SLOVENSKI STANDARD
SIST EN 14989-1:2007

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Dimniki - Zahteve in preskusne metode za kovinske dimnike in od materialov neodvisne kanale za dovod zraka za ogrevalne naprave v zaprtih prostorih - 1. del: Navpiļ ni terminali za odvod dima in dovod zraka za plinske kotle tipa C6

Chimneys - Requirements and test methods for metal chimneys and material independent air supply ducts for roomsealed heating applications - Part 1: Vertical air/flue terminals for C6-type appliances

Abgasanlagen - Anforderungen und Prüfverfahren für Metall-Abgasanlagen und materialunabhängige Luftleitungen für raumluftunabhängige Anlagen - Teil 1: Senkrecht angeordnete luft/Abgas-Aufsätze für Abgasanlagen mit Gasgeräten des Typs C6

Conduits de fumée - Exigences et méthodes d'essais pour conduits de fumées métalliques et conduits d'alimentation en air pour tous matériaux pour des appareils de chauffages étanches - Partie 1 : Terminaux verticaux air/fumée pour appareils de type C6

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Foreword

This document (EN 14989-1:2007) has been prepared by Technical Committee CEN/TC 166 “Chimneys”, the secretariat of which is held by UNI.

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of an identical text or by endorsement, at the latest by August 2007, and conflicting national standards shall be withdrawn at the latest by November 2008.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s).

For relationship with EU Directive(s), see informative Annex ZA, which is an integral part of this document.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, 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.

Introduction

This standard covers vertical air/flue terminals with metal flue ducts for chimneys for roomsealed heating applications meaning the combination of flue duct and air supply duct needed for the correct functioning of a C_6 roomsealed appliance.

The current requirements and test methods apply to balanced flue type applications. Requirements and test methods for other roomsealed applications will follow in separate documents.

A standard covering the design, installation and commissioning of room sealed heating applications is in the current CEN/TC 166 work program, which includes this Part 1: Vertical Terminals for C_6-type appliances, and Part 2: Flue and air supply ducts for individual roomsealed appliances.

1 Scope

This standard specifies the requirements and test methods for positive pressure air/flue terminals with metal flue ducts for C_{62}- and C_{63}-type gas appliances, which convey air for combustion, and the products of combustion from appliances to the outside atmosphere.

It also specifies the requirements for marking, manufacturer's instructions, product information and evaluation of conformity.

NOTE The classification of gas appliances is according to CEN/TR 1749.

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 573-3, *Aluminium and aluminium alloys - Chemical composition and form of wrought products - Part 3: Chemical composition*

EN 1443:2003, *Chimneys - General requirements*

EN 1856-1:2003, *Chimneys - Requirements for metal chimneys - Part 1: System chimney products*

EN 1856-2:2004, *Chimneys - Requirements for metal chimneys - Part 2: Metal liners and connecting flue pipes*

EN 1859:2000, *Chimneys - Metal chimneys - Test methods*

EN 10088-1, *Stainless steels - Part 1: List of stainless steels*

EN 14241-1, *Chimneys - Elastomeric seals and elastomeric sealants - Material requirements and test methods - Part 1: Seals in flue liners*

EN 14471, *Chimneys - System chimneys with plastic flue liners - Requirements and test methods*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 1443:2003, EN 1859:2000, EN 1856-1:2003, EN 1856-2:2004 and the following apply.

3.1
air/flue terminal
terminal unit consisting of a flue duct, which may be provided with a cover, and an air supply duct for the connection of a roomsealed appliance

3.2
air supply duct
independent duct in a building, or a structural part of an air/flue terminal, conveying combustion air to a roomsealed appliance

3.3
concentric air/flue configuration
configuration in which the chimney flue is fully surrounded by the air supply duct

3.4
flow resistance
difference between the static pressures in the flue connection and the air supply duct connection under dynamic conditions

3.5
friction length
imaginary dimension for the flow resistance of the air/flue terminal expressed in metres of duct length

3.6
nominal diameter of the flue of the terminal (D_n)
whole number representing the diameter of the flue of the terminal, expressed in millimetres

3.7
nominal flow rate
amount of air which flows at the nominal velocity through a duct with nominal diameter

3.8
nominal velocity
velocity in a duct which characterises the velocity used in the test

NOTE The actual test velocity may differ from the nominal velocity, because the actual inside diameter differs from the nominal diameter.

