Ventilation for buildings

Air handling units

Mechanical performance
English version of DIN EN 1886

DIN
EN 1886

ICS 91.140.30

Descriptors: Ventilation, air handling units, performance, testing.

Lüftung von Gebäuden – Zentrale raumlufttechnische Geräte –
Mechanische Eigenschaften und Meßverfahren

European Standard EN 1886 : 1998 has the status of a DIN Standard.

A comma is used as the decimal marker.

National foreword

This standard has been prepared by CEN/TC 156.

The responsible German body involved in its preparation was the *Normenausschuß Maschinenbau* (Mechanical Engineering Standards Committee), Technical Committee *Allgemeine Lufttechnik*.

EN comprises 27 pages.

Ref. No. DIN EN 1886 : 1998-07
English price group 08 *Sales No. 1108*
12.98

EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

EN 1886

May 1998

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English version

Ventilation for buildings

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Mechanical performance

Ventilation des bâtiments – Caissons de traitement d'air – Performance mécanique

Lüftung von Gebäuden – Zentrale raumlufttechnische Geräte – Mechanische Eigenschaften und Meßverfahren

This European Standard was approved by CEN on 1998-03-26.

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Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CEN member.

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CEN

European Committee for Standardization
Comité Européen de Normalisation
Europäisches Komitee für Normung

Central Secretariat: rue de Stassart 36, B-1050 Brussels

Ref. No. EN 1886 : 1998 E

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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.

The standard is a part of a series of standards for air handling units used for ventilation and air conditioning of buildings for human occupancy. It considers the mechanical performance of an air handling unit as a whole and will be supported by a standard for sections and components. The position of this standard in the whole field of standards for mechanical building services is illustrated in figure 1.

No existing European standard is superseded.

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 November 1998, and conflicting national standards shall be withdrawn at the latest by November 1998.

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.

