

## **ПІДТВЕРДЖУВАЛЬНЕ ПОВІДОМЛЕННЯ**

Наказом Міністерства економічного розвитку і торгівлі України  
від 30.12.2014 № 1494

**EN 12101-10:2005**

en: Smoke and heat control systems - Part 10: Power supplies

прийнято як національний стандарт  
методом підтвердження за позначенням

**ДСТУ EN 12101-10:2014**

uk: Системи протидимного захисту. Частина 10. Джерела живлення

(EN 12101-10:2005; EN 12101-10:2005/AC:2007, IDT)

З наданням чинності від 2016–01–01

***Відповідає офіційному тексту***

**З питань придбання офіційного видання звертайтеся  
до національного органу стандартизації  
(ДП «УкрНДНЦ» <http://uas.org.ua>)**

English Version

Smoke and heat control systems - Part 10: Power supplies

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

Rauch- und Wärmefreihaltung - Teil 10: Energieversorgung

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

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CEN member.

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.

CEN members are the national standards bodies of 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.

## Contents

Page

|                                                                     |    |
|---------------------------------------------------------------------|----|
| Foreword .....                                                      | 4  |
| Introduction.....                                                   | 6  |
| 1 Scope .....                                                       | 7  |
| 2 Normative references .....                                        | 7  |
| 3 Terms, definitions and abbreviations.....                         | 8  |
| 3.1 Terms and definitions.....                                      | 8  |
| 3.2 Abbreviations .....                                             | 9  |
| 4 General requirements (electrical) .....                           | 10 |
| 4.1 General .....                                                   | 10 |
| 4.2 Batteries.....                                                  | 11 |
| 4.3 Generator sets.....                                             | 11 |
| 5 General requirements (pneumatic).....                             | 12 |
| 5.1 General .....                                                   | 12 |
| 5.2 Power sources .....                                             | 12 |
| 6 Functions.....                                                    | 15 |
| 6.1 Power supply from the primary power source (electrical).....    | 15 |
| 6.2 Power supply from the secondary power source (battery).....     | 15 |
| 6.3 Power supply from the secondary power source (generators) ..... | 16 |
| 6.4 Recognition and indication of faults (electrical).....          | 17 |
| 6.5 Power supply from compressed gases.....                         | 18 |
| 7 Materials, design and manufacture .....                           | 20 |
| 7.1 Mechanical design .....                                         | 20 |
| 7.2 Electrical design .....                                         | 20 |
| 8 Classification.....                                               | 20 |
| 9 Documentation.....                                                | 21 |
| 9.1 User's documentation .....                                      | 21 |
| 9.2 Design documentation .....                                      | 22 |
| 10 Marking .....                                                    | 22 |
| 10.1 General .....                                                  | 22 |
| 10.2 Gas bottles .....                                              | 23 |
| 11 General test requirements.....                                   | 23 |
| 11.1 Standard atmospheric conditions for testing .....              | 23 |
| 11.2 Mounting and orientation .....                                 | 23 |
| 11.3 Electrical connection .....                                    | 23 |
| 11.4 Selection of tests .....                                       | 23 |
| 12 Tests .....                                                      | 26 |
| 12.1 Electrical functional test.....                                | 26 |
| 12.2 Pneumatic functional test.....                                 | 28 |
| 12.3 Test of the charger and the secondary power source .....       | 28 |
| 12.4 Cold (operational) .....                                       | 29 |
| 12.5 Damp heat, steady state (operational).....                     | 30 |
| 12.6 Impact (operational).....                                      | 31 |
| 12.7 Vibration, sinusoidal (operational) .....                      | 31 |
| 12.8 Damp heat, steady state (endurance).....                       | 32 |
| 12.9 Vibration, sinusoidal (endurance).....                         | 34 |

|                                                                                              |                                                                         |    |
|----------------------------------------------------------------------------------------------|-------------------------------------------------------------------------|----|
| 12.10                                                                                        | Dry heat (operational) .....                                            | 34 |
| 12.11                                                                                        | SO <sub>2</sub> corrosion .....                                         | 35 |
| 12.12                                                                                        | Salt spray testing .....                                                | 37 |
| 12.13                                                                                        | Protection against water .....                                          | 38 |
| 12.14                                                                                        | Protection against solid foreign objects .....                          | 38 |
| 12.15                                                                                        | EMC immunity tests (operational) .....                                  | 39 |
| 13                                                                                           | Evaluation of conformity .....                                          | 40 |
| 13.1                                                                                         | General .....                                                           | 40 |
| 13.2                                                                                         | Initial type testing .....                                              | 40 |
| 13.3                                                                                         | Factory production control (FPC) .....                                  | 41 |
| Annex A (informative) Summary of functions .....                                             |                                                                         | 45 |
| Annex ZA (informative) Clauses of this European Standard addressing the provisions of the EU |                                                                         |    |
|                                                                                              | Construction Products Directive .....                                   | 46 |
| ZA.1                                                                                         | Scope and relevant characteristics .....                                | 46 |
| ZA.2                                                                                         | Procedure for attestation of conformity of power supply equipment ..... | 47 |
| ZA.2.1                                                                                       | System of attestation of conformity .....                               | 47 |
| ZA.2.2                                                                                       | EC Certificate and Declaration of conformity .....                      | 48 |
| ZA.3                                                                                         | CE marking and labelling .....                                          | 49 |

## **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 12101-10:2005 (E)

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.

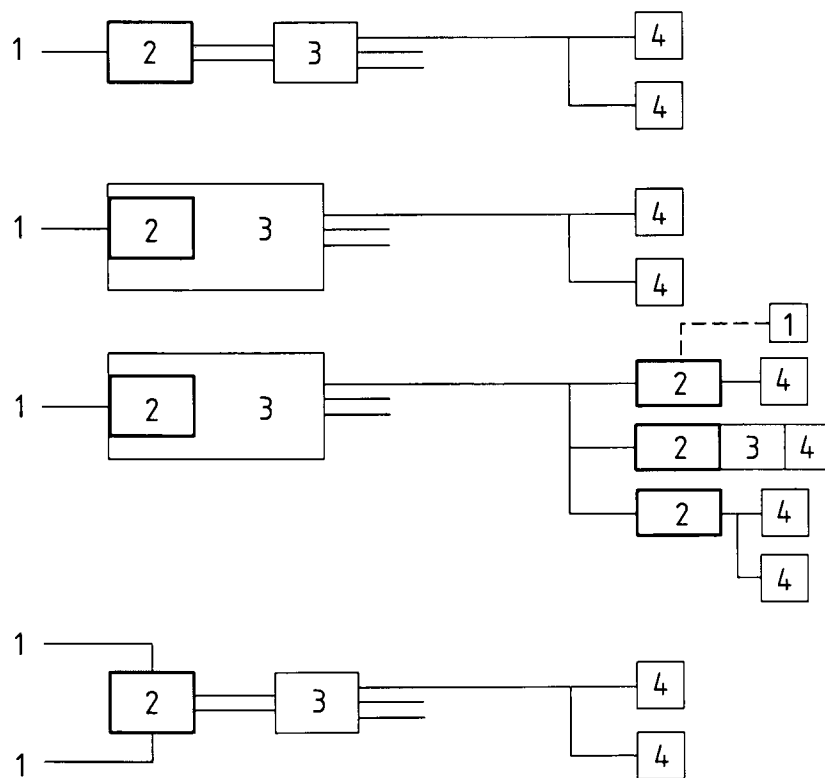
Monitoring of transmission paths, if required, shall be by the c.p., not the p.s.e.; see prEN 12101-9.

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<sub>2</sub> 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<sub>2</sub> 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).

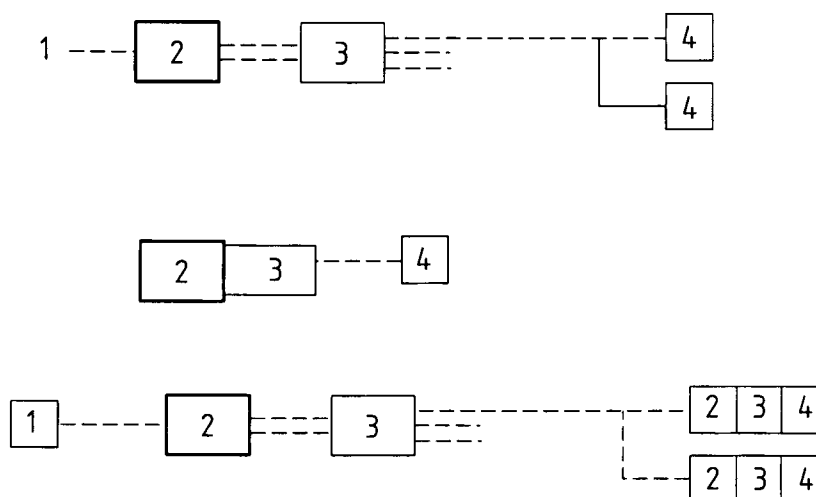
The p.s.e. shall be classified as either:

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<sub>2</sub> or N<sub>2</sub>.

#### **5.2.4.2 Multiple use CO<sub>2</sub> bottles**

The filling factor for multiple use CO<sub>2</sub> bottles shall be as follows, depending upon the maximum ambient temperature:

- 50 °C: filling factor 0,75 kg/l at a maximum ambient temperature of 50 °C;
- 68 °C: filling factor 0,71 kg/l at a maximum ambient temperature of 68 °C;
- 93 °C: filling factor 0,58 kg/l at a maximum ambient temperature of 93 °C.

The maximum operating pressure when the bottle is filled with CO<sub>2</sub> shall not exceed the maximum rated pressure for the bottle.

The maximum filling shall not exceed 30 kg.

#### **5.2.4.3 Construction**

The valve shall be designed to empty the gas charge in the bottle completely. Back pressure valves or valves allowing negative operating conditions are not permitted.

The bottle shall be equipped with a pressure relief valve or a burst cap. The relief pressure shall exceed 350 bar and shall be less than the burst pressure of the bottle. The pressure relief device shall have sufficient capacity to prevent rupture of the bottle.

