SLOVENSKI STANDARD
SIST EN 12238:2001

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Prezraļevanje stavb - Naprave za razvod zraka - Aerodinamiļno preskuġanje in ocenitev aplikacij strujanja zraka

Ventilation for buildings - Air terminal devices - Aerodynamic testing and rating for mixed flow application

Lüftung von Gebäuden - Luftdurchlässe - Aerodynamische Prüfung und Bewertung für Anwendung bei Mischströmung

Ventilation des bâtiments - Bouches d'air - Essais aérodynamiques et caractérisation pour applications en diffusion a mélange

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Ventilation for buildings - Air terminal devices - Aerodynamic testing and rating for mixed flow application

Ventilation des bâtiments - Bouches d'air - Essais aérodynamiques et caractérisation pour applications en diffusion à mélange

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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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of an identical text or by endorsement, at the latest by February 2002, and conflicting national standards shall be withdrawn at the latest by February 2002.

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.

1 Scope

This European Standard specifies methods for the laboratory aerodynamic testing and rating of air terminal devices for mixed flow applications, including the specification of suitable test facilities and measurement techniques.

The standard gives only tests for the assessment of characteristics of the air terminal devices under isothermal conditions.

The testing of low velocity air terminal devices is specified in EN 12239.

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 hereafter. For dated references the subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

CR 12792, *Ventilation for buildings — Symbols and terminology*

EN 12239, *Ventilation for buildings — Air terminal devices — Aerodynamic testing and rating for displacement flow applications*

prEN 13182:1998, *Ventilation for buildings — Instrumentation requirements for air velocity measurements in ventilated spaces*

ISO 3966, *Measurement of fluid flow in closed conduits — Velocity area method using Pitot static tubes*

EN ISO 5167-1, *Measurement of fluid flow by means of pressure differential devices — Part 1: Orifice plates, nozzles and Venturi tubes inserted in circular cross-section conduits running full [ISO 5167-1: 1991]*

3 Terms, definitions and symbols

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

3.1 functional characteristics of air terminal devices

NOTE The acroynym ATD is used to signify an air terminal device.

3.1.1
nominal size of an air terminal device
nominal value of dimensions of the duct into which the air terminal device is to be fitted

NOTE For an air diffuser, the nominal size is generally known as neck size.

3.1.2 core and specific areas

3.1.2.1
core of an air terminal device
that part of an air terminal device located within a convex closed surface of minimum area, inside which are all the openings of the air terminal device through which the air can pass

3.1.2.2
free area (of an air terminal device)
sum of the smallest areas of the cross-section of all openings of the air terminal device

3.1.2.3
core of a grille
that part of a grille located inside a convex closed plane curve of minimum length of contour, inside which are all the openings of the grille

3.1.2.4
core area (of a grille)
area limited by the plane curve defined in 3.1.2.3

3.1.2.5
free area (of a grille)
sum of the minimum measured areas of each opening through which the air can pass

3.1.2.6
free area ratio (of a grille)
ratio of the free area to the core area

3.1.2.7
effective area of an air terminal device A_k
quotient resultant from measured air flow rate and measured air velocity as determined in a specified manner with a specified instrument

3.1.3 aspect and vane ratios

3.1.3.1
aspect ratio (of a rectangular air terminal device)
ratio of the larger side to the smaller side of the rectangular core

3.1.3.2
vane ratio (of a grille)
ratio of the chord length to the vane pitch

3.1.4 Special terms relating to air

3.1.4.1
standard air
atmospheric air having a density of 1,2 $kg \cdot m^{-3}$ at 20 °C, 101 325 Pa (1 013,25 mbar) and 65 % Relative Humidity

3.1.4.2
supply air
air entering a supply air terminal device from an upstream duct

3.1.4.3
induced air
airflow induced by the supply air from a supply air terminal device

3.1.4.4
exhaust air
air leaving an exhaust air terminal device into a downstream duct

3.1.5 specific terms relating to air diffusion rating

3.1.5.1
mean measured air temperature of the occupied zone
arithmetical average of the measured values of air temperature within the occupied zone

3.1.5.2
supply temperature differential
algebraic difference between the supply air temperature and the mean measured air temperature of the occupied zone

3.1.5.3
exhaust temperature differential
algebraic difference of the exhaust air temperature and the mean measured air temperature of the occupied zone

3.1.5.4
temperature differential within the occupied zone
largest value of the difference between measured air temperatures within the occupied zone

3.1.5.5
primary air flow rate
volume of air entering a supply air terminal device in unit time from an upstream duct

3.1.5.6
exhaust air flow rate
volume of air leaving an exhaust air terminal device in unit time

3.1.5.7
local air velocity
magnitude of the time-averaged vector of velocity at a point of an air stream

The velocity vector (and therefore its three mutually perpendicular components u,v,w) in any point of a turbulent stream is submitted to fluctuations with respect to time. The time-averaged vector of velocity is a vector for which each component is averaged with respect to time. The components being:

$$\bar{u} = \frac{1}{T}\int_0^T u\,dt; \quad \bar{v} = \frac{1}{T}\int_0^T v\,dt; \quad \bar{w} = \frac{1}{T}\int_0^T w\,dt;$$

the local air velocity is therefore: $\sqrt{\bar{u}^2 + \bar{v}^2 + \bar{w}^2}$

3.1.5.8
local measured air velocity
measured value of local air velocity

3.1.5.9
treated space
enclosure served by an air distribution system

NOTE In this standard the treated space is the test room described in 6.2.

