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Smoke and heat control systems - Part 10: Power supplies

Rauch- und Wärmefreihaltung - Teil 10: Energieversorgung

Systemes pour le contrôle des fumées et de la chaleur - Partie 10 : Equipement d'alimentation en énergie

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Rauch- und Wärmefreihaltung - Teil 10: Energieversorgung

This European Standard was approved by CEN on 26 August 2005.

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Foreword

This European Standard (EN 12101-10:2005) 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of an identical text or by endorsement, at the latest by April 2006, and conflicting national standards shall be withdrawn at the latest by April 2006.

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(s).

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

EN 12101 ‘Smoke and heat control systems’ consists of the following:

Part 1: Specification for smoke barriers,

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

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

Part 4: Fire and smoke control installations – Kits,

Part 6: Pressure differential systems – Kits,

Part 7: Smoke control ducts,

Part 8: Specifications for smoke control dampers,

Part 9: Control panels,

Part 10: Power supplies.

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

— Gas extinguishing systems (EN 12094 and EN ISO 14520),

— Sprinkler systems (EN 12259),

— Powder systems (EN 12416),

— Explosion protection systems (EN 26184),

— Foam systems (EN 13565),

— Hose systems (EN 671),

— Water spray systems.

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, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

Introduction

Smoke and heat control systems are used to protect people, buildings and/or building contents from the effects of smoke and heat in the event of fire. The most common systems are smoke and heat exhaust ventilation systems (SHEVS) and pressure differential systems.

Smoke and heat exhaust ventilation systems (SHEVS) 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 buildings, equipment and furnishings;
- reduce thermal effects on structural components during a fire;
- reduce damage caused by thermal decomposition products and hot gases.

Pressure differential systems are used to either positively pressurise spaces separated from the fire or to depressurise the space containing the fire in order to limit or prevent the flow of smoke and heat into adjacent spaces. A typical use would be to pressurise an escape stair well in order to protect vertical means of escape.

Depending on the design of the system, natural or powered smoke and heat ventilation can be used in a smoke and heat control system.

Power supply equipment for a smoke and heat control system may be for pneumatic systems, low voltage or extra low voltage electrical systems, or a combination of any of these.

Smoke and heat control system power supplies may also provide power for day to day ventilation and for other fire safety equipment under fire conditions.

1 Scope

This European Standard specifies requirements and gives test methods for primary and secondary electrical and pneumatic power supply equipment, designed for use in smoke and heat control systems in buildings. It also provides for the evaluation of conformity of such equipment to the requirements of this European Standard.

NOTE A summary of functions is given in Annex A.

2 Normative references

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

EN 286-1, *Simple unfired pressure vessels designed to contain air or nitrogen – Part 1: Pressure vessels for general purposes*

EN 1964-1, *Transportable gas cylinders – Part 1: Specification for the design and construction of refillable transportable seamless steel gas cylinders of water capacities from 0,5 litre up to and including 150 litres. Cylinders made of seamless steel with an* R_m *value of less than 1100 MPa*

prEN 12101-9, *Smoke and heat control systems – Part 9: Control panels*

EN 12205, *Transportable gas cylinders – Non-refillable metallic gas cylinders*

EN 13293, *Transportable gas cylinders – Specification for the design and construction of refillable transportable seamless normalized carbon manganese steel gas cylinders of water capacity up to 0,5 litre for compressed, liquefied and dissolved gases and up to 1 litre for carbon dioxide*

EN 50130-4, *Alarm systems – Part 4: Electromagnetic compatibility – Product family standard: Immunity requirements for components of fire, intruder and social alarm systems*

EN 60068-1, *Environmental testing – Part 1: General and guidance (IEC 60068-1:1988 + Corrigendum 1988 + A1:1992)*

EN 60068-2-1, *Environmental testing – Part 2-1: Test methods – Tests A: Cold (IEC 60068-2-1:1990)*

EN 60068-2-6, *Environmental testing – Part 2-6: Test methods – Test Fc: Vibration (sinusoidal) (IEC 60068-2-6:1990 + Corrigendum 1995)*

EN 60068-2-47, *Environmental testing – Part 2-47: Test methods – Mounting of components, equipment and other articles for vibration, impact and similar dynamic tests (IEC 60068-2-47:1999)*

EN 60068-2-52:1996, *Environmental testing – Part 2-52 – Test methods – Test Kb, salt mist cyclic (sodium chloride solution (IEC 60068-2-52:1996)*