#### **5.2.5 Single use gas bottles**

##### **5.2.5.1 General**

Single use gas bottles used for supply of power to a smoke and heat control system shall conform to EN 12205 or ADR 2003. When the gas bottle is refillable, it shall conform to EN 13293 providing that the capacity is not more than one litre.

Single use gas bottles shall contain CO<sub>2</sub> or N<sub>2</sub>.

##### **5.2.5.2 Single use CO<sub>2</sub> bottles**

The filling factor for single use CO<sub>2</sub> bottles shall be as follows, depending upon the maximum ambient temperature:

- 50 °C: filling factor 0,75 kg/l at a maximum ambient temperature of 50 °C;
- 68 °C: filling factor 0,71 kg/l at a maximum ambient temperature of 68 °C;
- 93 °C: filling factor 0,58 kg/l at a maximum ambient temperature of 93 °C.

The maximum operating pressure when the bottle is filled with CO<sub>2</sub> shall not exceed the test pressure.

The maximum filling shall not exceed:

- 1 500 g at 50 °C maximum ambient temperature;
- 150 g at 68 °C maximum ambient temperature;
- 120 g at 93 °C maximum ambient temperature.

### 5.2.5.3 Single use N<sub>2</sub> bottles

The filling pressure at 15 °C shall be as follows, depending upon the maximum ambient temperature:

- 50 °C: 150 bar for a maximum ambient temperature of 50 °C;
- 68 °C: 13,5 bar for a maximum ambient temperature of 68 °C;
- 93 °C: 12,5 bar for a maximum ambient temperature of 93 °C.

The maximum operating pressure when the bottle is filled with N<sub>2</sub> shall not exceed 2/3 of the test pressure.

The maximum bottle volume shall be:

- 1,0 l at 50 °C nominal temperature;
- 0,3 l at 68 °C nominal temperature;
- 0,3 l at 93 °C nominal temperature.

### 5.2.5.4 Construction

The cap or disc shall be designed to serve as a pressure relief device. The relief pressure shall exceed 350 bar and shall be less than the burst pressure of the bottle. The pressure relief device shall have sufficient capacity to prevent rupture of the bottle.

The bottle shall be protected from corrosion by zinc plating or grey paint.

## 6 Functions

### 6.1 Power supply from the primary power source (electrical)

When operated from the primary power source, the p.s.e.:

- a) shall be capable of operating in accordance with the specification given in the manufacturer's data, irrespective of the condition of the secondary power source; and
- b) if batteries are used as the secondary power source, shall be capable of continuously supplying the maximum standby current  $I_{\max a}$  and simultaneously charging and monitoring a battery discharged to its final voltage.

NOTE When operated from the primary power source, the p.s.e. may allow battery charging to be limited or interrupted when the p.s.e. is delivering a short duration maximum output current ( $I_{\max b}$ , see note to Table 5).

### 6.2 Power supply from the secondary power source (battery)

6.2.1 When operated from the secondary power source, the p.s.e. shall be capable of operating in accordance with the specification given in the manufacturer's data, irrespective of the condition of the primary power source.

6.2.2 At the end of the maximum standby period supplying the maximum standby current  $I_{\max a}$  the battery shall be capable of supplying the maximum short duration current  $I_{\max b}$  for a period of 180 s with the output voltage within the range specified by the manufacturer.

NOTE 1 To allow for possible failures of equipment or of the incoming mains supply, the secondary supply should be capable of maintaining the system in operation for at least 72 h, unless provision is made for immediate notification of

## EN 12101-10:2005 (E)

failure, either by local or remote supervision of the system, and a repair contract is in force giving a maximum repair period of less than 24 h. In this case the minimum standby capacity may be reduced from 72 h to 30 h or may be further reduced to 4 h if spares, repair personnel and a standby generator are available on site at all times.

NOTE 2 At the end of the maximum standby period if dead lock is required, the residual power should be capable of operating the system (including deadlock) in accordance with the requirements of prEN 12101-9.

**6.2.3** The battery shall be:

- a) rechargeable;
- b) suitable to be maintained in a fully charged state;
- c) constructed for stationary use;
- d) marked with type designation and date of manufacture.

If the battery is mounted in an area which houses other smoke and heat control system equipment, then the battery shall be of the sealed type and shall be mounted in accordance with the manufacturer's data.

**6.2.4** The charger shall be designed and rated so that:

- a) battery can be charged automatically;
- b) battery discharged to its final voltage can be recharged to at least 80 % of its rated capacity within 24 h and to its rated capacity within another 48 h;
- c) charging characteristics are within the battery manufacturer's specification over the ambient temperature range of the battery.

Except for currents associated with battery monitoring, the battery shall not discharge through the charger when the charging voltage is below the battery voltage.

## **6.3 Power supply from the secondary power source (generators)**

**6.3.1** The generator set shall automatically provide full output power within 15 s of failure of the primary power supply in accordance with ISO 8528-5:1993, Figure 6.

**6.3.2** Indication of the operational state of the generating set shall be provided. This shall include visible indication of whether it is in standby condition (mains on), whether it is running (generator on) and any monitored fault condition. A voltmeter and ammeter indicating the total load on the generator shall also be provided.

**6.3.3** If the generator set is dedicated to the building life safety systems and will only start in case of a fire signal and provides fault indication to a permanently manned control room, the generator set shall incorporate a fuel supply capable of supplying the generator set for a minimum of 4 h at full output. If the generator set operates whenever the primary power source fails and provides fault indication to a permanently manned control room, the generator set shall incorporate a fuel supply capable of supplying the generator set for a minimum of 8 h at full output. Otherwise it shall be capable of 72 h supply at full output.

NOTE If the c.p. requires an external power supply to be maintained at all times then the generator set should operate immediately on loss of the primary power supply, regardless of fire or standby condition.

**6.3.4** The generator set shall have operating threshold values of at least Class G2 to ISO 8528-5:1993, Table 3 and shall be at least Class 1, 2 or 3 to ISO 8528-12:1997, Tables 1 and 2.

**6.3.5** The control system of the generator set shall at least provide the following conditions:

- automatic operation;
- test condition for the testing of all automatic operations, which can be divided into test condition with load acceptance and test condition without load acceptance. In case of a power failure during the test, the load acceptance shall take place automatically;
- full manual operation for:  
Start,  
Stop,  
Generator On-Off,  
Net On-Off;
- disablement of any generator condition, e.g. during maintenance services;
- Emergency Off.

#### **6.4 Recognition and indication of faults (electrical)**

Class A p.s.e. shall be capable of recognising and signalling the following faults:

- a) loss of the primary power source, within 30 min of the occurrence;
- b) loss of the secondary power source, within 15 min of the occurrence;

and in addition for Class A battery systems:

- c) reduction of the battery voltage to less than 90 % of the final voltage, within 30 min of the occurrence;
- d) loss of the battery charger, within 30 min to the occurrence, except where the charger is switched off or limited as defined in 6.1 c);

and in addition for generator sets:

- e) battery voltage too low;
- f) start failure;
- g) motor temperature too high;
- h) lubricating oil pressure too low;
- i) overspeed;
- j) generator – excess current;
- k) low fuel level (sufficient for less than 3 h operation).

For Class B p.s.e., signalling is not required, but if provided it shall conform to the requirements given in a) to d).

If the p.s.e. is housed separately from the c.p. then at least a common fault output for the faults listed in a) to d) shall be provided.

If the p.s.e. is housed within the cabinet of the c.p., then the faults listed in a) to d) shall be indicated at least as a common fault in accordance with prEN 12101-9.

## EN 12101-10:2005 (E)

Where indication of standby function is provided, the indication shall be green.

NOTE Where a SHEV contains an integrated p.s.e. and c.p., any indication provided solely for maintenance purposes, even if permanently lit when power is supplied, may be of any colour.

If Class A p.s.e. is designed to be used with a c.p. contained in a separate cabinet, then an interface shall be provided for at least two transmission paths to the c.p. such that a short circuit or an interruption in one does not prevent the supply of power to the c.p.

### 6.5 Power supply from compressed gases

#### 6.5.1 General

If Class A p.s.e. is designed to be used with a c.p. contained in a separate cabinet, then an interface shall be suitable for connection of metallic tubing.

#### 6.5.2 Compressors

The compressor shall provide compressed air to an air receiver, not direct to the c.p.

Each compressor shall be capable of filling the air receiver from atmospheric pressure to full rated pressure within a period of 60 min.

NOTE 1 Capacity requirements for air receivers should be selected in accordance with the requirements valid in the place of use.

Operation of the compressor shall be controlled automatically from air receiver pressure.

NOTE 2 Where two compressors provide primary and secondary supplies to an air receiver, the control system may be arranged so that under normal conditions the compressor in use alternates and/or both compressors operate together.

The air receiver shall be provided with:

- non-return valve to supply from compressor;
- air pressure gauge;
- adjustable air pressure switch for low pressure alarm;
- outlet shut off valve, lockable open and closed.

Class A p.s.e. shall be capable of recognising and signalling the following faults:

- low pressure, at 10% below compressor cut in pressure, within 15 min of the occurrence;
- continuous compressor operation of more than 60 min.

For Class B p.s.e. signalling is not required, but if provided it shall conform to the requirements above.

The minimum quality of compressed air supply shall be as defined in Table 1.

Table 1 — Minimum air quality according to ISO 8573-1

| Contaminant     | ISO class | Max. concentration (mg/m <sup>3</sup> ) | Max. size (µm) |
|-----------------|-----------|-----------------------------------------|----------------|
| Solid particles | 7         | 10                                      | 40             |
| Water           | 7         | 500                                     | —              |
| Oil             | 4         | 5                                       | —              |

### 6.5.3 Air receivers (fed from a non-dedicated air supply)

Where air pressure is provided to a smoke and heat control system that does not fail to the operational position on loss of pressure from a non-dedicated air supply (e.g. a factory compressed air system), then air pressure for the smoke and heat control system shall be stored in a dedicated air receiver.

NOTE 1 Capacity requirements for air receivers should be selected in accordance with the requirements valid in the place of use.

NOTE 2 Use of an air receiver is recommended regardless of failure mode of the smoke and heat control system.

The air receiver shall be provided with:

- non-return valve to air supply;
- air pressure gauge;
- adjustable air pressure switch for low pressure alarm;
- outlet shut off valve, lockable open and closed.