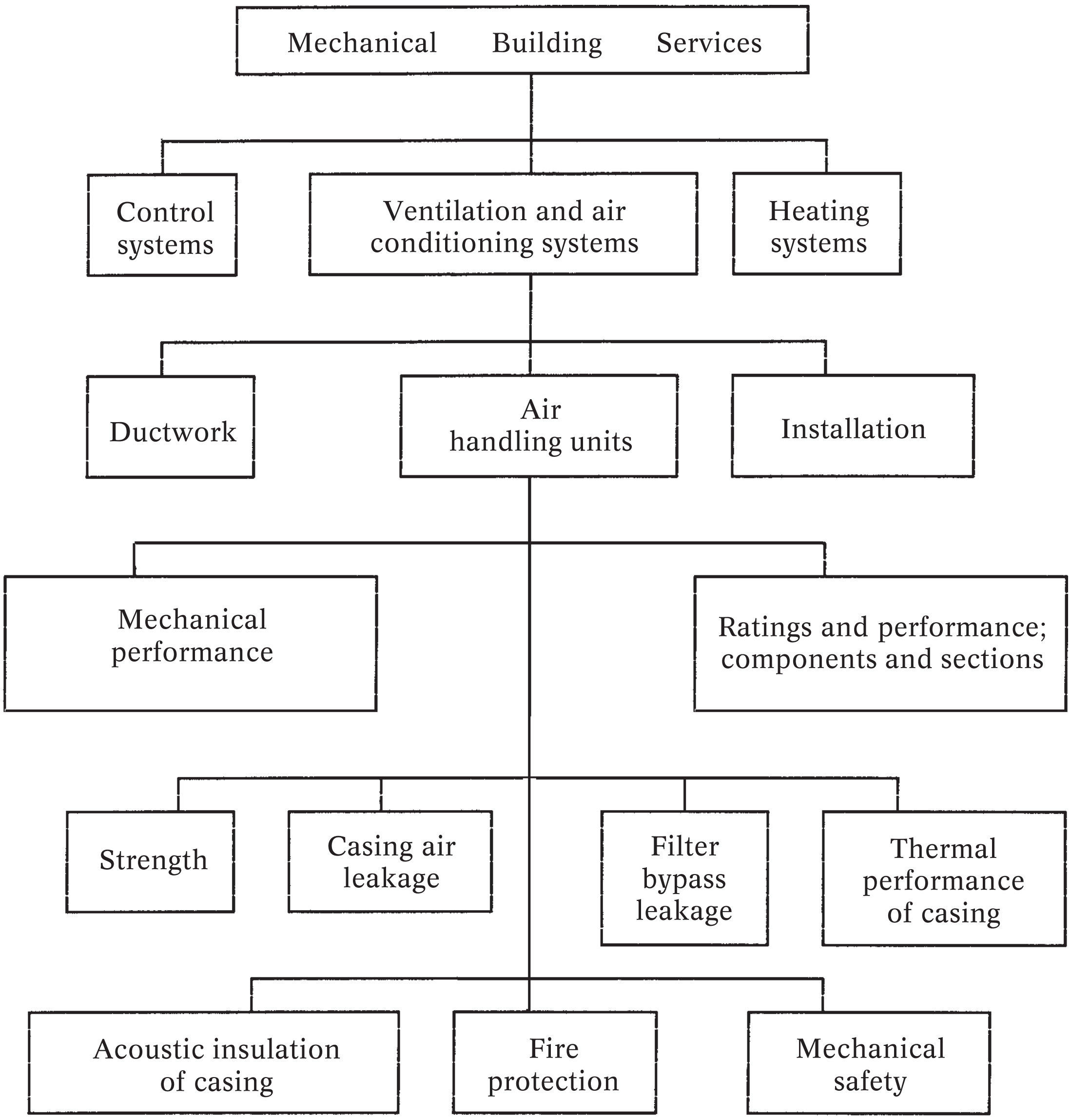


Figure 1: Air handling units. Mechanical performance. Position in the field of mechanical building services

Introduction

This standard specifies the mechanical performance of an air handling unit as a whole, to be utilized by all involved in ventilation and air conditioning manufacturing, design, installation and maintenance. The functions and characteristics of the individual sections of the unit will be considered in another of the series of standards covering air handling units.

Because of the different requirements due to climatic conditions, to building traditions in the different parts of Europe, and to the specific features of individual applications, most of the requirements are given in the form of classes, which may be specified generally to be used in certain regions, or separately for individual applications. Only parts of the standard have been adopted from existing national or international standards.

Comparison tests for strength, air leakage and thermal performance have been made in Finland, Germany, Netherlands, Switzerland and the United Kingdom.

1 Scope

This standard specifies test methods, test requirements and classifications for air handling units which are supplying and/or exhausting air, via ductwork, for ventilating/conditioning a part or the whole of the building.

This standard is not applicable to the following:

a) air conditioning units serving a limited area in a building, such as fan coil units;

b) units for residential buildings;

c) units producing ventilation air mainly for a manufacturing process.

Except for the thermal and acoustic performance of the casing, the test methods and requirements are applicable to both complete units and any separate sections.

The filter bypass test is not applicable to the testing of high efficiency particulate air filters (HEPA).

NOTE: HEPA filters are recommended to be installed downstream of the air handling unit. Such installations should be leak tested in accordance with the appropriate filter standards.

The test method for the thermal performance of the casing is applicable to the comparison of different constructions, but not to the calculation of thermal losses through the casing or the risk of condensation.

Similarly, the test method for the acoustic performance of the casing is applicable to the comparison of different constructions, but not to the provision of accurate acoustic data for specific units.

2 Normative references

This European Standard incorporates, by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed below. For dated references, any subsequent amendments or revisions to these publications only apply to this European Standard when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

CR 12792:1997 Ventilation for buildings - Symbols and terminology.

prEN 13053	Ventilation for buildings - Air handling units - Ratings and performance for components and sections
EN 292-2	Safety of machinery - Basic concepts, general principles for design - Part 2: Technical principles and specifications.
EN 779	Particulate air filters for general ventilation - Requirements, testing, marking
EN 61310-1	Safety of machinery - Indication, marking and actuating - Part 1: Requirements for visual, auditory and tactile signals
ISO 3744	Acoustics - Determination of sound power levels of noise sources using sound pressure - Engineering methods in an essentially free field over a reflecting plane
ISO 11546-2	Acoustics - Determination of sound insulation performances of enclosures - Part 2: Measurements in situ (for acceptance and verification purposes)

3 Definitions

For the purposes of this standard the definitions given in CR 12792:1997 apply, together with the following.

3.1 air handling unit: A factory made encased unit serving as a prime mover of a ventilation or air conditioning installation where outdoor air, recirculation air and exhaust air is treated, consisting of a fan section where a filter section and heat exchanger may be connected. In addition the unit may consist of an inlet section with one or more louvres, dampers and valves, a mixing section, heat recovery section, one or more heating and cooling coils, humidifiers, sound attentuators and additional equipment such as controls, measuring sections etc.

4 Mechanical strength of casing

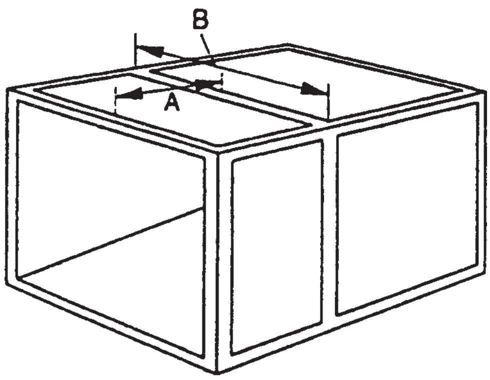
4.1 Requirements and classification

4.1.1 Air handling unit casings shall be categorised into Classes: 1, 1A, 1B, 2 and 2A in accordance with table 1.

Table 1: Casing strength classifications of air handling units

Casing class	Maximum relative deflection $mm \cdot m^{-1}$	Withstand maximum fan pressure
1	10	No
1A	10	Yes
1B	No requirements	Yes [1)]
2	4	No
2A	4	Yes
[1)] For Class 1B, the deflection shall not cause permanent deformation. Furthermore, after 5 minutes operating under maximum fan pressure, the leakage of the unit shall not increase by more than 5%. The leakage test shall be done before and after the strength test at maximum pressure.		