EN 60068-2-75, *Environmental testing – Part 2-75: Tests – Test Eh: Hammer tests (IEC 60068-2-75:1997)*

EN 60068-2-78, *Environmental testing – Part 2-78: Tests – Test Cab: Damp heat, steady state (IEC 60068-2-78:2001)*

EN 60204-1, *Safety of machinery – Electrical equipment of machines – Part 1: General requirements (IEC 60204-1:1997)*

EN 60529, *Degrees of protection provided by enclosures (IP code) (IEC 60529:1989)*

EN ISO 6988, *Metallic and other non-organic coatings – Sulphur dioxide test with general condensation of moisture (ISO 6988:1985)*

EN ISO 9001:2000, *Quality management systems – Requirements (ISO 9001:2000)*

EN ISO 12100-1, *Safety of machinery – Basic concepts, general principles for design – Part 1: Basic terminology, methodology (ISO 12100-1:2003)*

EN ISO 12100-2, *Safety of machinery – Basic concepts, general principles for design – Part 2: Technical principles (ISO 12100-2:2003)*

ISO 8528-1, *Reciprocating internal combustion engine driven alternating current generating sets – Part 1: Application, ratings and performance*

ISO 8528-2, *Reciprocating internal combustion engine driven alternating current generating sets – Part 2: Engines*

ISO 8528-3, *Reciprocating internal combustion engine driven alternating current generating sets – Part 3: Alternating current generators for generating sets*

ISO 8528-4, *Reciprocating internal combustion engine driven alternating current generating sets – Part 4: Control gear and switch gear*

ISO 8528-5:1993, *Reciprocating internal combustion engine driven alternating current generating sets – Part 5: Generating sets*

ISO 8528-6, *Reciprocating internal combustion engine driven alternating current generating sets – Part 6: Test methods*

ISO 8528-7, *Reciprocating internal combustion engine driven alternating current generating sets – Part 7: Technical declarations for specification and design*

ISO 8528-10, *Reciprocating internal combustion engine driven alternating current generating sets – Part 10: Measurement of airborne noise by the enveloping surface method*

ISO 8528-12:1997, *Reciprocating internal combustion engine driven alternating current generating sets – Part 12: Emergency power supply to safety devices*

ISO 8573-1, *Compressed air for general use – Part 1: Contaminants and purity classes*

Guideline 84/525/EWG of the advice from 17 September 1984 for the adjustment of the legislation of the member states over smooth gas bottles from steel

ADR 2003, *The European Agreement concerning the International Carriage of Dangerous Goods by Road (ADR)*

3 Terms, definitions and abbreviations

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

3.1 Terms and definitions

3.1.1
final voltage
lowest recommended voltage to which a battery should be discharged

NOTE The final voltage is specified by the battery manufacturer.

3.1.2
$I_{max\ a}$
maximum standby current

3.1.3
$I_{max\ b}$
maximum short duration current

3.1.4
multiple use gas bottle
gas bottle that is held open to the system and can operate the system a number of times before it has to be replaced or refilled

3.1.5
power supply equipment
either a source or store of power or a means of automatically switching between separate power sources

3.1.6
primary power source
power supply that is used whenever it is available

3.1.7
secondary power source
power supply that automatically replaces the primary power source in the event of its failure

3.1.8
single use gas bottle
gas bottle that remains sealed until pierced for once only emergency use

3.1.9
smoke and heat control system
arrangement of components installed in a building to limit the effects of smoke and heat from a fire

3.1.10
smoke and heat exhaust ventilation system (SHEVS)
system comprising components which together exhaust smoke and heat to establish a buoyant layer of warm gases above cooler, cleaner air

3.1.11
smoke and heat exhaust ventilator (SHEV)
device specially designed to move smoke and hot gases out of the building under conditions of fire

3.2 Abbreviations

p.s.e.: power supply equipment

c.p.: control panel

4 General requirements (electrical)

4.1 General

If a smoke and heat control system fails to the fire operational position on loss of power, only one power source shall be required. For non-fail safe smoke and heat control systems there shall be at least two power sources: the primary power source and the secondary power source. The primary power source shall be designed to operate from the public electricity supply or an equivalent system. The secondary power source, for example batteries or a generator, shall be permanently available, tested and maintained.

Each power source, on its own, shall be capable of operating those parts of the smoke and heat control system for which it is intended.

If the primary power source fails, then the p.s.e. shall be automatically switched over to a secondary power source. When the primary power source is restored, the p.s.e. shall be automatically switched back.

