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Prezračevanje stavb – Klimati - Ocenitev in lastnosti klimatov, sestavnih delov in sekcij

Ventilation for buildings - Air handling units - Rating and performance for units, components and sections

Lüftung von Gebäuden - Zentrale raumlufttechnische Geräte - Leistungskenndaten für Geräte, Komponenten und Baueinheiten

Ventilation des bâtiments - Caissons de traitement d'air - Classification et performance des unités, composants et sections

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Ventilation for buildings - Air handling units - Rating and performance for units, components and sections

Ventilation des bâtiments - Caissons de traitement d'air - Classification et performance des unités, composants et sections

Lüftung von Gebäuden - Zentrale raumlufttechnische Geräte - Leistungs-kenndaten für Geräte, Komponenten und Baueinheiten

This European Standard was approved by CEN on 26 June 2006.

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This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Central Secretariat has the same status as the official versions.

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Foreword

This document (EN 13053:2006) 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of an identical text or by endorsement, at the latest by February 2007, and conflicting national standards shall be withdrawn at the latest by February 2007.

This document supersedes EN 13053:2001.

This European 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 ratings and the performance of air handling units as a whole, the requirements and performance of specific components and sections of air handling units including hygiene requirements. The position of this standard in the field of mechanical building services is shown in Figure 1.

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

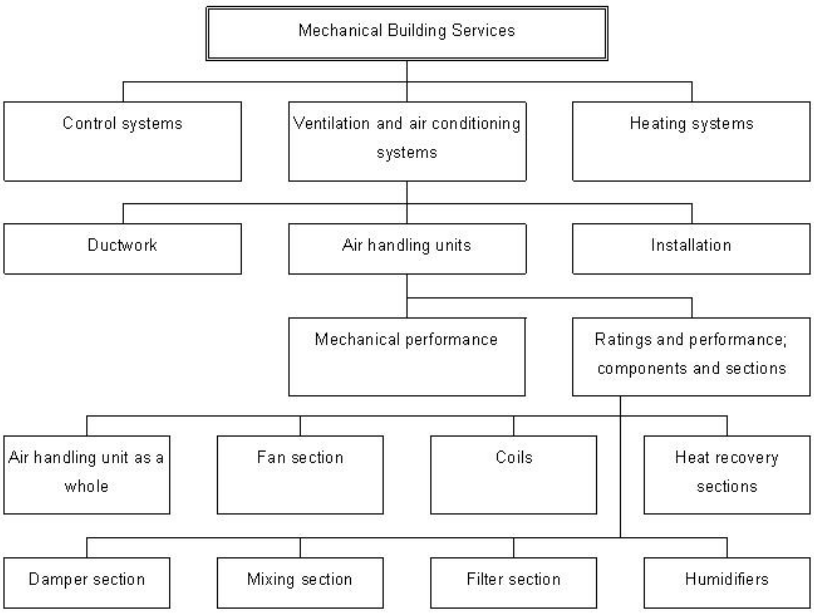

Figure 1 — Position of this standard in the field of mechanical building services

1 Scope

This European Standard specifies requirements and testing for ratings and performance of air handling units as a whole. It also specifies requirements, recommendations, classification, and testing of specific components and sections of air handling units. For many components and sections it refers to component standards, but it also specifies restrictions or applications of standards developed for stand alone components.

This standard is applicable both to standardised designs, which may be in a range of sizes having common construction concepts, and also to custom-design units. It also applies both to air handling units, which are completely prefabricated, and to units which are built up on site. Generally the units within the scope of this standard include at least a fan, a heat exchanger and an air filter.

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.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 308, *Heat exchangers — Test procedures for establishing performance of air to air and flue gases heat recovery devices*

EN 779, *Particulate air filters for general ventilation - Determination of the filtration performance*

EN 1216, *Heat exchangers — Forced circulation air-cooling and air-heating coils — Test procedures for establishing the performance*

EN 1751, *Ventilation for buildings — Air terminal devices — Aerodynamic testing of dampers and valves*

EN 1886:1998, *Ventilation for buildings — Air handling units — Mechanical performance*

EN 12792:2003, *Ventilation for buildings - Symbols, terminology and graphical symbols*

EN 13779, *Ventilation for non-residential buildings - Performance requirements for ventilation and room-conditioning systems*

EN ISO 3741, *Acoustics — Determination of sound power levels of noise sources using sound pressure — Precision methods for reverberation rooms (ISO 3741:1999)*

