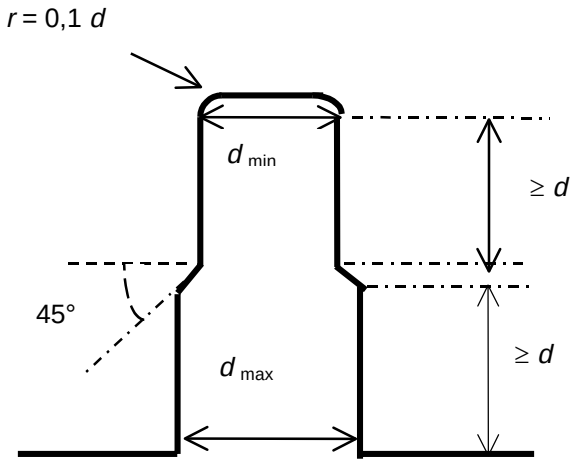
Two samples of duct are required. Tests shall be performed on three elements:

- Test element 1 is a compressed length of 100 mm cut from one end of a compressed duct;
- Test element 2 is an initial sample of the duct;
- Test element 3 is an uncompressed length of duct of maximum length 1,1 m including an extra length of 0,10 m for collar fixation, cut from the middle section of test element 2.

Test element 1 shall be subjected to tests in accordance with 5.3, element 2 in accordance with 5.2 and element 3 in accordance with 5.4 to 5.9.

5.2 Nominal diameter

The test element shall be entered by the minimum and not by the maximum diameter over the length on the test apparatus shown in Figure 2.



Key

d_{min} = nominal diameter + permitted negative deviation

d_{max} = nominal diameter + permitted positive deviation

Figure 2 – Test apparatus

5.3 Determination of crushing strength of a compressed duct

A compressed length of 100 mm is cut from a new compressed duct. This test specimen is placed in a suitable testing device to restrain the two extremities and subjected to a constantly increasing test load perpendicular to the axial direction and evenly distributed along its entire length, until the deformation in the direction of the load is equal to 10 % of the external diameter (see Figure 5).

The rate of increase of deformation during the test shall not exceed 50 mm/min.

The crushing strength shall be determined from the maximum test load F_1 that has been reached.

5.4 Nominal length

The two extremities of the test element shall be extended to receive an end cap for which the fixing elements shall not exceed 50 mm at each extremity.

The compressed reference test element shall be placed horizontally and fixed at one end. The other end shall be subject to a load specified by the manufacturer but not exceeding the yield load specified in Table 3. The uncompressed length shall be the length measured after 5 min with the load still applied.

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Table 3 – Yield load

Nominal diameter *d* mm	Maximum applied load N
≤ 65	120
65 ≤ *d* < 82	150
82 ≤ *d* < 102	160
102 ≤ *d* < 127	180
127 ≤ *d* < 160	200
160 ≤ *d* < 254	230
254 ≤ *d* < 315	260
≥ 315	300

5.5 Sag

The reference test element shall be placed in a straight line on a smooth, horizontal table surface in such a way that one end of the duct extends 500 mm beyond the edge of the table. The part of the duct lying on the table shall be restrained on the top along its whole length. The sag is obtained by measuring the angle between the projected line of the support and the line defined by the free end of the duct.

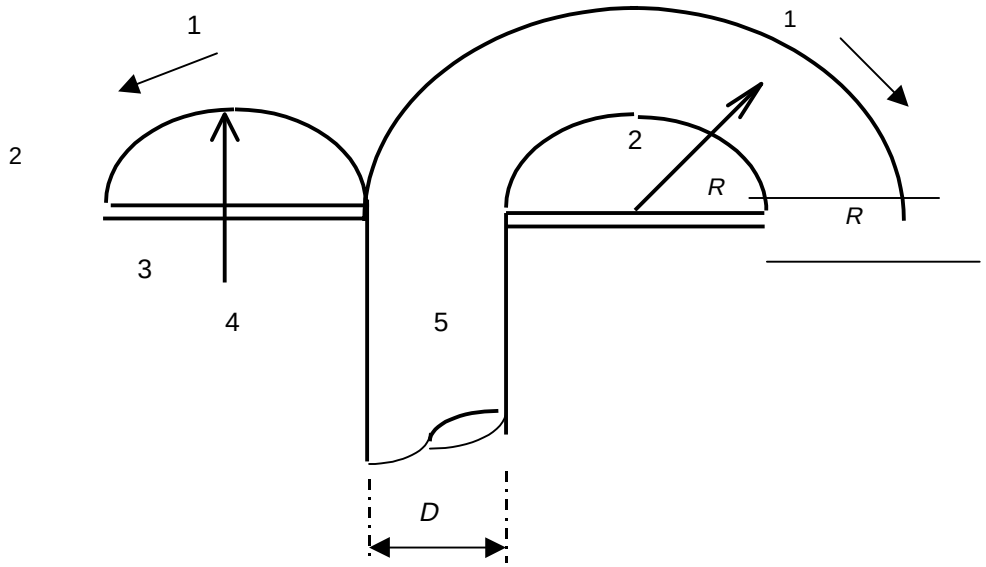
Four measurements shall be performed with the test element by rotating the element 90° after each measurement and a subsequent waiting period of five minutes. The sag is the average value of the four measurements.

5.6 Bending capability

The reference test element is placed in the apparatus shown in Figure 3.

The test element shall be secured between the formers so that at least 200 mm of the element projects below the base of the formers, and the length above is sufficient to bend over the formers.

