SLOVENSKI STANDARD

SIST EN 12101-3:2002

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Sistemi za nadzor dima in toplote - 3. del: Specifikacije za električne ventilatorje za odvod dima in toplote

Smoke and heat control systems - Part 3: Specification for powered smoke and heat exhaust ventilators

Rauch- und Wärmefreihaltung - Teil 3: Bestimmungen für maschinelle Rauch- und Wärmeabzugsgeräte

Systemes pour le contrôle des fumées et de la chaleur - Partie 3: Spécifications pour les ventilateurs extracteurs de fumées et de chaleur

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Smoke and heat control systems - Part 3: Specification for powered smoke and heat exhaust ventilators

Systèmes pour le contrôle des fumées et de la chaleur - Partie 3: Spécifications pour les ventilateurs extracteurs de fumées et de chaleur

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This European Standard was approved by CEN on 9 June 2001.

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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 Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
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Contents

Foreword

This European Standard has been prepared by Technical Committee CEN/TC 191 "Fixed firefighting systems", 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of an identical text or by endorsement, at the latest by August 2002, and conflicting national standards shall be withdrawn at the latest by November 2003.

This European Standard 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 89/106/EEC.

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

This European Standard is one of six parts of the European Standard prEN 12101 covering smoke and heat control systems.

This European Standard has the general title *Smoke and heat control systems* and consists of the following six parts:

Part 1: *Specification for smoke barriers — Requirements and test methods*

Part 2: *Specification for natural smoke and heat exhaust ventilators*

Part 3: *Specification for powered smoke and heat exhaust ventilators*

Part 4: *Natural smoke and heat exhaust ventilation systems — Installation and test methods*

Part 5: *Design and calculation for smoke and exhaust ventilation systems (published as CR 12101-5)*

Part 6: *Design and calculation methods and installation procedure for pressure differential smoke control systems*

prEN 12101 is included in a series of European Standards planned to cover also:

- Gas extinguishing systems (EN 12094 and ISO 14520-1)
- Sprinkler systems (EN 12259)
- Powder systems (EN 12416)
- Explosion protection systems (EN 26184)
- Foam systems (EN 13565)
- Hose systems (EN 671)
- Water spray systems

The annexes A to E are normative.

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, Malta, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

Introduction

Smoke and heat exhaust ventilation systems create a smoke free layer above the floor by removing smoke and thus improve the conditions for the safe escape and/or rescue of people and animals and the protection of property and permit the fire to be fought while still in its early stages. They also exhaust hot gases released by a fire in the developing stage.

The use of smoke and heat exhaust ventilation systems to create smoke free areas beneath a buoyant smoke layer has become widespread. Their value in assisting in the evacuation of people from construction works, reducing fire damage and financial loss by preventing smoke logging, facilitating fire fighting, reducing roof temperatures and retarding the lateral spread of fire is firmly established. For these benefits to be obtained it is essential that smoke and heat exhaust ventilators operate fully and reliably whenever called upon to do so during their installed life. A heat and smoke exhaust ventilation system is a scheme of safety equipment intended to perform a positive role in a fire emergency.

Components for smoke and heat exhaust systems should be installed as part of a properly designed smoke and heat system.

Smoke and heat exhaust ventilation systems help to

— keep the escape and access routes free from smoke;

— facilitate fire fighting operations by creating a smoke free layer;

— delay and/or prevent flashover and thus full development of the fire;

— protect equipment and furnishings;

— reduce thermal effects on structural components during a fire;

— reduce damage caused by thermal decomposition products and hot gases.

Depending on the design of the system and the ventilator, powered or natural smoke and heat ventilators can be used in a smoke and heat control system. Powered smoke and heat exhaust ventilators can be installed in the roof or upper part of walls of building or in a ducted system with the ventilator inside or outside the smoke reservoir or in a plant room.

Powered smoke and heat exhaust ventilation systems should operate based on powered ventilators. The performance of the powered smoke and heat exhaust system depends on

— the temperature of the smoke;

— size, number and location of the exhaust openings;

— the wind influence;

— size, geometry and location of the inlet air openings;

— the time of actuation;

— the location and conditions of the system (for example arrangements and dimensions of the building).

Smoke and heat exhaust ventilation systems are used in buildings or construction works where the particular (large) dimensions, shape or configuration make smoke control necessary.

Typical examples are:

— single and multi-storey shopping malls;

— single and multi-storey industrial buildings and warehouses;

— atria and complex buildings;

— enclosed car parks;

— stairways;

— tunnels;

— theatres.

Depending on differing circumstances and the situation of the building or construction works that can affect their performance, powered or natural smoke and heat exhaust ventilation systems may be used.

It is specified in parts 4 and 5 of this European Standard that powered and natural exhaust ventilators should not be used to extract smoke and hot gases from the same smoke reservoir.

Special conditions apply where gas extinguishing systems (e.g. according to prEN 12094 or ISO 14520-1) are used (see parts 4 and 5).

1 Scope

This European standard specifies requirements and gives methods for testing powered smoke and heat exhaust ventilators that are intended to be installed as part of a powered smoke and heat exhaust ventilation system. It also provides a procedure for approving a range of powered smoke and heat exhaust ventilators and their motors, from a limited number of tests.

2 Normative references

This European Standard incorporates, by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate place in the text and the publications are listed hereafter. For dated references, 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).