Class A p.s.e. shall be capable of recognising and signalling low pressure within 15 min of the occurrence.

NOTE 3 The air pressure switch should be set to operate at 10 % below the normal minimum supply air pressure.

Air receivers designed to operate only one SHEV and to be located within or adjacent to the SHEV do not require the gauge, pressure switch or shut off valve.

### 6.5.4 Gas bottles

The power supply shall be provided from either:

- a) gas bottles permanently connected to the system and capable of providing multiple operations of the smoke and heat control system; or
- b) single use gas bottles held disconnected and capable of operating the SHEV or smoke and heat control system once only under fire conditions.

NOTE Capacity requirements for gas bottles should be selected in accordance with the requirements valid in the place of use.

## **EN 12101-10:2005 (E)**

Multiple use gas bottles shall be provided with:

- gas pressure gauge;
- gas pressure switch for low pressure alarm or weighing device for low gas weight alarm;
- outlet shut off valve, lockable open and closed.

Single use gas bottles shall be provided with:

- trigger mechanism conforming to the requirements of prEN 12101-9 to connect the gas bottle to the SHEV or smoke and heat control system upon failure of a fusible device or receipt of an actuation signal,
- visible indication of operation.

## **7 Materials, design and manufacture**

### **7.1 Mechanical design**

**7.1.1** The housing of the p.s.e. shall have a minimum IP rating in accordance with the environmental class as specified in Table 2.

**7.1.2** The p.s.e. shall be housed either:

- a) in a separate housing; or
- b) in housings associated with other smoke and heat control system equipment.

**7.1.3** Manual controls, fuses, calibration elements etc. for disconnection and adjustment of the power sources shall be accessible only by persons who are trained and authorised to:

- re-configure the site specific data held within the p.s.e. or controlled by them; and/or
- maintain the p.s.e. in accordance with the manufacturer's published instructions and data.

**7.1.4** All manual controls, fuses, calibration elements and site connections (for example cable terminals and pneumatic fittings) shall be clearly labelled (e.g. to indicate their function, rating or reference to appropriate drawings).

### **7.2 Electrical design**

All outputs shall have appropriate power limitations (e.g. fuses, electronic circuits) in order to ensure that in case of external short circuits no danger exists because of heat production.

## **8 Classification**

The p.s.e. shall be classified according to the intended in-use environmental conditions as shown in Table 2.

Table 2 — Classification of p.s.e.

| Environmental class | Environment                               | Temperature range (°C) | Minimum IP rating (electrical) |
|---------------------|-------------------------------------------|------------------------|--------------------------------|
| 1                   | Internal, clean, low temperature          | -5 to +40              | 30                             |
| 2                   | Internal, clean, high temperature         | -5 to +75              | 42                             |
| 3                   | Internal — corrosive or humid or External | -5 to +75              | 54                             |
| 4                   | External — corrosive                      | -25 to +75             | 65                             |

## 9 Documentation

### 9.1 User's documentation

The manufacturer shall prepare installation and user documentation. This shall comprise at least the following:

- a) general description of the equipment;
- b) technical specifications of the inputs and outputs of the p.s.e., sufficient to permit an assessment of the mechanical, electrical and pneumatic compatibility with other components of the system (as described in other Parts of EN 12101) including:
  - 1) for electrical p.s.e.:
    - i) power requirements for recommended operation;
    - ii) maximum and minimum electrical ratings for each input and output;
    - iii) fuse ratings;
    - iv) types and the maximum and minimum capacities of the batteries suitable for use with the p.s.e.;
    - v) maximum allowed current drawn from the battery when the primary power source is disconnected;
    - vi) maximum interruption time during switching between power sources;
  - 2) for pneumatic p.s.e.:
    - i) maximum and minimum electrical ratings for any electrical input and output (if provided);
    - ii) maximum output pressure;
    - iii) storage capacity (by mass or volume);
    - iv) fuse ratings (if applicable);

## **EN 12101-10:2005 (E)**

c) installation information, including:

- 1) suitability for use in various environments;
- 2) mounting instructions;
- 3) instructions for connecting inputs and outputs (e.g. cable diameter, pipe diameter and thread);

d) commissioning instructions;

e) operating instructions;

f) maintenance information.

### **9.2 Design documentation**

The manufacturer shall prepare design documentation, which shall include drawings, parts lists, circuit diagrams, block diagrams and a functional description, to enable compliance with the requirements of this European Standard to be assessed and a general assessment of the mechanical, pneumatic and electrical design to be made.

## **10 Marking**

### **10.1 General**

The p.s.e. shall be clearly marked with the following information:

- a) number of this European Standard, EN 12101-10;
- b) name or trademark of the manufacturer or supplier;
- c) type number or other designation of the p.s.e.;
- d) code or number identifying the production period, batch or unique reference of the p.s.e.;
- e) classes to this European Standard;
- f) technical data including:
  - Interruption time;
  - Maximum capacity;
  - Input values;
  - Output values;
- g) warnings as appropriate.

If the p.s.e. is housed in its own cabinet, then at least a), b), c) and g) shall be marked on the outside of the cabinet.

If the p.s.e. is integrated with other equipment in a common cabinet, then at least a), b) and g) shall be marked on the outside of the common cabinet.

## 10.2 Gas bottles

Each cylinder shall be marked or labelled with at least:

- volume, type of gas, mass of filling or pressure, gross mass;
- manufacturer or distributor, date, batch identification;
- maximum nominal temperature in °C.

The permitted orientation in use shall be clearly marked.

## 11 General test requirements

### 11.1 Standard atmospheric conditions for testing

Unless otherwise stated in a test procedure, the testing shall be carried out after the test specimen has been allowed to stabilise in the standard atmospheric conditions for testing as described in EN 60068-1 as follows:

- a) temperature : 15 °C to 35 °C,
- b) relative humidity : 25 % to 75 %,
- c) air pressure : 86 kPa to 106 kPa.

The temperature and humidity shall be substantially constant for each environmental test where the standard atmospheric conditions are applied.

### 11.2 Mounting and orientation

Unless otherwise stated in a test procedure, the specimen shall be mounted in its normal orientation by the normal means of mounting indicated by the manufacturer.

### 11.3 Electrical connection

If the test procedure requires the specimen to be operating, then unless otherwise specified:

- a) all inputs and outputs shall be connected to appropriate cables and equipment or to dummy loads corresponding to the maximum load all as specified by the manufacturer; and
- b) for battery systems they shall be connected to the mains and to a battery of maximum capacity as rated by the manufacturer (tests with a maximum capacity battery are applicable to the p.s.e. with any smaller capacity battery).

### 11.4 Selection of tests

#### 11.4.1 General

Generator sets are not covered by this test regime because they are covered by ISO 8528.

Between one and three specimens shall be supplied for testing, as specified by the manufacturer.

If the p.s.e. is housed in the c.p. then the environmental and functional tests described in prEN 12101-9 shall be carried out in addition to the functional tests required by 12.1 or 12.2.

## EN 12101-10:2005 (E)

If the p.s.e. is housed separately from the c.p., then the tests shown in Table 3 or Table 4 shall be applied except where a single use gas bottle is part of the triggering mechanism in which case it shall be tested in accordance with prEN 12101-9.

Where tests given in Table 3 or Table 4 are carried out, the choice of test shall depend on the class of p.s.e. (see Table 2 for details of the classification system).

Secondary power supplies shall be tested in accordance with 12.3.

**Table 3 — Environmental tests for electrical p.s.e.**

| Test                                                | Environmental class of p.s.e. |   |   |   | Operational or Endurance | Clause number |
|-----------------------------------------------------|-------------------------------|---|---|---|--------------------------|---------------|
|                                                     | 1                             | 2 | 3 | 4 |                          |               |
| Cold                                                | Y                             | Y | Y | Y | Operational              | 12.4          |
| Damp heat, steady state                             | X                             | Y | Y | Y | Operational              | 12.5          |
| Impact                                              | Y                             | Y | Y | Y | Operational              | 12.6          |
| Vibration, sinusoidal                               | Y                             | Y | Y | Y | Operational              | 12.7          |
| Damp heat, steady state                             | X                             | Y | Y | Y | Endurance                | 12.8          |
| Vibration, sinusoidal                               | Y                             | Y | Y | Y | Endurance                | 12.8          |
| Dry heat                                            | X                             | Y | Y | Y | Operational              | 12.10         |
| SO <sub>2</sub> corrosion                           | X                             | X | Y | Y | Endurance                | 12.11         |
| Salt spray testing                                  | X                             | X | X | Y | Endurance                | 12.12         |
| Protection against water, IP rating                 | X                             | Y | Y | Y | Operational              | 12.13         |
| Protection against solid foreign objects, IP rating | X                             | Y | Y | Y | Operational              | 12.14         |
| EMC immunity                                        | Y                             | Y | Y | Y | Operational              | 12.15         |
| Y = test required.                                  |                               |   |   |   |                          |               |
| X = test not required.                              |                               |   |   |   |                          |               |

### 11.4.2 Tests for one specimen

If a single specimen is supplied for environmental testing, the specimen shall be subjected to all of the required tests listed in Tables 3 or 4, which may be carried out in any order. A functional test shall be carried out before and after the first environmental test and after each subsequent environmental test.

### 11.4.3 Tests for more than one specimen

If more than one specimen is supplied for environmental testing, then the tests may be divided between the specimens and carried out in any order. A functional test shall be carried out before and after each environmental test. For each specimen, the functional test after one environmental test may be taken as the functional test before the next environmental test.

### 11.4.4 Selection of functional tests

A functional test shall be carried out before, after and, when required, during the conditioning of each environmental test, as indicated in the test procedures. For each specimen, the initial functional test (before the conditioning of the first environmental test, on that specimen) and the final functional test (after the conditioning of the last environmental test, on that specimen) shall both be the full functional test; intermediate functional tests shall be the reduced functional test.