EN ISO 3744, *Acoustics — Determination of sound power levels of noise sources using sound pressure — Engineering method in an essentially free field over a reflecting plane (ISO 3744:1994)*

EN ISO 3746, *Acoustics — Determination of sound power levels of noise sources using sound pressure — Survey method using an enveloping measurement surface over a reflecting plane (ISO 3746:1995)*

EN ISO 5136, *Acoustics — Determination of sound power radiated into a duct by fans and other air-moving devices — In-duct method (ISO 5136:2003)*

EN ISO 5167-1, *Measurement of fluid flow by means of pressure differential devices inserted in circular cross-section conduits running full -- Part 1: General principles and requirements (ISO 5167-1:2003)*

EN ISO 7235, *Acoustics - Laboratory measurement procedures for ducted silencers and air-terminal units - Insertion loss, flow noise and total pressure loss (ISO 7235:2003)*

ISO 5221, *Air distribution and air diffusion — Rules to methods of measuring air flow rate in an air-handling duct*

ISO 5801:1997, *Industrial fans — Performance testing using standardized airways*

ISO/FDIS 13348, *Industrial Fans - tolerances, methods of conversion and technical data presentation*

3 Terms and definitions

For the purposes of this European Standard, the terms and definitions given in EN 12792:2003 and the following apply.

3.1
air handling unit
factory made encased assembly consisting of sections containing a fan or fans and other necessary equipment to perform one or more of the following functions: circulating, filtrating, heating, cooling, heat recovery, humidifying, dehumidifying and mixing air

3.2
section of air handling unit
functional element of an air handling unit consisting of one or more components in a single casing

3.3
component of air handling unit
smallest functional element of an air handling unit

3.4
blow-through unit
air handling unit with a section or sections downstream of the supply air fan

3.5
casing of an air-handling unit
enclosure of the unit, within which the components are mounted

3.6
openings for outdoor air, supply air, extract air, recirculation air and exhaust air
aperture through which air is taken in or discharged from the air handling unit, such as openings for outdoor air, supply air, recirculation air and exhaust air

3.7
damper section
section of air handling unit including a damper or valve

3.8
mixing section
section where e.g. outdoor air flow and the recirculation air flow are mixed in a controlled way. The section generally consists of one damper per air flow and a mixing chamber

3.9
filter section
section including a filter or filters and an associated filterframe

3.10
heat recovery section
section in which heat (and possibly also moisture) is transferred from one airstream into another, either directly or using an intermediary heat transfer medium

3.11
air heating and cooling coils
heat exchangers by means of which heat is transferred from a heat transfer medium to air (heating coil) or the other way round (cooling coil)

3.12
sound attenuation section
section in which sound transfer into a ductwork or into ambient air is reduced

3.13
humidifier section
section in which moisture is added to the air

3.14
fan section
section in which one or more fans are installed for moving air

3.15
combined section
section within which two or more functions are combined

3.16
functions

3.16.1
air treatment
process by which the state of the air is modified with respect to one or more of its characteristics such as temperature, moisture content, dust content, bacterial count, gas and vapour content

3.16.2
air type
designation of air moving through a ventilation, air conditioning or air treatment installation as a function of its location relative to the installation, e.g. outdoor air, exhaust air, extract air etc

3.16.3
cooling
removal of latent and/or sensible heat

3.16.4
dehumidification
controlled reduction of water vapour from the air

3.16.5
filtration
removal of particulate material from the airstream

3.16.6
heating
transfer of heat from one body or medium to another medium

3.16.7
humidification
controlled addition of water vapour to an air stream or space

3.16.8
sound reduction
controlled reduction of sound energy

3.17
characteristics

3.17.1
air flow
movement of air within set boundaries (such as ducts)

3.17.2
air flow rate
mass or volume flow of air passing a given plane divided by time

3.17.3
bypass factor
ratio of the diverted air flow to the sum of the main air flow and the diverted air flow

3.17.4
bypass leakage
unwanted and uncontrolled passing of untreated air into the treated air between the components within a casing, such as filters and coils

3.17.5
deflection of a casing
deformation in mm of the external surfaces of the enclosure when subjected to a positive (bulging) or negative (caving) pressure. It is given as the measured difference in distance between a reference plane and the maximum point of deflection when subjected to air pressure

3.17.6
defrosting heat factor
ratio between the energy transferred into the air supply and the maximum recoverable energy in exhaust air, excluding the energy input for defrosting

3.17.7
air leakage factor *f*
air tightness expressed as the air leakage per unit envelope area and pressure difference (external air leakage)