3.9
push-in spigot
part of a pipe or fitting which is pushed into the socket of another pipe or fitting, thus resulting in a connection

3.10
re-circulation percentage
ratio between the amount of flue gases leaking through the flue opening into the air supply duct opening of the terminal and the total amount of flue gases produced

3.11
room-sealed appliance
appliance in which the combustion circuit (air supply, combustion chamber, heat exchanger and evacuation of the products of combustion) is sealed with respect to the room in which the appliance is installed

3.12
separate air/flue configuration
configuration in which the air supply duct and the chimney flue are separate (non-concentric)

3.13
socket
part of a pipe or fitting which is pushed over the push-in spigot of another pipe or fitting, thus resulting in a connection

3.14
terminal adapter
part of the terminal used to connect the terminal to the air supply duct and the flue. It may include the transition from parallel to concentric configuration

3.15
wind pressure angle
angle from which the wind (generated in the wind tunnel) hits the air/flue terminal

3.16
wind effect pressure
additional pressure difference between the inlet and the outlet of the terminal due to the wind

3.17
balanced flue chimney system
system where the air entry to the combustion air supply duct is adjacent to the discharge of combustion products from the flue, the inlet and outlet being so positioned that wind effects are substantially balanced

4 Symbols

α_a	coefficient of heat transfer between the supply air and the outer surface of the flue duct	in	$\frac{W}{m^2 \cdot K}$
α_{aB}	coefficient of heat transfer between the outside of the air supply duct and the ambient air	in	$\frac{W}{m^2 \cdot K}$
α_i	coefficient of heat transfer between the air and the inner surface of the flue duct	in	$\frac{W}{m^2 \cdot K}$
α_{iB}	coefficient of heat transfer between the supply air and the inner surface of the air supply duct	in	$\frac{W}{m^2 \cdot K}$
η_A	dynamic viscosity of air for T_m	in	$\frac{N \cdot s}{m^2}$
η_B	dynamic viscosity of air for T_{mB}	in	$\frac{N \cdot s}{m^2}$
λ_A	thermal conductivity of air for T_m	in	$\frac{W}{m \cdot K}$
λ_B	thermal conductivity of air for T_{mB}	in	$\frac{W}{m \cdot K}$
$\left(\frac{1}{\Lambda}\right)$	thermal resistance of the flue duct	in	$\frac{m^2 \cdot K}{W}$
$\left(\frac{1}{\Lambda}\right)_B$	thermal resistance of the air supply duct	in	$\frac{m^2 \cdot K}{W}$
ρ	density of air at 20 °C = 1,2	in	$\frac{kg}{m^3}$
ρ_a	density of air	in	$\frac{kg}{m^3}$
ρ_e	density of air for T_e	in	$\frac{kg}{m^3}$
ρ_m	density of air for T_m	in	$\frac{kg}{m^3}$
ρ_{mB}	density of air for T_{mB}	in	$\frac{kg}{m^3}$
ψ	coefficient of friction of the flue	-	
ψ_B	the higher of the value of the coefficient of friction of the inside of the air supply duct and the outside of the flue duct	-	

ψ_{smooth}	coefficient of friction of the flue for hydraulically smooth flow	-	
$\psi_{smoothB}$	coefficient of friction of the air supply for hydraulically smooth flow	-	
ζ	coefficient of flow resistance, friction factor	-	
ζ_A	declared coefficient of flow resistance of the air supply duct of the terminal	-	
ζ_F	declared coefficient of flow resistance of the flue duct of the terminal	-	
A_B	cross-sectional area of the air supply passage	in	m^2
c_p	specific heat capacity of air for T_m	in	$\frac{J}{kg \cdot K}$
c_{pB}	specific heat capacity of air for T_{mB}	in	$\frac{J}{kg \cdot K}$
d_1	external diameter of the push-in spigot of the flue duct	in	mm
d_2	internal diameter of the socket of the flue duct	in	mm
D_1	external diameter of the push-in spigot of the air supply	in	mm
D_2	internal diameter of the duct socket of the air supply duct	in	mm
D_h	hydraulic diameter of the flue	in	m
D_{ha}	hydraulic diameter of the outside of the flue duct	in	m
D_{haB}	hydraulic diameter of the outside of the air supply duct	in	m
D_{hB}	hydraulic diameter of the air supply passage	in	m
D_{hiB}	hydraulic diameter of the inside of the air supply duct	in	m
D_n	declared nominal diameter of the terminal	in	mm
k_b	coefficient of heat transmission between the flue and the air supply passage at temperature equilibrium	in	$\frac{W}{m^2 \cdot K}$
k_{Bb}	coefficient of heat transmission between the supply air and the ambient air at temperature equilibrium	in	$\frac{W}{m^2 \cdot K}$
L	length of the test segment	in	m
L_0	Available insertion length	in	mm
Nu	Nusselt number for the flue	-	
Nu_a	Nusselt number for the outside of the flue duct	-	
Nu_B	Nusselt number for a reference pipe flow	-	
Nu_{iB}	Nusselt number for the inside of the air supply duct	-	
Δp	Static pressure difference, measured friction	in	Pa
P_A	static pressure above ambient pressure directly downstream of the air supply duct of the terminal	in	Pa
P_F	static pressure above ambient pressure directly upstream of the flue duct of the terminal	in	Pa
P_L	wind effect pressure	in	Pa
Pr	Prandtl number of the flue duct	-	
Pr_B	Prandtl number of the supply air duct	-	
r	mean value of roughness of the inner wall of the flue duct	in	m
r_B	the higher of the value of the mean value of roughness of the inside of the air supply duct and the outside of the flue duct	in	m