**Table 4 — Environmental tests for pneumatic p.s.e.**

| Test                                                              | Environmental class of p.s.e. |   |   |   | Operational or Endurance | Clause number |
|-------------------------------------------------------------------|-------------------------------|---|---|---|--------------------------|---------------|
|                                                                   | 1                             | 2 | 3 | 4 |                          |               |
| Cold                                                              | Y                             | Y | Y | Y | Operational              | 12.4          |
| Damp heat, steady state                                           | X                             | Y | Y | Y | Operational              | 12.5          |
| Impact                                                            | C                             | C | C | C | Operational              | 12.6          |
| Vibration, sinusoidal                                             | Y                             | Y | Y | Y | Operational              | 12.7          |
| Damp heat, steady state                                           | X                             | Y | Y | Y | Endurance                | 12.8          |
| Vibration, sinusoidal                                             | Y                             | Y | Y | Y | Endurance                | 12.9          |
| Dry heat                                                          | X                             | Y | Y | Y | Operational              | 12.10         |
| SO <sub>2</sub> corrosion                                         | X                             | X | Y | Y | Endurance                | 12.11         |
| Salt spray testing                                                | X                             | X | X | Y | Endurance                | 12.12         |
| Protection against water, IP rating                               | X                             | C | C | C | Operational              | 12.13         |
| Protection against solid foreign objects, IP rating               | X                             | C | C | C | Operational              | 12.14         |
| EMC immunity                                                      | C                             | C | C | C | Operational              | 12.15         |
| Y = test required.                                                |                               |   |   |   |                          |               |
| X = test not required.                                            |                               |   |   |   |                          |               |
| C = applicable for electrical components of compressor sets only. |                               |   |   |   |                          |               |

## **12 Tests**

### **12.1 Electrical functional test**

#### **12.1.1 Full functional test**

The test consists of all nine tests with voltage combinations and output currents as given in Table 5. The output voltages and the test results shall be measured and recorded.

#### **12.1.2 Reduced functional test**

The test consists of the tests 7 and 8 as given in Table 5. The output voltages and the test results shall be measured and recorded.

#### **12.1.3 Requirements**

In the tests of 12.1.1 and 12.1.2 the output voltages and test results recorded shall not fall outside the range specified by the p.s.e. manufacturer and the requirements in this European Standard.

Table 5 — Functional tests for battery p.s.e.

| Test | Mains supply voltage | Condition of battery                                                             | Output current load                         | Purpose of test                                     | Duration of test             |
|------|----------------------|----------------------------------------------------------------------------------|---------------------------------------------|-----------------------------------------------------|------------------------------|
| 1    | $V_n^a + 10\%$       | $V_{b\min}^b$                                                                    | $I_{\max, a}^c$<br>-----<br>$I_{\max, b}^d$ | No overheating                                      | 4 h<br>-----<br>$\geq 180$ s |
| 2    | $V_n - 10\%$         | $V_{b\min}$                                                                      | $I_{\max, a}^c$<br>-----<br>$I_{\max, b}^d$ | Performance within specification and no overheating | 4 h<br>-----<br>$\geq 180$ s |
| 3    | Disconnected         | $V_{b\min}$                                                                      | $I_{\max, b}^d$                             | Output voltage within specification                 |                              |
| 4    | $V_n^a - 10\%$       | $V_b = 0^e$                                                                      | $I_{\max, b}$                               | Output voltage within specification                 |                              |
| 5    | $V_n + 10\%$         | $\geq V_{b\min}^b$ and<br>$\leq V_{b\max}^f$<br>charging capability disconnected | $I_{\min}^g$                                | Output voltage within specification                 |                              |
| 6    | $V_n + 10\%$         | Disconnected                                                                     | $I_{\max, b}$                               | Ripple within specification                         |                              |
| 7    | $V_n - 10\%$         | Disconnected                                                                     | $I_{\max, b}$                               | Ripple within specification                         |                              |
| 8    | $V_n + 10\%$         | $V_{b\max}$                                                                      | $I_{\min}$                                  | Output voltage within specification                 |                              |
| 9    | $V_n$                | $\leq 0,9 \times V_{b\min}$                                                      | $I_{\min}$                                  | Fault signal                                        |                              |

<sup>a</sup>  $V_n$  is the nominal voltage of the public supply or equivalent.

<sup>b</sup>  $V_{b\min}$  is the final voltage of the battery at the test temperature, as specified by the manufacturer.

<sup>c</sup> Output current load  $I_{\max, a}$  is the maximum standby load.

<sup>d</sup> Output current load  $I_{\max, b}$  is the maximum short duration load (if  $I_{\max, b}$  is not specified by the manufacturer, then  $I_{\max, a}$  shall be applied).

<sup>e</sup>  $V_b = 0$  means a short circuit across the battery connection.

<sup>f</sup>  $V_{b\max}$  is the float voltage of the battery.

<sup>g</sup> Output current load  $I_{\min}$  is the minimum current load specified by the p.s.e. manufacturer.

NOTE The manufacturer specifies by  $I_{\max, a}$  that current which is necessary for continuous monitoring, current load for the battery and indications.  $I_{\max, b}$  specifies the current which is necessary opening the smoke and heat control system.

## 12.2 Pneumatic functional test

### 12.2.1 Compressor sets

**12.2.1.1** Discharge the air receiver to atmospheric pressure then close the outlet shut off valve. Operate the compressor with a supply voltage of  $V_n - 10\%$ . Measure the time taken to charge the air receiver to the rated maximum pressure.

**12.2.1.2** Repeat within 15 min with a supply voltage of  $V_n + 10\%$ .

**12.2.1.3** Leave the receiver charged for 72 h with the compressor switched off.

**12.2.1.4** In the tests of 12.2.1.1 and 12.2.1.2 the time taken to charge the receiver shall be no more than 60 min. In the test of 12.2.1.3 the air pressure in the receiver shall not drop by more than 5 % of the initial value after correction for any change in environmental temperature or pressure.

### 12.2.2 Multi use gas bottles

Discharge the bottle until the alarm operates. The weight or pressure shall be within 10 % of the manufacturer's nominal setting.

### 12.2.3 Single use gas bottles

No test is required by this European Standard since the functional test for these bottles is carried out with the triggering device or c.p. in accordance with prEN 12101-9.

## 12.3 Test of the charger and the secondary power source

### 12.3.1 Electrical charger

**12.3.1.1** Discharge the battery to its final voltage at a discharge current of  $I_d = C/20$  amperes for lead acid type batteries, or  $I_d = C/10$  amperes for nickel cadmium type batteries, where C is the rated ampere-hour capacity of the battery, given by the manufacturer.

NOTE Other types of batteries may require different discharge currents.

**12.3.1.2** Charge the battery for 72 h with the appropriate charger connected to the nominal mains voltage ( $V_n$ ) while the p.s.e. output is loaded by  $I_{max. a}$ .

**12.3.1.3** Repeat the procedure as in 12.3.1.1 and measure the discharge time (T1) in hours.

**12.3.1.4** Charge the battery again for 24 h at  $V_n - 15\%$  while the p.s.e. output is loaded by  $I_{max. a}$ .

**12.3.1.5** Repeat the procedure as in 12.3.1.1 and measure the discharge time (T2) in hours.

**12.3.1.6** In the test of 12.3.1.3 the product of the discharge time T1 and the discharge current  $I_d$  shall be not less than the rated capacity of the battery (C).

**12.3.1.7** In the test of 12.3.1.5 the product of the discharge time T2 and the discharge current  $I_d$  shall be not less than 0,8 x the rated capacity of the battery (C).

### 12.3.2 Replenishing pneumatic systems

For pneumatic p.s.e., monitor the specimen during the conditioning period to check that the available pressure is within the manufacturer's specified limits. During the last hour of the conditioning period, for a compressor set only, discharge the air receiver and check that the receiver is refilled to operating pressure within 60 min.

## 12.4 Cold (operational)

### 12.4.1 Object of the test

The object of the test is to demonstrate the ability of the equipment to function correctly at low ambient temperatures appropriate to the anticipated service environment.

### 12.4.2 Test procedure

#### 12.4.2.1 General

Testing shall be carried out in accordance with the test procedures with gradual changes in temperature described in EN 60068-2-1 with the modifications and additions given in 12.4.2 Test Ad shall be used for heat-dissipating specimens (as defined in EN 60068-2-1) and test Ab shall be used for non-heat-dissipating specimens.

#### 12.4.2.2 Initial examination

Before conditioning, subject the specimen to the functional test.

#### 12.4.2.3 State of the specimen during conditioning

The specimen shall be mounted as required by 11.2, be connected as required by 11.3 and be operating.

#### 12.4.2.4 Conditioning

Apply the following severity of conditioning in accordance with Table 6.

**Table 6 — Conditioning for cold (operational) test**

| Environmental class | 1  | 2  | 3  | 4   |
|---------------------|----|----|----|-----|
| Temperature (°C)    | -5 | -5 | -5 | -25 |
| Duration (h)        | 16 | 16 | 16 | 16  |

#### 12.4.2.5 Measurements during conditioning

For electrical p.s.e., monitor the specimen during the conditioning period to check that the output voltage is within the manufacturer's specified limits. During the last hour of the conditioning period, subject the specimen to the reduced functional test.

For pneumatic p.s.e., monitor the specimen during the conditioning period to check that the available pressure is within the manufacturer's specified limits. During the last hour of the conditioning period, for a compressor set only, discharge the air receiver and check that the receiver is refilled to operating pressure within 60 min.

#### 12.4.2.6 Final measurements

Within 30 min after the end of the recovery period, subject the specimen to the functional test required by 12.1 or 12.2 and inspect it visually for mechanical damage both externally and internally.

## **12.5 Damp heat, steady state (operational)**

### **12.5.1 Object of the test**

The object of the test is to demonstrate the ability of the equipment to function correctly at high relative humidities (without condensation) which may occur for short periods in the service environment.

### **12.5.2 Procedure**

#### **12.5.2.1 General**

Testing shall be carried out in accordance with the procedures of EN 60068-2-78 with the modifications and additions given in 12.5.2.

#### **12.5.2.2 Initial examination**

Before conditioning, subject the specimen to the functional test required by 12.1 or 12.2.

#### **12.5.2.3 State of the specimen during conditioning**

The specimen shall be mounted as required by 11.2, be connected as required by 11.3 and be operating.

#### **12.5.2.4 Conditioning**

Apply the following severity of conditioning:

— temperature :  $40\text{ °C} \pm 2\text{ °C}$ ;

— relative humidity :  $(93 \pm 2)_{-3}^+2\%$  ;

— duration : 4 days.