3.17.8
air leakage rate q_{vl}
air leakage of the air handling unit subject to air pressure (external air leakage)

3.17.9
external total pressure difference
difference between the total pressure at the outlet of the air handling unit and the total pressure at the inlet

3.17.10
humidification efficiency
ratio between the mass of water evaporated by the humidifier and the theoretical mass needed to achieve saturation at a given temperature

3.17.11
internal air leakage rate
air leakage in between the two air streams within a section

3.17.12
thermal bridging factor k_b
ratio between the lowest temperature difference between any point on the external surface and the mean internal air temperature and the mean air to air temperature difference

3.17.13
thermal transmittance *U*
heat flow per unit of area and temperature difference

4 Symbols and abbreviations

For the purposes of this standard, symbols and units given in EN 12792:2003 and in Table 1 apply together with those defined by the formulae, text and annexes of this standard.

Table 1 — Symbols, terms, units and subscripts

Symbol	Term	Unit
A	Surface area	m^2
A_c	Cross sectional area of a duct	m^2
c	Sound velocity in the air	$m \times s^{-1}$
d	Effective duct diameter	m
D_p	Sound insertion loss	dB
E	Duct end correction value	dB
f	Air leakage factor	$l \times (s \times m^2)^{-1}$
k	Number of measurements within the total measuring time	-
k	Filter bypass leakage factor	%
k_b	Thermal bridging factor of the casing	-
L_p	Sound pressure level	dB
L_W	Sound power level	dB
L_{WA}	A-weighted sound power level	dB(A)
n_F	Rotational speed of the fan	s^{-1}
P_E	Electrical motor input power	W
p_a	Atmospheric pressure	Pa
p_d	Dynamic pressure	Pa
p_s	Static pressure	Pa
p_t	Total fan pressure	Pa
p_{tu}	External total pressure difference of the unit	Pa
Q_{defr}	Total energy input for defrosting during one complete frosting/defrosting cycle	J
p_v	Partial pressure of water vapour	Pa
q_{mn}	Nominal air mass flow rate of the recovery device	$kg \times s^{-1}$
q_m	Air mass flow rate	$kg \times s^{-1}$
q_v	Air volume flow rate	$m^3 \times s^{-1}$

Table 1 *(continued)*

Symbol	Term	Unit
q_{vm}	Measured and converted air volume flow rate	$m^3 \times s^{-1}$
q_{vs}	Specified air volume flow rate	$m^3 \times s^{-1}$
t_a	Dry-bulb temperature	°C
$t_{m,i}$	Local temperature at measurement point	°C
t_i	Mean internal air temperature	°C
t	Tolerance range	%
u	Uncertainty range of measured data	%
U	Range of uniformity of flow after the mixing section	-
U	Thermal transmittance of the casing	$W \times (m^2 \times K)^{-1}$
v	Velocity of air at a point	$m \times s^{-1}$
x	Absolute humidity	g x kg^{-1}
$\Delta\tau$	Sampling interval time	s
Δp_1	Pressure drop on exhaust-air side	Pa
ε_D	Defrosting heat ratio	-
η_h	Humidifier efficiency	-
η_{mix}	Mixing efficiency	%
φ	Relative humidity	%
ρ	Density	$kg \times m^{-3}$

Table 1 *(concluded)*

Subscripts	
1	Inlet
2	Outlet
11	Exhaust air in
12	Exhaust air out
21	Supply air in
22	Supply air out
i	Internal
H	Air flow with higher temperature
L	Air flow with lower temperature
M	Mixed air flow [mean temperature]
tot	Air flow downstream of the mixing section
Abbreviations	
HVAC	Heating, ventilation and air conditioning

5 Ratings and performance of the entire air handling unit

5.1 General

The performance of the entire air handling unit cannot be defined as the sum of the individual components and sections. Hence, the procedures that follow shall be applied to a complete air handling unit. In particular, and under agreed circumstances these procedures can be applied to a part of an air handling unit.

The methods described in 5.2 cover measuring air volume flow together with the external total pressure of the unit and power consumption. By selecting an appropriate test system, these procedures can be extended to include measuring the sound level transmitted from the air handling unit into the ductwork at a known volume flow, as described in 5.3.

5.2 Testing of aerodynamic performance

5.2.1 Characteristics and quantities

5.2.1.1 Characteristics

a) External total pressure difference of the unit/Air volume flow - characteristic. The difference in total pressure between outlet and inlet of the air handling unit related to the air volume flow at the measurement plane.