If the switching from one power source to the other causes an interruption in supply of power, the duration of the interruption shall be specified in the manufacturer's data (see Clause 9).

Where there are two or more power sources, failure of one of the power sources shall not cause the failure of any other power source or the failure of the supply of power to the system.

The p.s.e. shall be classified as either:

Class A – suitable for use with all systems; or

Class B – suitable for use with fail safe systems only.

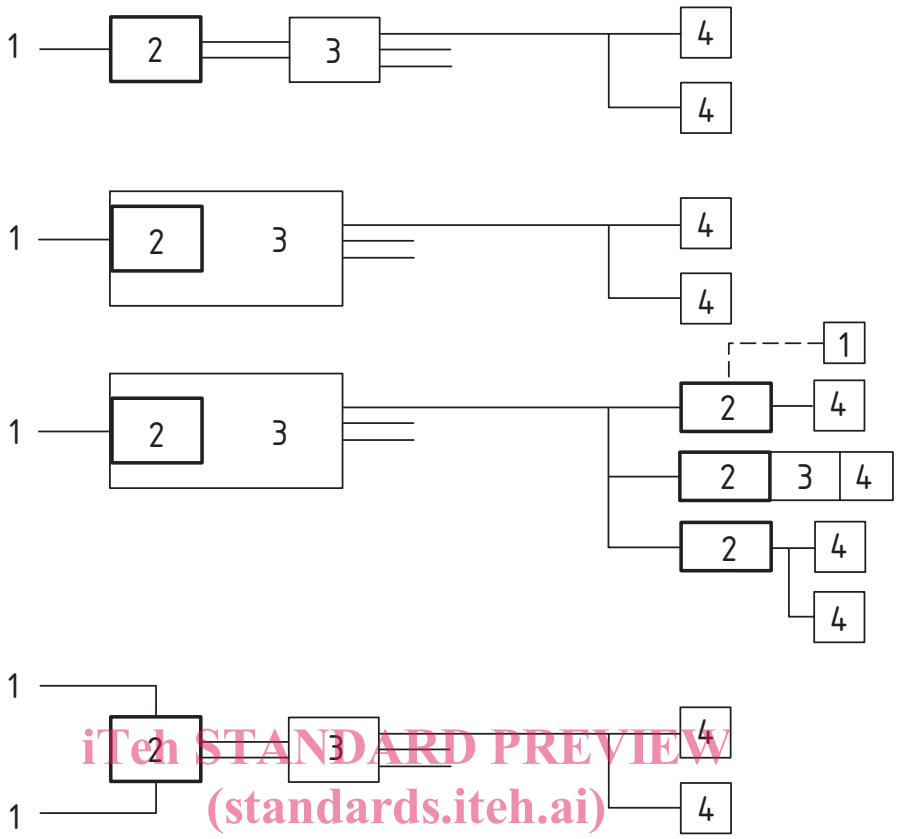
Monitoring of transmission paths, if required, shall be by the c.p., not the p.s.e.; see prEN 12101-9.

When subjected to the functional test in 12.1 the p.s.e. shall satisfy the requirements of 12.1.4.

The secondary power source may also be used for other functions, e.g. day to day comfort ventilation. When used in this way the p.s.e. shall ensure that sufficient power is retained for emergency use as specified in Clause 6, e.g. by preventing further use for the other functions.

NOTE 1 The compatibility of a separate p.s.e. with other equipment, for example, the c.p., should be taken into account by the system designer.

NOTE 2 The use of frequency converters for day to day ventilation within smoke control systems is dealt with in prEN 12101-9.



Key

1 mains in
2 power supply equipment (p.s.e.)
3 control panel (c.p.)
4 actuator or motor

Electrical requirement _____

Electrical optional _ _ _ _ _ _ _ _

Figure 1 — Examples showing typical locations and interrelationships of electrical p.s.e. with other components of a smoke control system

4.2 Batteries

If a rechargeable battery is used as a power supply the p.s.e. shall include charging equipment to charge and monitor the battery and maintain it in a fully charged state.

4.3 Generator sets

Generator sets used for the supply of power to a smoke and heat control system shall conform to ISO 8528-1 to 7, 10 and 12 and shall be diesel driven. The generating set and the electrical arrangements for the supply from the generator shall be fully independent of the normal electrical supply for the smoke control system.

5 General requirements (pneumatic)

5.1 General

Pneumatic p.s.e. shall supply primary power, secondary power or both.