EN 1363, *Fire resistance tests.*

EN 1366, *Fire resistance tests for service installations.*

EN 60034-1, *Rotating electrical machines, rating and performance.*

IEC 34-2, *Methods for determining losses and efficiencies from test.*

ISO 834-1, *Fire resistance tests. Elements of building construction - Part 1: General requirements for fire resistance testing.*

EN ISO 5167, *Measurement of fluid flow by means of pressure differential devices.*

ISO 5221, *Air distribution and air diffusion. Rules for methods of measuring air flowrate in an air handling duct.*

ISO 5801, *Industrial fans, performance testing using standardized airways.*

prEN 12101-2:1995, *Smoke and heat control systems - Part 2: Specification for natural smoke and heat exhaust ventilators.*

3 Terms and definitions

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

3.1
smoke and heat control system
arrangement of components installed in a construction work to limit the effects of smoke and heat from a fire

3.2
smoke and heat exhaust system
smoke control system that exhausts smoke and heat from a fire in a construction work or part of a construction work

3.3
smoke and heat exhaust ventilation system (SHEVS)
smoke and heat exhaust ventilation system consists of components jointly selected to exhaust smoke and heat to establish a buoyant layer of warm gases above cooler, cleaner air

3.4
natural ventilation
ventilation caused by buoyancy forces due to differences in density of the gases because of temperature differences

3.5
powered ventilation
ventilation caused by the positive displacement of gases through a ventilator

NOTE Fans are usually used.

3.6
ventilator
device for enabling the movement of gases into or out of a construction work

3.7
exhaust ventilator
device for the movement of gases out of the construction work

3.8
smoke and heat exhaust ventilator
device specially designed to move smoke and hot gases out of the construction work under conditions of fire

3.9
dual purpose ventilator
smoke and heat exhaust ventilator that has provision to allow its use for comfort (i.e. day to day) ventilation

3.10
emergency ventilator
smoke and heat exhaust ventilator that is not used for comfort (i.e. day to day) ventilation

3.11
permanently open natural smoke and heat exhaust ventilator
smoke and heat exhaust ventilator without devices for closing

3.12
manually opened natural smoke and heat exhaust ventilator
smoke and heat exhaust ventilator that can only be opened by a manual control or release device

3.13
automatic natural smoke and heat exhaust ventilator
smoke and heat exhaust ventilator which is designed to open automatically after the outbreak of fire if called upon to do so

NOTE Automatic natural smoke and heat exhaust ventilators may also be fitted with a manual control or release device.

3.14
automatically initiated powered smoke and heat exhaust ventilator
powered smoke and heat exhaust ventilator that operates automatically after the outbreak of fire if called upon to do so

3.15
smoke reservoir
region within a building limited or bordered by smoke curtains or structural elements and which will in the event of a fire retain a thermally buoyant smoke layer

3.16
hot gas fan
fan that is suitable for handling hot gases for a specified time/temperature profile. The time may be “continuous” or more specific to the application. Special materials may be incorporated in the fan that may have a direct or indirect drive. The motor may be in the airstream on a direct drive fan or separated from it by a bifurcation tunnel. Indirect drive fans may incorporate a means of cooling belts, bearings or other drive components

3.17
powered smoke and heat exhaust ventilator
hot gas fan that is suitable for handling hot gases for a limited period only

3.18
powered roof ventilator
partition fan designed for mounting on a roof and having exterior weather protection

3.19
insulated ventilator
ventilator insulated to limit the external surface temperature to reduce the danger of injury to persons or damage to materials

3.20
smoke reservoir ventilator
ventilator suitable for operation fully immersed in a smoke reservoir

3.21
non smoke reservoir ventilator
ventilator not suitable for operation fully immersed in a smoke reservoir

3.22
powered ventilator product range
physically similar ventilators using the same form of construction and materials throughout, with the same methods of impeller construction and motor mounting and construction, and electrical connection in which the following may vary across the range:

— overall dimensions of units; and/or

— the impeller diameter and width, hub size, blade length and number of blades of the impeller; and/or

— the size of the motor

3.23
powered ventilator motor range
motors which are physically similar, using the same form of construction i.e. same materials and manufacturing method for carcase, cooling impeller, when fitted, and end covers; same insulation specification which includes sheet insulation used on for coil separation and slot insulation, winding impregnation material (varnish or resin etc... ,lead insulation, terminal blocks and any other materials that could affect the integrity of the insulation); same bearing type, class of fit, lubricant and arrangement, with motor windings based on the same maximum winding temperature and class of insulation, in which the following may vary across the range:

— the frame size;

— the rotational speed;

— the electrical windings, including multi-speed;

— the form of mounting, e.g. foot, flange, pad, clamp, etc.

3.24
motor rating
the motor rating (rated power) is the maximum power that the motor will deliver continuously without exceeding the allowable temperature rise

3.25
fire position
position of a component to be reached and maintained while venting smoke and heat

4 Design requirements

4.1 Application classes

A powered ventilator shall be classified into one or more of the following application classes:

- — insulated or uninsulated;
- — smoke reservoir or non smoke reservoir;
- — dual purpose or emergency only use;
- — ducted cooling air required.

4.2 Motor rating

4.2.1 The motors shall be selected for continuous operation at the power required for normal ambient temperature not just for operation at high temperature.

4.2.2 Motor ratings shall be limited either by the temperature rise for one class lower than the insulation class of the motor, as defined in EN 60034-1, as given in Table 1, or for motors with class B or class F insulation to the motor rated output power being 15 % above the absorbed power at a density of 1,2 kg/m^3.

Table 1 — Motor temperature ratings

Motor insulation	Temperature rise at ambient
Class H or C	Class F
Class F	Class B
Class B	Class E

4.3 Motor specification

Motors shall comply with the requirements of EN 60034-1.

5 General testing procedures

For type approval, tests shall be carried out in accordance with annex A, B, C, D and E. For each test a test report shall be prepared in accordance with annex C and/or D.