4.1.2 Class 1 and Class 2 casings shall be designed and selected such that the maximum deflection of any span of the panels and/or frames does not exceed the limits in table 1 when the unit is running at its operating conditions, see fig 2.



A = Panel deflection
B = Frame deflection

Figure 2 : Illustration of panel and frame spans of air handling units

In addition to meeting the deflection limits of Classes 1 and 2 respectively, Class 1A and Class 2A casings shall also be capable of withstanding the maximum pressure generated by the fan at its design operating speed, without damage to the unit or visible permanent deformation of the casing. This may be demonstrated, by prior agreement between manufacturer and purchaser, by blanking off the inlets to the unit and running the fan up to its design operating speed. Downstream sections of blow-through units shall be proved by blanking off the air handling unit's outlets.

Any special requirements, for example the ability to survive shock loading caused by sudden closure of fire dampers, should be clearly specified.

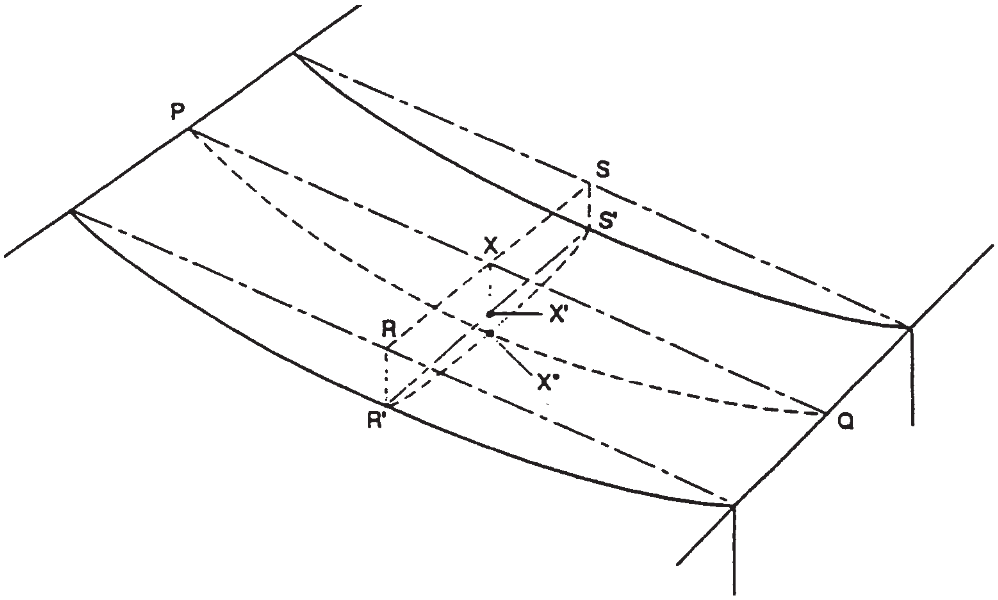


Figure 3 : Deflection of panels and frames of air handling units

4.2 Testing

Deflection shall be measured within an uncertainty of ± 0,5 mm whilst the air handling unit is operating at its normal design condition; for example, referring to figure 3, X'X" measured for span R'S', XX" is measured for span PQ.

Deflection X'X" is a function of panel stiffness. Deflection XX" is a function of both frame and panel stiffness. Frame deflection is RR' and SS'.

EXAMPLE:

PQ = 2m
R'S' = RS = 1m
Measured deflection XX" = 8mm
Measured deflection X'X" = 5mm

Hence, the deflection of span R'S' is 5 $mm.m^{-1}$ and that of span PQ is 4 $mm.m^{-1}$. The class is determined by the highest value of the measured deflections.

In this example the deflection of R'S' (the shortest span) determines that Class 1 is met.

5 Casing air leakage

5.1 Requirements and classification

5.1.1 *Units operating under negative pressure only*

The air leakage of the assembled air handling unit shall be tested at 400 Pa negative pressure, and it shall not exceed the applicable rate given in table 2.

Table 2: Casing air leakage classes of air handling units, 400 Pa negative test pressure

Leakage Class	Maximum leakage rate $l \cdot s^{-1} \cdot m^{-2}$	Filter Class (EN 779)
3A	3,96	G1-4
A	1,32	F5-7
B	0,44	F8-9

Unless otherwise specified, the applicable rate shall be a function of the efficiency of the air filters within the air handling unit. Where there is more than one stage of air filtration, the classification shall be based on the efficiency of the highest grade of filter.

NOTE: For special applications, by agreement, leakage class may be chosen independent from the filter class. Even if the unit is not equipped with filters, class 3A is still recommended.