The p.s.e. shall comprise one of the following:

— compressor set and air receiver;

— air receiver set (fed from a separate non-specific air supply);

— gas bottle set (multiple use);

— gas bottle set (single use).

When subjected to the functional test in 12.2, the p.s.e. shall satisfy the requirements of 12.2.1.4.

5.2 Power sources

5.2.1 General

If a smoke and heat control system fails to the fire operational position on loss of power, only one power source shall be required. For non-fail safe smoke and heat control system there shall be at least two power sources: the primary power source and the secondary power source, for example two compressors with a receiver or a compressor with a receiver plus a single use CO_2 gas bottle. The secondary power source may be incorporated within the ventilator or other SHEVS component. Both power sources shall be readily available and maintained.

Each power source, on its own, shall be capable of operating those parts of the smoke and heat control system for which it is intended.

If the secondary power source is not independently initiated (e.g. a fusible bulb operated single use CO_2 bottle), and if the primary power source fails, then the p.s.e. shall automatically switch over to a secondary power source. When the primary power source is restored, the p.s.e. shall automatically switch back.

Where there are two or more power sources, failure of one of the power sources shall not cause the failure of any other power source or the failure of the supply of power to the system.

If the switching from one power source to the other causes an interruption in supply of power, the duration of the interruption shall be specified in the manufacturer’s data (see Clause 9).

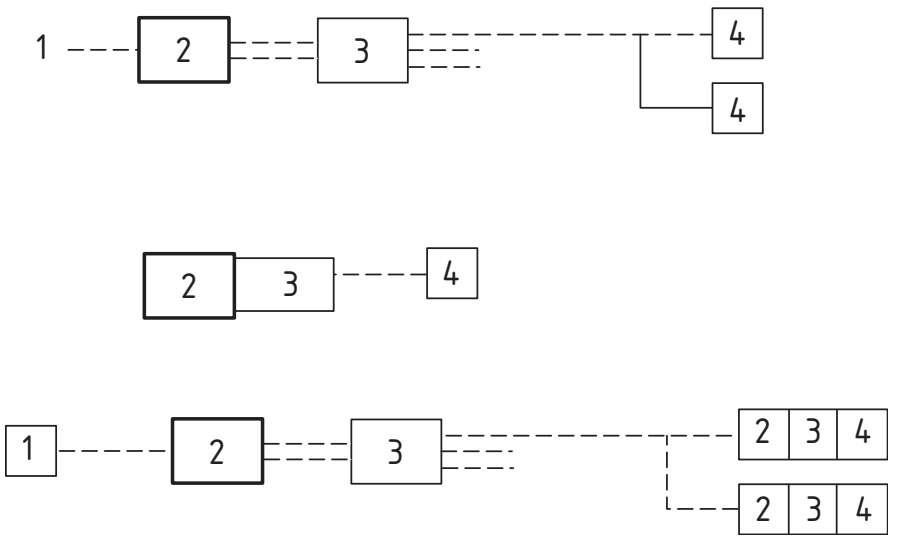
The p.s.e. shall be classified as either:

Class A – suitable for use with all systems; or

Class B – suitable for use with fail safe systems only.

The secondary power source may also be used for other functions, e.g. day to day comfort ventilation. When used in this way the p.s.e. shall ensure that sufficient power is retained for emergency use as specified in Clause 6, e.g. by preventing further use for the other functions.

NOTE 1 The compatibility of a separate p.s.e. with other equipment, for example the c.p., should be taken into account by the system designer.



Key

1 mains in
2 power supply equipment (p.s.e.)
3 control panel (c.p.)
4 actuator

Pneumatic -·-·-·-·-

Electrical requirement ——— Electrical Optional - - - - - -

NOTE Pneumatic p.s.e. may be compressor set, air receiver or gas bottle as appropriate.

Figure 2 — Examples showing typical locations and interrelationships of pneumatic p.s.e. with other components of a smoke control system

5.2.2 Compressors

Compressors used for supply of power to a smoke and heat control system shall conform to EN 60204-1, EN ISO 12100-1 and EN ISO 12100-2.

5.2.3 Air receivers

Air receivers used for supply of power to a smoke and heat control system shall conform to EN 286-1.

5.2.4 Multiple use gas bottles

5.2.4.1 General

Multiple use gas bottles used for supply of power to a smoke and heat control system shall conform to EN 13293 or EN 1964-1 and Guideline 84/525/EWG.

Multiple use gas bottles shall contain air, CO_2 or N_2.