Precondition the specimen by raising the temperature slowly from ambient to the conditioning temperature  $(40 \pm 2)\text{ °C}$  and hold until temperature stability has been reached before raising the relative humidity, to prevent the formation of water droplets on the specimen.

#### **12.5.2.5 Measurements during conditioning**

For electrical p.s.e., monitor the specimen during the conditioning period to check that the output voltage is within the manufacturer's specified limits. During the last hour of the conditioning period, subject the specimen to the reduced functional test.

For pneumatic p.s.e. monitor the specimen during the conditioning period to check that the available pressure is within the manufacturer's specified limits. During the last hour of the conditioning period, for a compressor set only, discharge the air receiver and check that the receiver is refilled to operating pressure within 60 min.

#### **12.5.2.6 Final measurements**

Within 30 min after the end of the recovery period, subject the specimen to the functional test and inspect it visually for mechanical damage both externally and internally.

## **12.6 Impact (operational)**

### **12.6.1 Object of the test**

The object of the test is to demonstrate the immunity of the equipment to mechanical impacts upon the surface, which it may sustain in the normal service environment and which it can reasonably be expected to withstand.

### **12.6.2 Test procedure**

#### **12.6.2.1 General**

Testing shall be carried out using test apparatus and procedure in accordance with EN 60068-2-75, Test Ehb with the modifications and additions given in 12.6.2.4.

#### **12.6.2.2 Initial examination**

Before conditioning, subject the specimen to the functional test required by 12.1 or 12.2.

#### **12.6.2.3 State of the specimen during conditioning**

The specimen shall be mounted as required by 11.2, be connected as required by 11.3 and be operating.

#### **12.6.2.4 Conditioning**

Apply impacts to all external surfaces of the specimen.

For all such surfaces three blows shall be applied to any point(s) considered likely to cause damage to or impair the operation of the specimen.

Care shall be taken to ensure that the results from a series of three blows do not influence subsequent series.

Apply the following severity of conditioning:

- impact energy :  $(0,5 \pm 0,04)$  J;
- number of impacts per point : 3.

#### **12.6.2.5 Measurements during conditioning**

Monitor the specimen during the conditioning period to check that the outputs are within the manufacturer's specified limits and ensure that results of three blows do not influence subsequent series.

#### **12.6.2.6 Final measurements**

Within 30 min after the end of the recovery period, subject the specimen to the functional test required by 12.1 or 12.2 and inspect it visually for mechanical damage externally and internally.

## **12.7 Vibration, sinusoidal (operational)**

### **12.7.1 Object of the test**

The object of the test is to demonstrate the immunity of the equipment to vibrations at levels appropriate to the service environment.

## 12.7.2 Test procedure

### 12.7.2.1 General

Testing shall be carried out in accordance with the procedure described in EN 60068-2-6 with the modifications and additions given in 12.7.2.4.

NOTE The vibration operational test may be combined with the vibration endurance test so that the specimen is subjected to the operational test conditioning followed by the endurance test conditioning in each axis.

### 12.7.2.2 Initial examination

Before conditioning, subject the specimen to the functional test required by 12.1 or 12.2.

### 12.7.2.3 State of the specimen during conditioning

The specimen shall be mounted as required by 11.2 and in accordance with EN 60068-2-47, be connected as required by 11.3 and be operating.

### 12.7.2.4 Conditioning

Subject the specimen to vibration in each of the three mutually perpendicular axes in turn, one of which is perpendicular to the plane of mounting of the specimen.

Apply the following severity of conditioning:

- a) frequency range : 10 Hz to 150 Hz;
- b) acceleration amplitude :  $0,981 \text{ ms}^{-2}$  ( $0,1 g_n$ );
- c) number of axes : 3;
- d) number of sweep cycles per axis : 1 for each functional condition.

### 12.7.2.5 Measurements during conditioning

Monitor the specimen during the conditioning period to check that the output voltage is within the manufacturer's specified limits.

### 12.7.2.6 Final measurements

Within 30 min after the end of the recovery period, subject the specimen to the functional test required by 12.1 or 12.2 and inspect it visually for mechanical damage externally and internally.

## 12.8 Damp heat, steady state (endurance)

### 12.8.1 Object of the test

The object of the test is to demonstrate the ability of the equipment to withstand the long-term effects of humidity in the service environment (e.g. changes in electrical properties due to absorption, chemical reactions involving moisture or galvanic corrosion).

## 12.8.2 Test procedure

### 12.8.2.1 General

Testing shall be carried out in accordance with the test procedure described in EN 60068-2-78 with the modifications and additions given in 12.8.2.4.

### 12.8.2.2 Initial examination

Before conditioning, subject the specimen to the functional test required by 12.1 or 12.2.

### 12.8.2.3 State of the specimen during conditioning

The specimen shall be mounted as required by 11.2. The specimen shall not be supplied with power during the conditioning.

### 12.8.2.4 Conditioning

Apply the following severity of conditioning:

- temperature :  $(40 \pm 2) ^\circ\text{C}$ ;
- relative humidity :  $(93 \begin{smallmatrix} +2 \\ -3 \end{smallmatrix})\%$  ;
- duration : 21 days.

Precondition the specimen by raising the temperature slowly from ambient to the conditioning temperature  $(40 \pm 2) ^\circ\text{C}$  and hold until temperature stability has been reached before raising the relative humidity, to prevent the formation of water droplets on the specimen.

### 12.8.2.5 Final measurements

After conditioning, subject the specimen to the functional test required by 12.2 or 12.2 and inspect it visually for mechanical damage both externally and internally.

## **12.9 Vibration, sinusoidal (endurance)**

### **12.9.1 Object of the test**

The object of the test is to demonstrate the ability of the equipment to withstand the long-term effects of vibration at levels appropriate to the environment.

### **12.9.2 Test procedure**

#### **12.9.2.1 General**

Testing shall be carried out in accordance with the test procedure described in EN 60068-2-6 with the modifications and additions given in 12.9.2.4.

NOTE The vibration endurance test may be combined with the vibration operational test, so that the specimen is subjected to the operational test conditioning followed by the endurance test conditioning in each axis in turn.

#### **12.9.2.2 Initial examination**

Before conditioning, subject the specimen to the functional test required by 12.1 or 12.2.

#### **12.9.2.3 State of the specimen during conditioning**

The specimen shall be mounted as required by 11.2 and in accordance with EN 60068-2-47, connected as required by 11.3 and be operating. The specimen shall not be supplied with power during the conditioning.

#### **12.9.2.4 Conditioning**

Subject the specimen to vibration in each of the three mutually perpendicular axes in turn, one of which shall be perpendicular to the plane of the specimen.

Apply the following severity of conditioning:

- a) frequency range : 10 Hz to 150 Hz;
- b) acceleration amplitude :  $4,905 \text{ ms}^{-2}$  (0,5  $g_n$ );
- c) number of axes : 3;
- d) number of sweep cycles : 20 per axis.

#### **12.9.2.5 Final measurements**

After conditioning, subject the specimen to the functional test required by 12.1 or 12.2 and inspect it visually for mechanical damage both externally and internally.

## **12.10 Dry heat (operational)**

### **12.10.1 Object of the test**

The object of the test is to demonstrate the ability of the equipment to function correctly at high ambient temperatures appropriate to the anticipated service environment.

## 12.10.2 Test procedure

### 12.10.2.1 General

Testing shall be carried out in accordance with the test procedures with gradual changes in temperature described in EN 60068-2-1 with the modifications and additions given in 12.10.2.4. Test Bd shall be used for heat-dissipating specimens (as defined in EN 60068-2-1) and test Bb shall be used for non-heat-dissipating specimens.

### 12.10.2.2 Initial examination

Before conditioning, subject the specimen to the functional test required by 12.1 or 12.2.

### 12.10.2.3 State of the specimen during conditioning

The specimen shall be mounted as required by 11.2, be connected as required by 11.3 and be operating.

### 12.10.2.4 Conditioning

The specimen shall be conditioned in accordance with Table 7.

**Table 7 — Dry heat conditioning**

| Environmental class | 1       | 2   | 3   | 4   |
|---------------------|---------|-----|-----|-----|
| Temperature (°C)    | No test | +75 | +75 | +75 |
| Duration (h)        |         | 2   | 2   | 2   |

### 12.10.2.5 Measurements during conditioning

Monitor the specimen during the conditioning period to check that the output voltage is within the manufacturer's specified limits. During the last hour of the conditioning period, subject the specimen to the reduced functional test.

### 12.10.2.6 Final measurements

Within 30 min after the end of the recovery period, subject the specimen to the functional test required by 12.1 or 12.2 and inspect it visually for mechanical damage both externally and internally.

## 12.11 SO<sub>2</sub> corrosion

### 12.11.1 Object of the test

The object of the test is to demonstrate the ability of the equipment to withstand corrosive effects, caused by air pollution.

### 12.11.2 Test procedure

#### 12.11.2.1 General

Testing shall be carried out in accordance with the procedures described in EN ISO 6988 with the modifications and additions given in 12.11.2.4.

#### 12.11.2.2 Initial examination

Before conditioning, subject the specimen to the functional test required by 12.1 or 12.2.

#### 12.11.2.3 State of the specimen during conditioning

The specimen shall be mounted as required by 11.2, be connected as required by 11.3 and not be operating.

#### 12.11.2.4 Conditioning

The specimen shall be conditioned in accordance with Table 8.