3.1.5.10
envelope
geometrical surface in a treated space where the local measured air velocity has the same value and is the reference velocity associated with this envelope

3.1.5.11
room air velocity
value of velocity conventionally derived from the various local measured air velocities within the occupied zone

3.1.5.12
free area velocity
primary air flow rate divided by the free area of a supply air terminal device or exhaust air flow divided by the free area of an exhaust air terminal device

3.1.5.13
throw (for a supply air terminal device)
maximum distance between the centre of the core and a plane which is tangent to a specified envelope, such as 0,25 $m \cdot s^{-1}$, 0,5 $m \cdot s^{-1}$, etc., and the centre of the core

3.1.5.14
drop (for a supply air terminal device)
vertical distance between the lowest horizontal plane tangent to a specified envelope, such as 0,25 $m \cdot s^{-1}$, 0,5 $m \cdot s^{-1}$, etc., and the centre of the core

3.1.5.15
rise (for a supply air terminal device)
vertical distance between the highest horizontal plane tangent to a specified envelope, such as 0,25 $m \cdot s^{-1}$, 0,5 $m \cdot s^{-1}$, etc., and the centre of the core

3.1.5.16
spread (for a supply air terminal device)
maximum distance between two vertical planes tangent to a specified envelope, such as 0,25 $m \cdot s^{-1}$, 0,5 $m \cdot s^{-1}$, etc., and perpendicular to a plane through the centre of the core

There can be two different spreads, which are not always equal: one for the left side, the other for the right side (considered when looking at the treated space from the supply air terminal device).

3.1.5.17
occupied zone (for laboratory purposes)
portion of the treated space geometrically limited to be no closer than 0,15 m to all walls and within a height of 1,8 m above the floor

3.1.5.18
slot air terminal device
device with single or multiple components with aspect ratio [the ratio of length to width of the enclosed rectangular opening] of 10:1 or greater for each slot

3.2 Symbols

The symbols used in this standard are given in Table 1.

Table 1 — Symbols

Symbol	Quantity	SI unit
A	Area	m^2
A_d	Area corresponding to the cross section of the nominal size of the duct to which the device is fitted (neck area)	m^2
A_f	Free area	m^2
A_k	Effective area (k-factor area) $\left(\frac{q_v}{v_k}\right)$	m^2
b_R	Width of test room or installation	m
D_e	Equivalent diameter $\left(\sqrt{\frac{4 \times A_d}{\pi}}\right)$	m
D_h	Hydraulic diameter $\left(\frac{4 \times A_d}{\text{perimeter}}\right)$	m
d	Diameter	m
h_D	Face height of linear grille of diffuser	m
h_R	Height of test room or installation	m
l_R	Length of test room or installation	m
p_{sa}	Absolute static pressure	Pa
p_a	Atmospheric pressure	Pa
p_s	Static pressure or static gauge pressure (p_{sa} - p_a)	Pa
p_{ta}	Stagnation (or absolute total) pressure	Pa
p_t	Total pressure (p_{ta} - p_a)	Pa
$p_{t1,2}$	Total pressure corresponding to a density of 1,2 $kg \cdot m^{-3}$	Pa
p_{tD}	Total pressure requirement of the device	Pa

Table 1 — Symbols [concluded]

Symbol	Quantity	SI unit
$p_{s1,2}$	Static gauge pressure corresponding to a density of 1,2 kg·m^{-3}	Pa
p_{sD}	Static pressure requirement of the device	Pa
$p_{d1,2}$	Dynamic pressure (Velocity pressure) $\left(\rho\frac{v^2}{2}\right)$	Pa
Δp	Pressure difference (for a pressure difference device)	Pa
q_v	Volume rate of flow	m^3·s^{-1}
v	Velocity	m·s^{-1}
v_k	Velocity referred to the effective area (k-factor velocity) $\left(\frac{q_v}{A_k}\right)$	m·s^{-1}
v_x	Maximum velocity at distance x from centre of supply air terminal device	m·s^{-1}
x	Distance from supply air terminal device along the centreline of the jet	m
X	Throw	m
Y	Spread	m
Z	Drop	m
ζ	Loss coefficient	-
θ	Thermodynamic temperature	K
ρ	Density of air	kg·m^{-3}
R	Area parameter that relates to the effective size of the air terminal device	m^2
S	Linear parameter that relates to the effective size of the air terminal device	m
X_C	Coordinate (see annex A)	m
Y_C	Coordinate (see annex A)	m
Z_C	Coordinate (see annex A)	m