5.1.2 *Units operating under both negative and positive pressure*

Air handling units with sections operating under positive pressure shall have the positive pressure sections tested separately from the rest of the unit in all cases where the operating pressure immediately downstream of the fan exceeds 250 Pa positive. If the positive pressure does not exceed 250 Pa, a single, combined, negative pressure test shall be acceptable. The test pressure applied to the positive pressure sections shall be 700 Pa positive, or the air handling unit's maximum positive operating pressure, whichever is the greater. The remainder of the unit shall be tested in accordance with 5.1.1, the applicable leakage rate being governed by the efficiency of the filter immediately upstream of the fan.

The air leakage from the sections subjected to 700 Pa positive pressure shall be in accordance with table 3.

Table 3: Casing air leakage classes of air handling units, 700 Pa positive test pressure

Leakage class	Maximum leakage rate f_{700} $l \cdot s^{-1} \cdot m^{-2}$
3A	5,70
A	1,90
B	0,63

In the case of units tested at a higher pressure than 700 Pa the maximum allowable leakage rate for each leakage class shall be calculated from the following formula:

$$f_m = f_{700} \left(\frac{test\ pressure}{700}\right)^{0,65} \qquad (1)$$

where

f_m is the maximum allowable leakage at the actual test pressure ($l \cdot s^{-1} \cdot m^{-2}$)

f_{700} is the maximum allowable leakage at 700 Pa ($l \cdot s^{-1} \cdot m^{-2}$), see table 3.

5.2 Testing

5.2.1 *Test apparatus*

The test apparatus shall be as shown in figure 4, using a fan with a duty at least capable of meeting the anticipated leakage rate at the test pressure(s).

If the unit is too large for the capacity of the leakage test apparatus, or a restriction of access for delivery requires that the unit be tested in sections or sub-assemblies, the breakdown should be agreed by the manufacturer and purchaser prior to the test date.

Where heat recovery devices are installed, the supply and exhaust sections shall be tested together as a single unit at 400 Pa negative pressure.

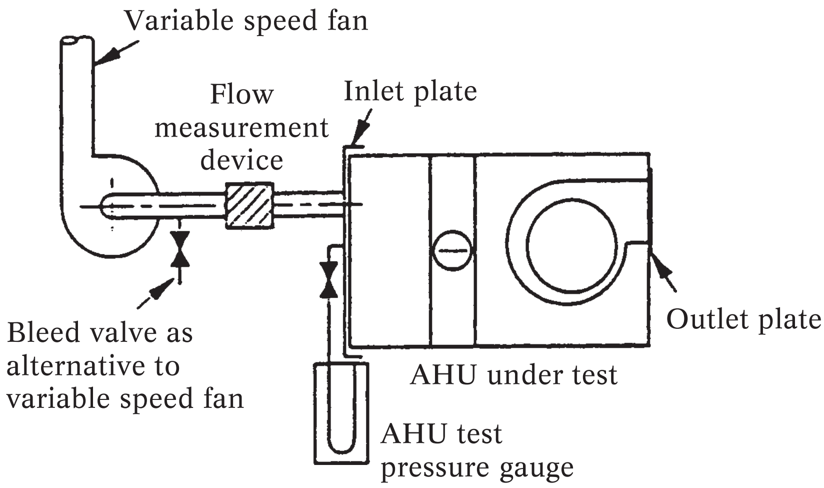


Figure 4 : Apparatus for testing the casing air leakage (negative pressure test). Typical example

5.2.2 *Preparation for test*

The unit to be tested shall be mounted in the plane in which it is intended to operate and its sections connected or joined by the method given in the installation instructions.

Where it is necessary to fit blanking plates, the plates shall be fitted by a similar method to that of the intended installed joint.

Openings for electrical, air or water services shall be sealed prior to testing.

The air handling unit shall not incorporate any additional sealing over that of the standard product or, where applicable, of the agreed specification.

5.3 Test procedure

Turn on the test apparatus fan unit and adjust until the static test pressure within the test unit is within 5 % of the specified figure.

Keep this pressure constant for 5 min, and do not record any readings until the pressure has stabilised.

Record the leakage flow rate and the test pressure.

5.4 Determination of allowable leakage rates

Calculate the casing surface area from the nominal external dimensions, excluding the area of the inlet and outlet airflow apertures and also the area of components which do not form part of the airtight casing.

Determine the maximum allowable leakage from tables 2 and 3, as appropriate, and relate it to the casing area of the unit under test.

The unit shall be deemed to pass if the recorded leakage rate is not greater than the allowable leakage rate. If the unit has to be tested in sections, the total sum of the recorded leakage rates for all sections shall be the basis for pass or fail.

6 Filter bypass leakage

6.1 Requirements

6.1.1 *General*

Air bypass around filter cells will decrease the effective efficiency of the filter, especially a high efficiency one, because the bypass air is not filtered. In addition, any inward leakage through the casing downstream of the filter has the same effect. Therefore for filters located upstream of the fan, the airtightness and area of the casing between the filter and the fan are factors that can affect the filter bypass leakage rate.