**Table 8 — Conditioning for SO<sub>2</sub> corrosion test**

| Environmental class                                                                                                             | 1       | 2       | 3                                       | 4                                       |
|---------------------------------------------------------------------------------------------------------------------------------|---------|---------|-----------------------------------------|-----------------------------------------|
| Theoretical SO <sub>2</sub> concentration at the beginning of a cycle                                                           | No test | No test | 0,67 Vol. %                             | 0,67 Vol. %                             |
| <u>Cycle</u>                                                                                                                    |         |         |                                         |                                         |
| 1. test section                                                                                                                 | No test | No test | 8 h                                     | 8 h                                     |
| 2. test section                                                                                                                 |         |         | 16 h                                    | 16 h                                    |
| <u>Test cycles</u>                                                                                                              | No test | No test | 20                                      | 20                                      |
| <u>Climate</u>                                                                                                                  |         |         |                                         |                                         |
| 1. test section                                                                                                                 | No test | No test | (40 ± 3) °C at 100 % relative humidity  | (40 ± 3) °C at 100 % relative humidity  |
| 2. test section                                                                                                                 |         |         | 18 °C to 28 °C relative humidity ≤ 75 % | 18 °C to 28 °C relative humidity ≤ 75 % |
| Soil water in the test chamber <sup>a</sup>                                                                                     | No test | No test | 0,67 Vol. %                             | 0,67 Vol. %                             |
| <sup>a</sup> Distilled water is added to the base of the chamber until it fills the specified percentage volume of the chamber. |         |         |                                         |                                         |

#### 12.11.2.5 Measurements during conditioning

No measurements are required during this period.

#### 12.11.2.6 Final measurements

Within 30 min after the end of the recovery period (24 h at laboratory temperature), subject the specimen to the functional test required by 12.1 or 12.2 and inspect it visually for mechanical damage both externally and internally.

## 12.12 Salt spray testing

### 12.12.1 Object of the test

The object of the test is to demonstrate the ability of the equipment to withstand a saliferous atmosphere.

### 12.12.2 Test procedure

#### 12.12.2.1 General

Testing shall be carried out in accordance with the procedures described in EN 60068-2-52 with the modifications and additions given in 12.12.2.4.

#### 12.12.2.2 Initial examination

Before conditioning, subject the specimen to the functional test required by 12.1 or 12.2.

#### 12.12.2.3 State of the specimen during conditioning

The specimen shall be mounted as required by 11.2, be connected as required by 11.3 and not be operating. Connection to the p.s.e. shall be by un-tinned stranded copper wire.

#### 12.12.2.4 Conditioning

The specimen shall be conditioned in accordance with Table 9.

Table 9 — Conditioning for salt spray test

| Environmental class             | 1       | 2 | 3 | 4              |
|---------------------------------|---------|---|---|----------------|
| Total duration                  | No test |   |   | 28 d           |
| Number of cycles                |         |   |   | 4              |
| Salt concentration              |         |   |   | 5 Vol %        |
| pH-value of the saline solution |         |   |   | 6,2 to 7,2     |
| Temperature                     |         |   |   | 15 °C to 35 °C |
| Duration per cycle              |         |   |   | 2 h            |
| <u>Damp heat:</u>               |         |   |   |                |
| Temperature                     |         |   |   | 40 °C          |
| Relative humidity               |         |   |   | 93 %           |
| Duration per cycle              |         |   |   | 166 h          |

#### 12.12.2.5 Measurements during conditioning

No measurements are required during this period.

## **EN 12101-10:2005 (E)**

### **12.12.2.6 Final measurements**

After the test procedure the specimen shall be handled according to EN 60068-2-52:1996, Clause 10. After the test procedure, subject the specimen to the functional test required by 12.1 or 12.2 and inspect it visually for mechanical damage both externally and internally.

## **12.13 Protection against water**

### **12.13.1 Object of the test**

The object of the test is to demonstrate the protection against water of the equipment.

### **12.13.2 Test procedure**

#### **12.13.2.1 General**

Testing shall be carried out in accordance with the procedures described in EN 60529 with the modifications and additions given in 12.13.2.4.

#### **12.13.2.2 Initial examination**

Before conditioning, subject the specimen to the functional test required by 12.2 or 12.2.

#### **12.13.2.3 State of the specimen during conditioning**

The specimen shall be mounted as required by 11.2 including all additional weather protection and be connected as required by 11.3. Power need not be supplied.

#### **12.13.2.4 Conditioning**

The specimen shall be conditioned in accordance with EN 60659 for protection against water.

#### **12.13.2.5 Measurements during conditioning**

Monitor the specimen during the conditioning period to check that the output voltage is within the manufacturer's specified limits. No change in the status of the equipment is allowed.

#### **12.13.2.6 Final measurements**

After the recovery period, subject the specimen to the functional test required by 12.1 or 12.2 and inspect it visually for mechanical damage both externally and internally.

## **12.14 Protection against solid foreign objects**

### **12.14.1 Object of the test**

The object of the test is to demonstrate the protection against solid foreign objects of the equipment.

### **12.14.2 Test procedure**

#### **12.14.2.1 General**

Testing shall be carried out in accordance with the procedures described in EN 60529 with the modifications and additions given in 12.14.2.

#### **12.14.2.2 Initial examination**

Before conditioning, subject the specimen to the functional test required by 12.1 or 12.2.

#### **12.14.2.3 State of the specimen during conditioning**

The specimen shall be mounted as required by 11.2 and be connected as required by 11.3. Power need not be supplied.

#### **12.14.2.4 Conditioning**

The specimen shall be conditioned in accordance with EN 60529 for protection against solid foreign objects.

#### **12.14.2.5 Measurements during conditioning**

Monitor the specimen during the conditioning period to check that the output voltage is within the manufacturer's specified limits. No change in the status of the equipment is allowed.

#### **12.14.2.6 Final measurements**

Within 30 min after the end of the recovery period, subject the specimen to the functional test required by 12.1 or 12.2 and inspect it visually for mechanical damage both externally and internally.

### **12.15 EMC immunity tests (operational)**

The following EMC immunity tests shall be carried out on any p.s.e. intended to be provided with mains electrical power in accordance with EN 50130-4:

- a) mains voltage variations;
- b) mains supply voltage dips and interruptions;
- c) electrostatic discharge;
- d) radiated electromagnetic fields;
- e) conducted disturbances induced by electromagnetic fields;
- f) fast transient bursts;
- g) slow high energy voltage surges.

The functional test, called for in the initial and final measurements, shall be the reduced functional test as described in 12.1.3.

**NOTE** The connections to the various inputs should be made with unscreened cables unless the manufacturer's installation data specify that only screened cables should be used.

## 13 Evaluation of conformity

### 13.1 General

The compliance of electrical and pneumatic power supply equipment (p.s.e.) with the requirements of this European Standard shall be demonstrated by:

- initial type testing;
- factory production control by the manufacturer.

**NOTE** The manufacturer is a natural or legal person, who places the p.s.e. on the market under his own name. Normally, the manufacturer designs and manufactures the p.s.e. himself. As a first alternative, he may have it designed, manufactured, assembled, packed, processed or labelled by subcontracting. As a second alternative he may assemble, pack, process, or label ready-made products.

The manufacturer shall ensure:

- initial type testing in accordance with this document is initiated and carried out; and
- p.s.e. continuously complies with the initial type testing samples, for which compliance with this European Standard has been verified.

The manufacturer shall always retain the overall control and shall have the necessary competence to take the responsibility for the p.s.e.

The manufacturer, when affixing the CE marking to the p.s.e., shall be fully responsible for the conformity of that p.s.e. to all relevant regulatory requirements. However, where the manufacturer uses components already shown to conform to those requirements relevant for that component (e.g. by CE marking) the manufacturer is not required to repeat the evaluation which led to such conformity. Where the manufacturer uses components not already shown to conform, it is his responsibility to undertake the necessary evaluation to show conformity.

### 13.2 Initial type testing

**13.2.1** Initial type testing shall be performed to demonstrate conformity with this European Standard.

All performance characteristics given in this standard shall be subject to this initial type testing.

**13.2.2** In the case of modification of the p.s.e. or of the method of production (where these may affect the stated properties), initial type testing shall be performed. All characteristics which may be changed by the modification, shall be subject to this initial type testing.

**13.2.3** Tests previously performed in accordance with the provisions of this European Standard may be taken into account providing that they were made to the same or a more rigorous test method under the same system of attestation of conformity on the same p.s.e. or p.s.e. of similar design, construction and functionality, such that the results are applicable to the p.s.e. in question.

**NOTE** Same system of attestation of conformity means testing by an independent third party under the control of a product certification body.

**13.2.4** P.s.e. may be grouped into families where one or more characteristics are the same for all p.s.e. within that family or the test results are representative of all p.s.e. within that family. In this case not all p.s.e. of the family have to be tested for the purposes of the initial type testing.

**13.2.5** Test samples shall be representative of the normal production. If the test samples are prototypes, they shall be representative of the intended future production and shall be selected by the manufacturer.

**NOTE** In the case of prototypes and third party certification, this means that it is the manufacturer not the third party who is responsible for selecting the samples. During the initial inspection of the factory and of the factory production control (see 13.3), it is verified that the p.s.e. continuously complies with the initial type testing samples.

**13.2.6** All initial type testing and its results shall be documented in a test report, which shall be held for at least 10 years after the date of last production of the products to which it applies.

### **13.3 Factory production control (FPC)**

#### **13.3.1 General**

FPC is the permanent internal control of production exercised by the manufacturer.

The manufacturer shall establish, document and maintain an FPC system to ensure that the p.s.e. placed on the market conform with the stated performance characteristics.

If the manufacturer has the p.s.e. designed, manufactured, assembled, packed, processed and labelled by subcontracting, FPC of the subcontractor may be taken into account. Where subcontracting takes place, the manufacturer shall retain the overall control of the p.s.e. and ensure that he receives all the information that is necessary to fulfil his responsibilities according to this European Standard. The manufacturer who subcontracts all of his activities may in no circumstances discharge himself of his responsibilities to a subcontractor.

All the elements, requirements and provisions adopted by the manufacturer shall be documented in a systematic manner in the form of written policies and procedures. This production control system documentation shall ensure a common understanding of conformity evaluation and enable the achievement of the required product characteristics and the effective operation of the production control system to be checked.

Factory production control therefore brings together operational techniques and all measures allowing maintenance and control of the conformity of the p.s.e. with technical specifications. Its implementation may be achieved by controls and tests on measuring equipment, raw materials and constituents, processes, machines and manufacturing equipment and finished products, including material properties in products, and by making use of the results thus obtained.

#### **13.3.2 General requirements**

The FPC system shall fulfil the requirements as described in the following clauses of EN ISO 9001:2000, where applicable:

- 4.2 except 4.2.1 a);
- 5.1 e), 5.5.1, 5.5.2;
- Clause 6;
- 7.1 except 7.1 a), 7.2.3 c), 7.4, 7.5, 7.6;
- 8.2.3, 8.2.4, 8.3, 8.5.2.