The free upper length of the element shall be bent at a rotational speed of 12 rpm through an angle of 180° over one former then the other, which means within 5 s to the right and within 5 s to the left. This cycle shall be repeated three times.



Key

r = Radius equal to the nominal diameter or the bending radius quoted by the manufacturers
D = Opening equal to external diameter of duct

1 Direction of bend
2 Test former fixed to base
3 Secure base
4 Centerline of the former
5 Secured part

Figure 3 – Bending capability test apparatus

5.7 Determination of crushing strength for an uncompressed duct

The reference test element shall be fitted with two end caps which are attached to a stationary fixture which maintains the duct at its nominal length. A plate of 2000 mm diameter is positioned in the middle and subject to the procedure specified in 5.8.1.

5.8 Pressure

5.8.1 Positive pressure

The reference test element shall be placed horizontally with each end of the sample sealed to be airtight by any means consistent with the use of the material under test. An end cap shall then be connected to a positive source of pressure.

The element shall be subject to the test procedure as specified in Table 4 with p_s equal to p_t+.

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Table 4 - Test procedure

Pressure	Pressure Escalation period s	Duration min
0 to p_s	45 to 60	-
p_s	-	5
p_s to 2,5 p_s	45 to 60	-
2,5 p_s	-	60

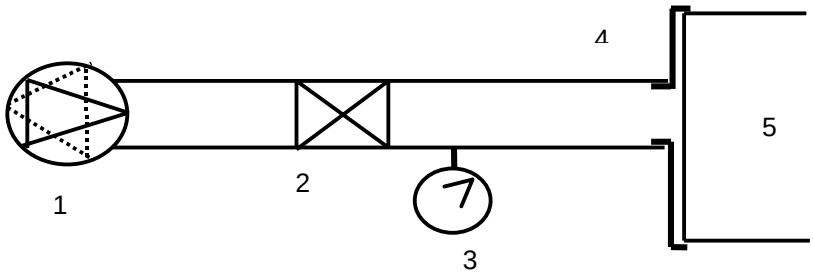
5.8.2 Negative pressure

The reference test element similar to that described in 5.8.1 shall be used but the end caps shall be attached to a stationary fixture so that the duct is maintained at its nominal length. A source of negative pressure shall be connected to one end and the reference test element subjected to the test procedure as specified in Table 4 with negative test pressure.

5.9 Air leakage

The reference test element shall be placed horizontally with two end caps sealed. The test apparatus comprises an air supply with variable air flow rate, an air flow meter and a pressure gauge meter as shown in Figure 4. The air flow capacity shall be sufficient to maintain the required pressure levels specified in Table 5.

Key



1 Variable air
2 Air flow meter
3 Pressure gauge meter
4 End cap
5 Duct

Figure 4 – Test installation for air leakage measurements

Table 5 – Test static gauge pressure p_s for tightness classes

Tightness class	Test static gauge pressure p_s							
	> 1000 Pa		1000 Pa		400 Pa		200 Pa	
	+	-	+	-	+	-	+	-
A	-	-	-	-	X	X	-	-
B	[a]	-	X	X	-	-	-	-
C	[a]	-	X	X	-	-	-	-

[a] Test should be conducted if the positive rated pressure is higher than 100 Pa.

The test pressure shall be maintained for five minutes and at the end of this period the leakage flow rate shall be recorded.

The leakage factor shall be determined by the air leakage rate divided by the surface area $\pi \cdot d_n \cdot L$ where L is the length of the reference test element and d_n is its nominal diameter.

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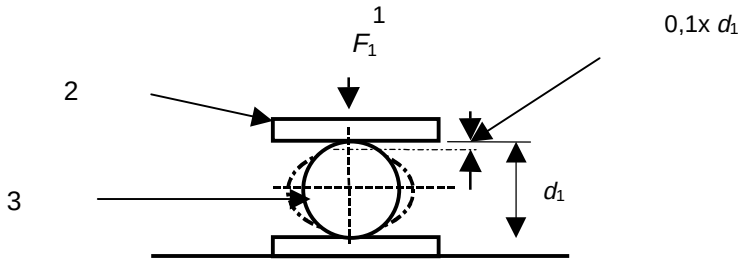

Key
Test load
1 Pressure plate
2 Specimen

Figure 5 – Test apparatus for crushing

6 Test report

The test report shall include a description of the construction and materials of the product as well as a test sheet recording the test results for each diameter. The test report should specify the references of the clauses containing the appropriate tests.

An example of a test sheet is shown in annex A.

7 Marking, labelling and packaging

The marking of the product or product packaging shall contain at least the nominal diameter and the nominal length of the duct.

Annex A

(informative)

Example of a test sheet

Table A.1 – Example of a test sheet

PRODUCT NAME:			**MANUFACTURER:**		
LABORATORY:			**DATE:**		
DATA SUPPLIED BY THE MANUFACTURER:					
Nominal diameter:	Nominal Length:		Yield Strength:		
Bending radius (if different than nominal diameter):			Tigthness class:		
Negative rated Pressure:			Positive rated Pressure:		
Designation	**Characteristics**	**Test requirement** *)			**Remarks**
		P	**NP**	**Class** (if any)	
Diameter					
Length after decompression					
Sag (angle)					
Bending (Maximum deformation)					
Positive Pressure test - Deformation during test - Deformation after test					
Negative pressure test - Deformation during test - Deformation after test					
Air leakage factor					
Crushing strength on compressed duct					
Crushing strength on uncompressed duct					
Packaging					
*) P = Passed NP = Failed					

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