The requirements in this standard are based on filter bypass being limited to contributing no more than a 10% increase in the penetration of atmospheric dust through the filter at the test condition of 400 Pa. The real increase in dust penetration will depend upon the actual operating pressure within the air handling unit.

6.1.2 *Acceptable filter bypass leakage rates*

Table 4 gives the acceptable total leakage rates related to different filter classes, as percentages of the specified or nominal volume flow rate of the air handling unit to be tested. If the filter is upstream of the fan, leakages of the sections between the filter and fan are deemed to be included in the specified values. In the case of downstream filters the specified values are for the bypass around the filter only.

The acceptable leakage rate q_{va} is specified by the formula:

$$q_{va} = k \cdot q_{vnom} / 100 \qquad (2)$$

where

q_{vnom} is specified volume flow rate ($m^3 \bullet s^{-1}$) of the filter section or nominal volume flow rate of the filter section.

k is total leakage, in per cent of specified or nominal volume flow rate (see table 4)

Table 4: Acceptable total leakage, 400 Pa test pressure

Filter class	G 1-4	F5	F6	F7	F8	F9
Total leakage *k* %	-	6	4	2	1	0,5

The tabulated percentages are given for the test pressure of 400 Pa.
The unit shall be deemed to pass if the specified value for the leakage rate, determined in 6.2, is no greater than the acceptable leakage rate q_{va}.

6.1.3 *Two or more filter sections in the same unit*

If two or more filter sections are provided within the air handling unit, the filter bypass leakage shall be tested separately for each filter.

6.2 *Testing*

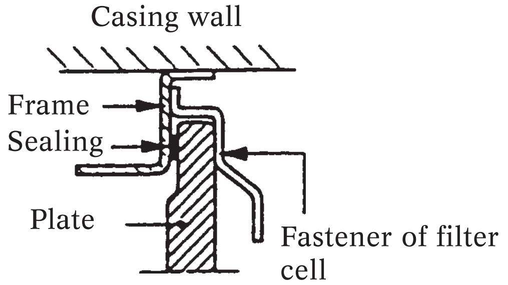
6.2.1 *General*

The specified test requirements refer to the complete air handling unit.

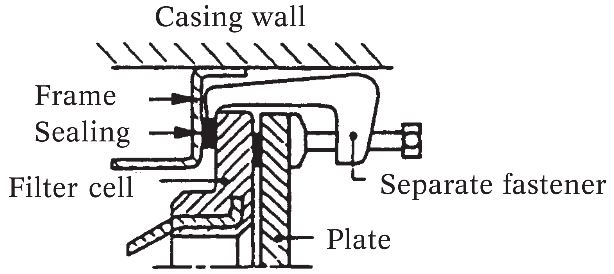
As shown in figure 5, option A, the filter cells shall be removed and replaced with blanking plates. These plates shall have exactly the same shape, dimensions and surface quality as the filter cell in the area relevant to air tightness.

Alternatively, the inlet face of every individual filter cell may be covered with a plate as shown in figure 5, option B, or a plastic membrane may be used for every individual filter cell as in figure 5, option C.

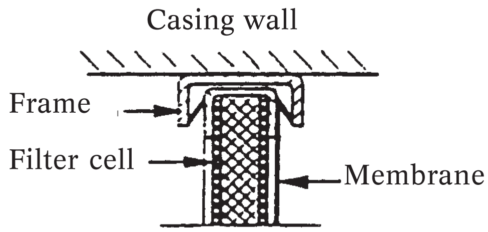
The joints between the filter cells and frames shall not be covered and any additional fastenings (option B) shall not have any influence on the air tightness of the joints.



a) Option A



b) Option B



c) Option C

Figure 5 : Methods of blanking off filter cells

6.2.2 *Filter sections downstream of the fan (positive pressure)*

For testing, the inlet opening of the test filter section shall be covered with an airtight plate. A leakage test apparatus shall be connected as shown in figure 6. The outlet opening for the test filter shall be open.

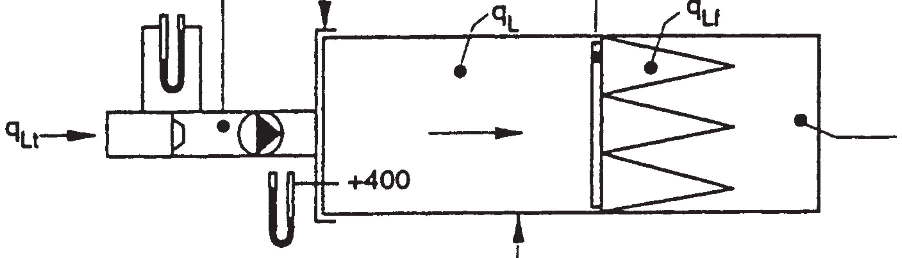


Figure 6 : Test apparatus for testing filter sections downsteam of the fan

The test shall be carried out in two stages at a positive test pressure of 400 Pa.