The FPC system may be part of a Quality Management system in accordance with EN ISO 9001:2000.

### 13.3.3 P.s.e. specific requirements

#### 13.3.3.1 The FPC system shall:

- address this European Standard; and
- ensure that the p.s.e. placed on the market conform with the stated performance characteristics.

**13.3.3.2** The FPC system shall include a product specific FPC- or Quality-plan, which identifies procedures to demonstrate conformity of the p.s.e. at appropriate stages; i.e.

- controls and tests to be carried out prior to and/or during manufacture according to a frequency laid down; and/or
- verifications and tests to be carried out on finished p.s.e. according to a frequency laid down.

If the manufacturer uses only finished p.s.e., the operations under b) shall lead to an equivalent level of conformity of the p.s.e. as if normal FPC had been carried out during the production.

If the manufacturer carries out parts of the production himself, the operations under b) may be reduced and partly be replaced by operations under a). Generally, the more parts of the production are carried out by the manufacturer, the more operations under b) may be replaced by operations under a). In any case the operation shall lead to an equivalent level of conformity of the p.s.e. as if normal FPC had been carried out during the production.

**NOTE** Depending on the specific case, it can be necessary to carry out the operations referred to under a) and b), only the operations under a) or only those under b).

The operations under a) centre as much on the intermediate states of the p.s.e. as on manufacturing machines and their adjustment, and equipment etc. These controls and tests and their frequency are chosen based on product type and composition, the manufacturing process and its complexity, the sensitivity of product features to variations in manufacturing parameters etc.

The manufacturer shall establish and maintain records which provide evidence that the production has been sampled and tested. These records shall show clearly whether the production has satisfied the defined acceptance criteria. Where the p.s.e. fails to satisfy the acceptance measures, the provisions for non-conforming products shall apply, the necessary corrective action shall immediately be taken and the p.s.e. or batches not conforming shall be isolated and properly identified. Once the fault has been corrected, the test or verification in question shall be repeated.

The results of controls and tests shall be properly recorded. The product description, date of manufacture, test method adopted, test results and acceptance criteria shall be entered in the records under the signature of the person responsible for the control/test. With regard to any control result not meeting the requirements of this European Standard, the corrective measures taken to rectify the situation (e.g. a further test carried out, modification of manufacturing process, throwing away or putting right of product) shall be indicated in the records.

**13.3.3.3** Individual components or batches of components and the related manufacturing details shall be completely identifiable and retraceable.

### 13.3.4 Initial inspection of factory and FPC

**13.3.4.1** Initial inspection of factory and FPC shall generally be carried out when the production is already running and the FPC is already in practice.

It is however possible, that the initial inspection of factory and FPC is carried out before the production is already running and/or before the FPC is already in practice.

**13.3.4.2** The following shall be assessed:

- FPC-documentation; and
- factory.

In the assessment of the factory it shall be verified:

- a) all resources necessary for the achievement of the product characteristics required by this document are or will be (see 13.3.4.1) available; and
- b) FPC-procedures in accordance with the FPC-documentation are or will be (see 13.3.4.1) implemented and followed in practice; and
- c) p.s.e. complies or will comply (see 13.3.4.1) with the initial type testing samples, for which compliance with this document has been verified; and
- d) whether the FPC system is part of a Quality Management system in accordance with EN ISO 9001 (see 13.3.2) and as part of this Quality Management system is certified and has yearly surveillance by a notified certification body.

**13.3.4.3** All factories of the manufacturer, where for the relevant p.s.e. final assembling and/or final testing is performed, shall be visited to verify that the conditions of 13.3.4.2 a) to c) are in place. One visit may cover one or more p.s.e., production lines and/or production processes. If the FPC system covers more than one p.s.e., production line or production process, and if it is verified that the general requirements are fulfilled, then the verification of these general requirements does not need to be repeated when assessing another p.s.e., production line or production process. The product-specific FPC requirements, however, shall always be assessed.

**13.3.4.4** Assessments previously performed in accordance with the provisions of this European Standard may be taken into account providing that they were made to the same system of attestation of conformity on the same p.s.e. or p.s.e. of similar design, construction and functionality, such that the results may be considered applicable to the p.s.e. in question.

**13.3.4.5** Any assessment and its results shall be documented in a report.

### **13.3.5 Continuous surveillance of FPC**

**13.3.5.1** All factories which have been assessed according to 13.3.4 shall be re-assessed at least once a year, except as stated in 13.3.5.2. Where the surveillance gives no cause for concern, the frequency shall be once a year.

Where different types of p.s.e. are produced at a factory, each FPC visit shall verify a different p.s.e. or production process.

**13.3.5.2** In the case of third party certification, if the manufacturer provides proof of continuing satisfactory operation of his FPC system the frequency of the re-assessment may be reduced to once every four years.

NOTE 1 Sufficient proof can be the report of a notified certification body, see 13.3.4.2 d).

NOTE 2 If the over all Quality Management system in accordance with EN ISO 9001 is properly implemented (verified in the initial assessment of factory and FPC) and continuously practised (verified in QM-audits), it can be assumed that the integrated FPC-relevant part is covered. On this basis the frequency of special FPC-surveillance-assessments can be reduced.

**13.3.5.3** Any assessment and its results shall be documented in a report.

**13.3.6 Procedure for modifications**

In the case of modification of the p.s.e., the method of production or the FPC system (where these may affect the stated properties), a re-assessment of the factory and of the FPC system shall be performed for those aspects which may be affected by the modification.

All assessment and its results shall be documented in a report.

## Annex A (informative)

### Summary of functions

Table A.1 below provides a summary of the functions covered by this European Standard, whether they are required or optional and the relevant clauses where requirements can be found.

**Table A.1 — Summary of functions**

| Function                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Type and number of power sources |                                    |                                 |               |                                  |                                  |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|------------------------------------|---------------------------------|---------------|----------------------------------|----------------------------------|
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | ELV <sup>a</sup><br>Class A      | LV <sup>b</sup><br>Class A         | ELV<br>Class B                  | LV<br>Class B | Pneumatic<br>Class A             | Pneumatic<br>Class B             |
| Primary power source <sup>c</sup> (6.1) (6.5)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Mains <sup>d</sup> or batteries  | Mains                              | Mains <sup>d</sup> or batteries | Mains         | Mains <sup>e</sup> or gas bottle | Mains <sup>e</sup> or gas bottle |
| Secondary power source <sup>c,g</sup> (6.2) (6.5)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Batteries                        | Mains/<br>Generators<br>/Batteries | X                               | X             | Gas bottle or air receiver       | X                                |
| Fault output (6.4)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | R                                | R                                  | O                               | O             | R                                | O                                |
| Standby function (6.1, 6.2)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | O                                | O                                  | O                               | O             | O                                | O                                |
| Dual output transmission path (6.4.7, 6.5)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | R <sup>f</sup>                   | R <sup>f</sup>                     | X                               | X             | O                                | X                                |
| Charger equipment (if batteries used) (6.2.4)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | R                                | R                                  | R                               | X             | X                                | X                                |
| Minimum number of power sources (4.1.1, 5.1.1)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 2                                | 2                                  | 1                               | 1             | 2                                | 1                                |
| <sup>a</sup> ELV – Extra Low Voltage up to 75 VDC or 50 VAC.<br><sup>b</sup> LV – Low Voltage up to 1 500 VDC or 1 000 VAC.<br><sup>c</sup> These rows show typical examples.<br><sup>d</sup> Mains via, for example, transformer and rectifier.<br><sup>e</sup> Mains to operate compressor.<br><sup>f</sup> Only where the p.s.e. is in a separate cabinet from the c.p.<br><sup>g</sup> The secondary power source may be incorporated within the ventilator or other SHEVS component.<br>X = Not required.<br>R = Required.<br>O = Option (with requirements). |                                  |                                    |                                 |               |                                  |                                  |

## Annex ZA (informative)

### Clauses of this European Standard addressing the provisions of the EU Construction Products Directive

#### ZA.1 Scope and relevant characteristics

This European Standard has been prepared under Mandate M/109, Fire alarm/detection, fixed firefighting, fire and smoke control and explosion suppression products, given to CEN by the European Commission and the European Free Trade Association.

The clauses of this European Standard shown in this annex meet the requirements of the mandate given under the EU Construction Products Directive (89/106/EEC).

Compliance with these clauses confers a presumption of fitness of the power supply equipment covered by this annex for the intended uses indicated herein; reference shall be made to the information accompanying the CE marking.

**WARNING — Other requirements and other EU Directives, not affecting the fitness for intended uses, can be applicable to the power supply equipment falling within the scope of this European Standard.**

NOTE 1 In addition to any specific clauses relating to dangerous substances contained in this standard, there may be other requirements applicable to the products falling within its scope (e.g. transposed European legislation and national laws, regulations and administrative provisions). In order to meet the provisions of the EU Construction Products Directive, these requirements need also to be complied with, when and where they apply.

NOTE 2 An informative database of European and national provisions on dangerous substances is available at the Construction web site on EUROPA (accessed through <http://europa.eu.int/comm/enterprise/construction/internal/dangsub/dangmain.htm> ).

This annex establishes the conditions for the CE marking of the power supply equipment intended for the use indicated in Table ZA.1 and shows the relevant clauses applicable.

The scope of this annex is defined by Table ZA.1.

**Table ZA.1 — Relevant clauses for power supply equipment for smoke and heat control systems**

| <b>Product:</b> Power supply equipment              |                                               |                       |       |
|-----------------------------------------------------|-----------------------------------------------|-----------------------|-------|
| <b>Intended use:</b> Smoke and heat control systems |                                               |                       |       |
| Essential characteristics                           | Requirement clauses in this European Standard | Levels and/or classes | Notes |
| Operational reliability                             | 6 and 7                                       | —                     |       |
| Performance parameters under fire conditions        | 4.1 and 5.2.1                                 | —                     |       |
| Response time                                       | 4.1, 5.2.1, 6.2.2 and 6.3.1                   | —                     |       |

## ZA.2 Procedure for attestation of conformity of power supply equipment

### ZA.2.1 System of attestation of conformity

The system of attestation of conformity of power supply equipment indicated in Table ZA.1, as given in Annex III of the mandate for "Fire alarm/detection, fixed firefighting, fire and smoke control and explosion suppression products", is shown in Table ZA.2 for the indicated intended use and relevant level(s) or class.