Re	Reynolds number of the flue	-	
Re_B	Reynolds number of the air supply passage	-	
S_A	cross sectional area of the duct at the measurement position directly downstream of the air supply duct of the terminal	in	mm^2
S_F	cross sectional area of the duct at the measurement position directly upstream of the flue duct of the terminal	in	mm^2
S_{rad}	correction factor for radiation from the outer surface of the flue duct to the inner surface of the air supply duct	-	
T_e	air temperature at the flue inlet	in	°C
T_{eB}	air temperature at the air supply inlet	in	°C
T_{mB}	mean temperature in the air supply	in	°C
T_o	air temperature at the flue outlet	in	°C
T_{oB}	air temperature at air supply outlet	in	°C
T_u	ambient air temperature	in	°C
U	circumference of the inside of the flue	in	m
U_a	circumference of the outside of the flue duct	in	m
U_{iB}	circumference of the inside of the air supply duct	in	m
$\dot{V}$	test flow rate	in	$\frac{m^3}{s}$
w_A	velocity at the static pressure measurement position directly downstream of the air supply duct of the terminal, in m/s.	in	$\frac{m}{s}$
w_F	velocity at the static pressure measurement position directly upstream of the flue duct of the terminal, in m/s.	in	$\frac{m}{s}$
w_n	velocity of the flow inside the terminal under nominal operating conditions	in	$\frac{m}{s}$
w_{mB}	average velocity of the supply air	in	$\frac{m}{s}$
w_w	Wind speed	in	$\frac{m}{s}$
x	centre to centre distance of the air supply duct and the flue duct for separate air/flue configuration	in	mm

5 Manufacturer's declaration for type test

The manufacturer shall provide the relevant information from product documentation and instructions and in addition shall declare:

a) the manufacturing drawings including declared internal diameter and tolerances of manufacture;

b) materials from which the air/flue terminal is made (according to EN 10088-1 and EN 573-3 for metal);

c) the minimum thicknesses after manufacture; and

d) the nominal diameter (D_n);

e) the nominal length (L_n)

6 Dimensions and tolerances

The thickness of material of the flue and air supply ducts shall be not less than that declared by the manufacturer.

The declared internal diameter and length of the air/flue terminal shall not vary by more than ± 5 mm from the nominal diameter (D_n) and nominal length (L_n). The measured internal diameter of the air/flue terminal shall be not less than the manufacturer's declared diameter.

NOTE Annex A gives examples of typical dimensions for air flue terminals.

7 Performance requirements

7.1 Mechanical resistance and stability

7.1.1 Vertical load on the air/flue terminal

When tested according to the test method described in 12.1.1, the flue/air terminal shall be able to withstand an evenly applied force of 7 N/mm x D_n to a maximum of 750 N without showing any permanent deformations.

7.1.2 Wind load

When the air/flue terminal is tested according to the test method described in 12.1.2, the air/flue terminal shall withstand a minimum load of 1,5 kN/m^2 of the projected outer surface area.

This requirement shall be declared fulfilled for a terminal of height less than 0,8 m above the roof, and more than 0,4 m below the roof.

7.2 Hygiene, health and environment

7.2.1 Gas tightness of the flue

When an air/flue terminal is tested according to the test method described in 12.1.3 with a positive pressure of 200 Pa in the flue, the leakage rate shall not exceed 0,006 l s^{-1} m^{-2} of surface area of the flue before and after the thermal performance test.

7.2.2 Gas tightness of the air supply duct

When an air/flue terminal is tested according to the test method described in 12.1.4 with a positive pressure of 40 Pa in the air supply duct section, the leakage shall not exceed 0,28 l s^{-1} m^{-2} of surface of the air supply duct before and after the thermal performance test.