First stage: The sum of leakages through the casing q_L and the leakages through the joints between the filter cell, the frame and the casing q_{Lf}:

$$q_{Lt} = q_L + q_{Lf} \qquad (3)$$

Second stage: The leakage through the casing q_L shall be measured by making airtight the joints between the filter cell, the frame and the casing, for example with adhesive tape.

The value used to judge the leakage is specified by the formula:

$$q_{Lf} = q_{Lt} - q_L \qquad (4)$$

6.2.3 *Filter sections upstream of the fan (negative pressure)*

For testing, the outlet opening of this section, which is downstream of the filter under negative pressure, shall be covered with an airtight plate.

A leakage test apparatus shall be connected to it as shown in figure 7. The inlet opening of the test filter section shall be open.

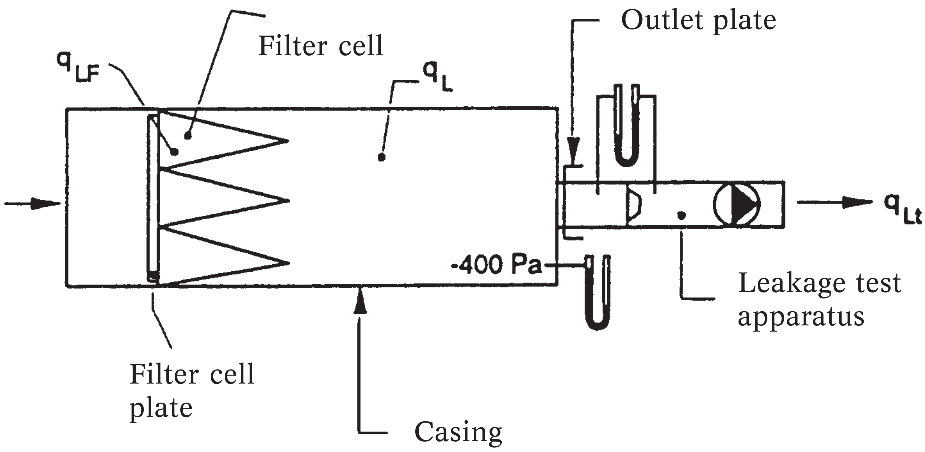


Figure 7: Test apparatus for testing filter sections upstream of the fan

The test shall be carried out at a negative test pressure of 400 Pa.

The sum of leakages through the casing q_L and the leakages through the joints between the filter cell, the frame and the casing q_{Lf} shall be measured :

$$q_{Lt} = q_L + q_{Lf} \qquad (5)$$

This is the value to judge the leakage

EXAMPLE
A test was performed for a filter section with 4 filters.

Surface section area :	1,49 m^2
Face velocity:	2,5 ms^{-1}
Nominal volume flow rate:	3,725 m^3s^{-1}

The following values were determined:

a) Testing filter sections downstream of the fan (positive pressure)

Sum of leakages q_{Lt}:	$5{,}5 \times 10^{-3} m^3 s^{-1}$
Leakage through the casing q_L:	$2{,}9 \times 10^{-3} m^3 s^{-1}$
Leakage through the filter q_{Lf}:	$2{,}6 \times 10^{-3} m^3 s^{-1}$
Leakage per cent:	0,07 %
Usable filter class:	F9

b) Testing filter sections upstream of the fan (negative pressure)

Sum of leakages q_{Lt}:	$4{,}9 \times 10^{-3} m^3 s^{-1}$
Leakage through the filter q_{Lf}:	$4{,}9 \times 10^{-3} m^3 s^{-1}$
Leakage per cent:	0,13 %
Usable filter class:	F9

7 Thermal performance of casing

7.1 General

This test procedure provides the means of classifying the thermal transmittance of an air handling unit using a test enclosure having standardised construction features.

The test may also be used to provide a measure of thermal bridging associated with the structural design.

7.2 Requirements and classification

7.2.1 *Thermal transmittance*

The thermal transmittance, $U(W.m^{-2}K^{-1})$, shall be determined when the steady state temperature difference is between 20 and 25 K. Under these conditions, the value of U shall be classified in accordance with table 5. The area used for the purposes of calculating the U value shall be that of the external surface of the casing.

Table 5 : Classification of thermal transmittance U of the casing of air handling units

Class	Thermal transmittance U $(W \cdot m^{-2} \cdot K^{-1})$
T1	$U \leq 0,5$
T2	$0,5 < U \leq 1$
T3	$1 < U \leq 1,4$
T4	$1,4 < U \leq 2$
T5	No requirements

7.2.2 Thermal bridging

Under the test conditions, when the mean temperature difference between internal and external temperatures is stabilized between 20 and 25 K, establish the lowest value of temperature difference between any point on the external surface and the mean internal air temperature. Use the ratio between the lowest temperature difference and the mean air-to-air temperature difference, to indicate the level of thermal bridging that applies.