**Table ZA.2 — System of attestation of conformity**

| Product                                                                                     | Intended use                   | Level(s) or class(es) | Attestation of conformity system |
|---------------------------------------------------------------------------------------------|--------------------------------|-----------------------|----------------------------------|
| Power supply equipment                                                                      | Smoke and heat control systems | —                     | 1                                |
| System 1: See Directive 89/106/EEC (CPD) Annex III.2.(i), without audit testing of samples. |                                |                       |                                  |

The attestation of conformity of the power supply equipment in Table ZA.1 shall be according to the evaluation of conformity procedures indicated in Table ZA.3 resulting from the application of the clauses of this European Standard indicated therein.

**Table ZA.3 — Assignment of evaluation of conformity tasks for power supply equipment under system 1**

| Tasks                                                            |                                                            | Content of the task                                              | Evaluation of conformity clauses to apply |
|------------------------------------------------------------------|------------------------------------------------------------|------------------------------------------------------------------|-------------------------------------------|
| Tasks under the responsibility of the manufacturer               | Factory production control (F.P.C.)                        | Parameters related to all relevant characteristics of Table ZA.1 | 13.3                                      |
|                                                                  | Further testing of samples taken at factory                | All relevant characteristics of Table ZA.1                       | 13.3.3.2                                  |
| Tasks under the responsibility of the product certification body | Initial type testing                                       | All relevant characteristics of Table ZA.1                       | 13.2                                      |
|                                                                  | Initial inspection of factory and of F.P.C.                | Parameters related to all relevant characteristics of Table ZA.1 | 13.3.4                                    |
|                                                                  | Continuous surveillance, assessment and approval of F.P.C. | Parameters related to all relevant characteristics of Table ZA.1 | 13.3.5                                    |

### ZA.2.2 EC Certificate and Declaration of conformity

When compliance with the conditions of this annex is achieved, the certification body shall draw up a certificate of conformity (EC Certificate of conformity), which entitles the manufacturer to affix the CE marking. The certificate shall include:

- name, address and identification number of the certification body;
- name and address of the manufacturer, or his authorised representative established in the EEA, and place of production;
- description of the product (type, identification, use, ...);
- provisions to which the product conforms (i.e. Annex ZA of this EN);
- particular conditions applicable to the use of the product (e.g. provisions for use under certain conditions);
- number of the certificate;
- conditions and period of validity of the certificate, where applicable;
- name of, and position held by, the person empowered to sign the certificate.

In addition, the manufacturer shall draw up a declaration of conformity (EC Declaration of conformity) including the following:

- name and address of the manufacturer, or his authorised representative established in the EEA;
- NOTE 1 The manufacturer may also be the person responsible for placing the product onto the EEA market, if he takes responsibility for CE marking.
- name and address of the certification body;

- description of the product (type, identification, use, ...), and a copy of the information accompanying the CE marking;

NOTE 2 Where some of the information required for the Declaration is already given in the CE marking information, it does not need to be repeated.

- provisions to which the product conforms (i.e. Annex ZA of this EN);
- particular conditions applicable to the use of the product (e.g. provisions for use under certain conditions);
- number of the accompanying EC Certificate of conformity;
- name of, and position held by, the person empowered to sign the declaration on behalf of the manufacturer or of his authorised representative.

The above mentioned declaration and certificate shall be presented in the language or languages accepted in the Member State in which the product is to be used.

### ZA.3 CE marking and labelling

The manufacturer or his authorised representative established within the EEA is responsible for the affixing of the CE marking. The CE marking symbol to affix shall be in accordance with Directive 93/68/EC and shall be shown on the power supply equipment (or when not possible it may be on the accompanying label, the packaging or on the accompanying commercial documents e.g. a delivery note). The following information shall accompany the CE marking symbol:

- identification number of the certification body;
- name or identifying mark and registered address of the producer;
- last two digits of the year in which the marking is affixed;
- number of the EC Certificate of conformity;
- reference to this European Standard;
- description of the product: generic name, material, dimensions, ... and intended use;
- information on those relevant essential characteristics listed in Table ZA.1.

Figure ZA.1 gives an example of the information to be given on the product, label, packaging and/or commercial documents for electrical p.s.e., while Figure ZA.2 gives an example for pneumatic p.s.e.

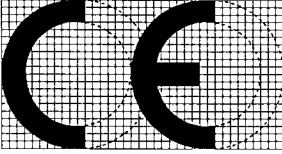
|                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <div></div> <div>01234</div>                                                                                                                                                                                                                                                                                              | <div>CE conformity marking, consisting of the "CE"-symbol given in Directive 93/68/EEC.</div>                                                                                                                                                                                                                                                                  |
| <div>AnyCo Ltd, PO Box 21, B-1050</div> <div>06</div> <div>01234-CPD-00234</div>                                                                                                                                                                                                                                                                                                                           | <div>Identification number of the certification body</div> <div>Name or identifying mark and registered address of the producer</div> <div>Last two digits of the year in which the marking was affixed</div> <div>Certificate number</div> <div>No. of European Standard</div> <div>Description of product and information on regulated characteristics</div> |
| <div>EN 12101-10</div> <div>Electrical power supply equipment, intended to be used in smoke and heat control systems.</div> <div>Operational class: A</div> <div>Environmental class: 1</div> <div>Interruption time: 0,05 seconds</div> <div>Maximum capacity: 3 Ah</div> <div>Output current (max b): 6 A</div> <div>Input: 230 V single phase 50 Hz</div> <div>Output: 24 VDC <math>\pm</math> 5%</div> |                                                                                                                                                                                                                                                                                                                                                                |

Figure ZA.1 — Example CE marking information for electrical p.s.e.

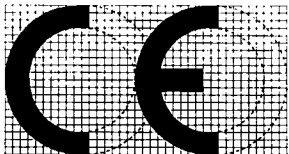
|                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                          |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|
|  <p>01235</p>                                                                                                                                                                                                                                                                                                                                  | <p>CE conformity marking, consisting of the "CE"-symbol given in Directive 93/68/EEC</p> |
| <p>AnyCo Ltd, PO Box 21, B-1050</p> <p>06</p> <p>01235-CPD-00234</p>                                                                                                                                                                                                                                                                                                                                                            | <p>Identification number of the certification body</p>                                   |
| <p><b>EN 12101-10</b></p> <p>Pneumatic power supply equipment, intended to be used in smoke and heat control systems.</p> <p><b>Operational class: A</b></p> <p><b>Environmental class: 1</b></p> <p><b>Interruption time: 0,05 seconds</b></p> <p><b>Maximum capacity: 200 litre</b></p> <p><b>Maximum output pressure: 10 bar</b></p> <p><b>Input: 230 V single phase 50 Hz</b></p> <p><b>Warning: Pressurised vessel</b></p> | <p>Name or identifying mark and registered address of the producer</p>                   |
|                                                                                                                                                                                                                                                                                                                                                                                                                                 | <p>Last two digits of the year in which the marking was affixed</p>                      |
|                                                                                                                                                                                                                                                                                                                                                                                                                                 | <p>Certificate number</p>                                                                |
|                                                                                                                                                                                                                                                                                                                                                                                                                                 | <p>No. of European Standard</p>                                                          |
|                                                                                                                                                                                                                                                                                                                                                                                                                                 | <p>Description of product and</p>                                                        |
|                                                                                                                                                                                                                                                                                                                                                                                                                                 | <p>information on regulated characteristics</p>                                          |

Figure ZA.2 — Example CE marking information for pneumatic p.s.e.

In addition to any specific information relating to dangerous substances shown above, the product should also be accompanied, when and where required and in the appropriate form, by documentation listing any other legislation on dangerous substances for which compliance is claimed, together with any information required by that legislation.

NOTE European legislation without national derogations need not be mentioned.

Smoke and heat control systems - Part 10: Power supplies

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

Rauch- und Wärmefreihaltung - Teil 10:  
Energieversorgung

This corrigendum becomes effective on 24 January 2007 for incorporation in the three official language versions of the EN.

Ce corrigendum prendra effet le 24 janvier 2007 pour incorporation dans les trois versions linguistiques officielles de la EN.

Die Berichtigung tritt am 24. Januar 2007 zur Einarbeitung in die drei offiziellen Sprachfassungen der EN in Kraft.

### English version

5.2.5.2 shall be modified as follows:

The maximum filling shall not exceed:

- 500 g at 50 °C maximum ambient temperature;

5.2.5.3 shall be modified as follows:

The filling pressure at 15 °C shall be as follows, depending upon the maximum ambient temperature:

- 50 °C: 150 bar for a maximum ambient temperature of 50 °C;
- 68 °C: **135** bar for a maximum ambient temperature of 68 °C;
- 93 °C: **125** bar for a maximum ambient temperature of 93 °C.

### Version française

5.2.5.2 doit être modifié comme suit:

Le remplissage maximal ne doit pas dépasser :

- 500 g à une température ambiante maximale de 50 °C ;

5.2.5.3 doit être modifié comme suit:

La pression de remplissage à 15 °C doit être la suivante, en fonction de la température ambiante maximale :

- 50 °C : 150 bar à une température ambiante maximale de 50 °C ;
- 68 °C : **135** bar à une température ambiante maximale de 68 °C ;
- 93 °C : **125** bar à une température ambiante maximale de 93 °C.

### Deutsche Fassung

5.2.5.2 ist wie folgt zu modifizieren:

Die maximale Füllung darf nicht mehr sein als:

- 500 g bei einer maximalen Umgebungstemperatur von 50 °C;

5.2.5.3 ist wie folgt zu modifizieren:

Der Fülldruck bei 15 °C muss, abhängig von der maximalen Umgebungstemperatur, wie folgt sein:

- 50 °C: 150 bar bei einer maximalen Umgebungstemperatur von 50 °C;
- 68 °C: **135** bar bei einer maximalen Umgebungstemperatur von 68 °C;
- 93 °C: **125** bar bei einer maximalen Umgebungstemperatur von 93 °C.