7.3 Safety in use

7.3.1 Thermal performance

7.3.1.1 Gas tightness

The air/flue terminal shall meet the gas tightness requirements of 7.2 before performing the test described in 12.2.4.1 and after performing the test described in 12.2.4.3.

7.3.1.2 Heat stress

7.3.1.2.1 Distance to adjacent combustible surfaces

When the air/flue terminal is tested in accordance with 12.2.4.1, the maximum temperature of the test walls adjacent to the air flue terminal shall not be greater than 85 °C related to an ambient temperature of 20 °C.

This requirement shall be declared fulfilled for a concentric air/flue terminal designated T200 or below with a zero distance to combustible materials.

NOTE For a concentric terminal having a separate connecting spigot, the manufacturer should give instructions on how the terminal is to be installed regarding the distance to combustible material.

7.3.1.2.2 Temperature cycling test

When the air/flue terminal and its components is tested in accordance with 12.2.4.3 no part of the terminal or its components shall show any permanent deformation, blisters or cracks which could affect its performance.

7.3.2 Thermal resistance

7.3.2.1 Air/flue terminal with separate air/flue configuration

The thermal resistance value of the air/flue terminal section declared by the manufacturer shall be verified either by testing according to the test method of EN 1859 or by calculation using either the simplified calculation or the finite difference equation of EN 1859:2000 (Annexes F and G). When the value for the thermal resistance is calculated, the thermal conductivity value shall be based on the mean temperature of the insulation depending on the nominal temperature of Table 1.

7.3.2.2 Air/flue terminal with concentric air/flue configuration

The thermal resistance value of the air/flue terminal section declared by the manufacturer shall be verified by testing according to 12.2.4.4.

7.3.3 Rainwater ingress

7.3.3.1 Flue

When a terminal designated D according to 10.4 is tested for rain ingress according to the test method described in 12.3, the volume of the water collected in the flue shall not exceed 0,05 mm^3/s per millimetre of the nominal size.

7.3.3.2 Air supply duct

When a terminal is tested for rain ingress according to the test method described in 12.3, the volume of the water collected in the air supply duct shall not exceed 0,05 mm^3/s per millimetre of nominal size.

7.3.3.3 Insulation

When a section of the air flue terminal containing insulation is tested for rain ingress according to the test method described in 12.3 the increase of mass shall not exceed 1% of the mass of the insulation of the section.

7.3.4 Aerodynamic properties of the terminal

7.3.4.1 Coefficient of flow resistance of the air supply duct of the terminal

When a terminal is tested according to the test method described in 12.4 under the conditions specified in 12.4.2.1, the declared coefficient of flow resistance of the air supply duct ζ_A shall fulfil the following condition:

$$\zeta_A \geq \frac{-2}{\rho_a w_n^2}\left(P_A + \frac{1}{2}\rho_a w_A^2\right) \quad (1)$$

with

ζ_A declared coefficient of flow resistance of the air supply duct of the terminal

ρ_a density of air, in kg/m^3

w_n velocity of the flow inside the terminal under nominal operating conditions, in m/s

P_A static pressure above ambient pressure directly downstream of the air supply duct of the terminal, in Pa

w_A velocity at the static pressure measurement position directly downstream of the air supply duct of the terminal, in m/s

7.3.4.2 Coefficient of flow resistance of the flue duct of the terminal

When a terminal is tested according to the test method described in 12.4 under the conditions specified in 12.4.2.2 the declared coefficient of flow resistance of the flue duct ζ_F shall fulfil the condition:

$$\zeta_F \geq \frac{2}{\rho_a w_n^2}\left(P_F + \tfrac{1}{2}\rho_a w_F^2\right) \quad (2)$$

with

ζ_F declared coefficient of flow resistance of the flue duct of the terminal

ρ_a density of air, in kg/m^3

w_n velocity of the flow inside the terminal under nominal operating conditions, in m/s

P_F static pressure above ambient pressure directly upstream of the flue duct of the terminal, in Pa

w_F velocity at the static pressure measurement position directly upstream of the flue duct of the terminal, in m/s

7.3.4.3 Wind effect on the terminal

When a terminal is tested according to the test method described in 12.4 under the conditions specified in 12.4.2.3, the wind effect pressure P_L for each condition shall be determined using the following formula

$$P_L = P_F - P_A - \tfrac{1}{2}\rho_a w_n^2\left(\zeta_F + \zeta_A\right) \quad (3)$$