Determine the thermal bridging factor k_b as follows:

$$k_b = \Delta t_{min} / \Delta t_{air} \qquad (6)$$

where

Δt_{min} $(= t_i - t_{max})$ is the least temperature difference;

Δt_{air} $(= t_i - t_a)$ is the air-to-air temperature difference;

t_i is the mean internal air temperature;

t_a is the mean external air temperature;

t_{max} is the maximum external surface temperature

The thermal bridging factor k_b of the casing shall be graded in accordance with table 6.

Table 6 : Classification of thermal bridging factor of the casing

Class	k_b
TB1	$0{,}75 < k_b < 1$
TB2	$0{,}6 < k_b \leq 0{,}75$
TB3	$0{,}45 < k_b \leq 0{,}6$
TB4	$0{,}3 < k_b \leq 0{,}45$
TB5	No requirements

NOTE: Any accessible surface which is exposed to the air outside the enclosure is considered to be an external surface. In classes TB3 and TB4, however, 1% of the external surface may have a lower thermal bridging factor, due to screws, hinges and similar.

The influence of other factors such as air leakage and external air movement should be allowed for, if the effects of thermal bridging need to be assessed with precision. Nevertheless, this grading can be used as a guide, since the lower the value of k_b the greater is the likelihood that condensation will form on those parts of the unit where low air temperatures may be met.

7.3 Testing

7.3.1 *General*

The principal requirements for the classification of thermal transmittance of air handling units are that:

a) the enclosure tested reproduces closely the design and quality of construction that is typical of the range of products represented;

b) variation of temperature in the steady state inside the enclosure is not significant.

7.3.2 *Test facility*

An enclosure shall be made with the type of design and method of assembly that is to be used by the manufacturer as part of the normal production programme. If more than one type of construction or assembly method is available, the construction adopted for each test shall be clearly stated by the manufacturer.

The means of building the assembly, including the torque applied to fixings, shall be in accordance with normal manufacturing procedures and standards for the product range.

The enclosure shall be constructed taking account of the following specification:

- Height and width shall have external dimensions between 0,9 m and 1,4 m.
- The total external surface area shall be between 10 m^2 and 30 m^2.
- The enclosure shall reproduce an assembly of at least two sections of a unit joined in accordance with the methods that are normal for the design being tested.
- Each section shall have an access door.

If an actual air handling unit enclosure is used, any internal fitments, such as coils or filters, shall be removed. The complete assembly shall be supported by insulating blocks, with the base of the enclosure not less than 100 mm above the floor of a draught-free test room. The total area of the insulating blocks shall not exceed 5% of the air handling unit base area.

Inside the enclosure shall be mounted:

a) Electric heater elements, the voltage of which can be controlled externally;

b) A circulating fan, with a free air volume throughput equivalent to at least 100 and at most 200 air changes per hour.

Internal temperatures shall be measured, using suitable temperature measuring instruments with accuracy within 0,5 K, e.g. thermocouples or thermometers in each corner of the enclosure, at points 100 mm from the adjacent panels. Two additional measurements shall be obtained, 100 mm from the centre of two side panels.

The external air temperature shall be measured at 1 m distance from the centre of all four vertical sides of the enclosure.

7.3.3 *Testing procedure*

Energise the heater and the internal fan from a stable electrical power supply and maintain the voltage constant until measurements show that a steady state temperature difference has been reached between mean internal and external temperatures. To be acceptable both sets of measurements shall yield a standard deviation not exceeding 1,5 K during a period of 30 minutes.

Conduct not less than two further tests, with different levels of power input, such that a straight line can be drawn from the origin and through the measurement points, when the data are plotted on a graph of total power input versus the temperature difference between mean internal and external temperatures.

Determine from the graph the power input (including power to the circulating fan) dissipated when the mean steady state temperature difference is 20 K, internal to external; this is to be the index of thermal transmittance. The measured values shall be such that the 20 K difference can be obtained by interpolation between them.

Under stable test conditions, measure the surface temperatures at points which may be affected by thermal bridging, e.g. metal fittings and framework members.

8 Acoustic insulation of casing

8.1 General

This procedure provides a way of determining the approximate sound insertion loss value "D_e" of an air handling unit.

8.2 Test requirements

An enclosure shall be made with the type of design and method of assembly, in accordance with clause 7.3.2.

Inside the enclosure, in the centre of the floor, a sound source shall be resiliently mounted, designed to prevent vibration of the floor.

8.3 Test method

The test method shall be the artificial source method described in ISO 11546-2, conducted in accordance with ISO 3744.

The sound pressure insulation performance (casing insertion loss) shall be calculated in accordance with ISO 11546-2 and reported for octave bands 125 Hz to 8000 Hz.

The terms and formulae are the following.

$L'_{pi(Oct)}$ - individually measured values i = 1, 2 ... n of the sound pressure level on the enveloping surface per octave band for every single measuring point.

$\overline{L}'_{p(Oct)}$ - mean sound pressure level per octave band, calculated by taking the logarithmic mean of all single measured points on the enveloping surface.

K_1 - correction value for background noises

The mean sound pressure level, with background noise correction per octave band, with enclosure :

$$\overline{L}_{p1(Oct)} = \overline{L}'_{p(Oct)} - K_1 \quad (7)$$

The mean sound pressure level, with background noise correction per octave band, without enclosure :

$$\overline{L}_{p2(Oct)} = \overline{L}'_{p(Oct)} - K_1 \quad (8)$$

Sound insertion loss is given by:

$$D_e = \overline{L}_{p2(Oct)} - \overline{L}_{p1(Oct)} \quad (9)$$

8.4 Test procedure

In accordance with the enveloping surface method, described in prEN 13053, annex A, arrange the measuring points dependent upon the accuracy class. Determine the octave-related sound pressure levels in octave bands from 125 Hz to 8 kHz. Take the mean of the sound pressure levels recorded during at least 10 s for every frequency range.

First perform the measurement with enclosure $(\overline{L}'_{p1(Oct)})$.

Then remove the enclosure. The position of the sound source and the measuring points shall remain the same. Applying the same method as described above, determine the mean sound pressure level without enclosure $\overline{L}'_{p2(Oct)}$.

8.5 Evaluation of the sound insertion loss D_e

Present the D_e values between 125 Hz and 8 kHz, in tabular form as test results.

$$D_e = \overline{L}_{p2(Oct)} - \overline{L}_{p1(Oct)} \quad (10)$$

9 Fire protection

9.1 General

This section has been prepared to indicate how the classification standards for fire protection prepared by CEN TC 127 may be adapted to apply specifically to air handling units.

9.2 Classification

9.2.1 *General*

The inlet and outlet openings of an air handling unit are normally connected to ductwork, the inlet opening of which often has an air intake opening in the building envelope. The casing of a unit may therefore be considered as a part of the ductwork.

An air handling unit has many functions, and therefore it contains many components which have to be serviced and cleaned, resulting in a complicated casing with many joints and inspection doors. It is much more difficult to achieve good fire resistance in the casing of a unit than in a duct. On the other hand, the surface area of a unit in a typical application is very small compared with the area of the ductwork. Also, the fan, coils, dampers and other components of a unit form an obstacle to the spreading of fire and, in certain cases, prevent direct contact between the casing panels and the fire.

It is therefore reasonable to accept that an air handling unit should be one fire class lower than that for the ductwork in the same application. A similar philosophy has been adopted, for example, in the requirements for air tightness.

9.2.2 ***Classification of applications***

Category A:

- Units installed in a classified plant room. Distance of the supply and exhaust air openings to the nearest un-classified part of construction more than 5 m	No requirements for fire class
- Units installed in a separate plant room separated from ductwork by a fire damper	No requirements for fire class
- Units installed in the ventilation system as a part of the ductwork, both sides separated from the ducts by fire dampers	No requirements for fire class
- Units installed in the ventilation system as a part of the ductwork, inside an enclosure assembled of fire classified panels or ductwork components	No requirements for fire class

Category B:

- Units installed in the ventilation system as a part of the ductwork	One fire class lower than the ductwork

In the last sub-category of category A the enclosure shall be equipped with access doors of at least the same size as the unit.

9.3 Requirements

9.3.1 ***General***

NOTE: All requirements presented in this section are based on the essential requirement FIRE SAFETY in the Construction Products Directive.

An air handling unit is a complicated sub-system which includes many functions and components. For technical and economic reasons, non-metallic materials are frequently used in its construction, resulting in a risk of increased fire load and/or generation of toxic gases in the case of fire. The latter can be critical because there is a connection to the whole or part of the building through the ductwork.

It is therefore reasonable to limit the amount of flammable materials, relating it to the size of the unit since this is normally related to the size of the space it serves. Amounts of toxic gases should be limited by their concentration values with respect to the ambient air.

Dust deposits within the unit are limited, by the hygienic requirements of the system, to levels which are considerably below those which might pose a fire risk.

9.3.2 *Fire insulation of the application*

Requirements are presented in 9.2.2.

9.3.3 *Materials*

The materials for air handling units shall be selected so that the whole casing is fire resistant. A corresponding test is needed when relevant.

10 Mechanical safety

The arrangements for mechanical safety of the fan shall be in accordance with EN 292-2.

Units over 1,6 m internal height, and which are expected to be entered during operation, shall have guards for the fan inlet(s) and drive(s) on the access side.

If fans are unprotected, the fan section access door(s) shall not be openable without a special tool or key.

A lockable isolating switch shall be placed outside the air handling unit, near the fan section access door.

A sign shall be fitted on the fan section access door(s) warning that the fan must be isolated and allowed to stop before the door is opened. The warning sign shall be in accordance with EN 61310-1, as a combined sign equipped with text, see figure 8 as an example.

WARNING

Before opening doors, the fan
must be switched off, isolated
and allowed to rundown
(Two minutes minimum)

Figure 8 : Example of text included in the warning sign for an air handling unit