

# Fire detection and fire alarm systems .

## Part 4: Power supply equipment

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The European Standard EN 54-4:1997, with the incorporation of amendment A1:2002, has the status of a British Standard

ICS 13.220.20

National foreword

This British Standard is the English language version of EN 54-4:1997, including amendment A1:2002. Together with BS EN 54-2:1997, it supersedes BS 5839-4:1988 which will be withdrawn on 1999-04-30. It is one of a series of standards for fire detection and fire alarm systems (see BS EN 54-1 for a full list of current and proposed standards).

The start and finish of text introduced or altered by amendment is indicated in the text by tags !". Tags indicating changes to CEN text carry the number of the CEN amendment. For example, text altered by CEN amendment A1 is indicated by !".

The UK participation in its preparation was entrusted by Technical Committee FSH/12, Fire detection and alarm systems, to Subcommittee FSH/12/3, Control and indicating equipment, which has the responsibility to:

- aid enquirers to understand the text;
- present to the responsible European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;
- monitor related international and European developments and promulgate them in the UK.

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English version

## Fire detection and fire alarm systems — Part 4: Power supply equipment (includes amendment A1:2002)

Systèmes de détection et d'alarme incendie — Brandmeldeanlagen —  
Partie 4: Equipement d'alimentation électrique Teil 4: Energieversorgungseinrichtungen  
(inclut l'amendement A1:2002) (enthält Änderung A1:2002)

This European Standard was approved by CEN on 25 December 1996, amendment A1 was approved by CEN on 23 September 2002.

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## Foreword

This European Standard has been prepared by Technical Committee CEN/TC 72, Fire detection and fire alarm systems, the Secretariat of which is held by BSI.

This standard has been prepared in co-operation with the CEA (Comité Européen des Assurances) and with EURALARM (Association of European Manufacturers of Fire and Intruder Alarm Systems).

EN 54 is published in a series of parts.

Information on the relationship between this European Standard and other standards of the EN 54 series is given in Annex A of EN 54-1.

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 1998, and conflicting national standards shall be withdrawn at the latest by April 1999. In addition, a further 36 months shall be allowed for certification purposes for equipment conforming to the national standard.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

## Foreword to amendment A1

This document (EN 54-4:1997/A1:2002) has been prepared by Technical Committee CEN/TC 72, Fire detection and fire alarm systems, the Secretariat of which is held by BSI.

This amendment to the European Standard EN 54-4:1997 shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by June 2003, and conflicting national standards shall be withdrawn at the latest by December 2005.

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

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

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

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## Introduction

This European Standard is drafted on the basis of functions which are to be provided on all power supply equipment. The power supply equipment may have its own cabinet, or may be housed with other equipment of the fire detection and fire alarm system, such as the control and indicating equipment of EN 54-2. A fire detection and fire alarm system may use more than one power supply equipment.

## 1 Scope

This European Standard specifies requirements, methods of test and performance criteria for power supply equipment (see component L of Figure 1 of EN 54-1) of fire detection and fire alarm systems installed in buildings.

!This standard does not cover the power supplies for self-contained smoke alarms or the battery powered parts of wire-free detection and fire alarm systems."

## 2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

EN 54, *Fire detection and fire alarm systems*. EN 54-1:1996, *Introduction*.

EN 54-2:1997, *Control and indicating equipment*.

ENV 50142:1994, *Electromagnetic compatibility — Basic immunity standard — Surge immunity tests*.

IEC 68, *Basic environmental testing procedures*.

IEC 68-1:1998, *General and guidance*.

IEC 68-2, *Tests*.

IEC 68-2-1:1990, *Test A: Cold*.

IEC 68-2-3:1969 + A1:1984, *Test Ca: Damp heat, steady state*.

IEC 68-2-6:1982 + A1:1983 + A2:1985, *Test Fc and guidance — Vibration, sinusoidal*.

IEC 68-2-47:1982, *Specification for mounting of components, equipment and other articles for dynamic tests*.

IEC 529:1989, *Classification of degrees of protection provided by enclosures*. IEC 721, *Classification of environmental conditions*.

IEC 721-3, *Classifications of groups of environmental parameters and their severities*. IEC 721-3-3:1978, *Stationary use and weather protected locations*.

IEC 801, *Electromagnetic compatibility for industrial process measurement and control equipment*. IEC 801-2:1991, *Method of evaluating susceptibility to electrostatic charge*.

IEC 801-3:1984, *Radiated electromagnetic field — Requirements*.

IEC 801-4:1988, *Electrical fast transient/burst requirements*.

IEC 817:1984, *Spring-operated impact test apparatus and its calibrations*.

IEC 950:1991, *Safety of information technology equipment including electrical business equipment*.

### 3.1 Definitions

following.

#### 3.1.1

**float voltage**

the voltage which when applied to the battery will maintain the battery in a fully charged state. The float voltage is specified by the battery manufacturer

#### 3.1.2

**final voltage**

the lowest recommended voltage to which a battery should be discharged. The final voltage is specified by the battery manufacturer

### 3.2

**Abbreviations**

For the purposes of this European Standard the following abbreviations

apply. p.s.e.: power supply equipment (L of Figure 1 of EN 54-1)

c.i.e.: control and indicating equipment (B of Figure 1 of EN 54-1)

## 4 General requirements

### 4.1 Conformity

In order to conform to this standard, the p.s.e. shall meet the requirements of Clauses 4, 5, 6, 7 and 8, shall be tested as described in Clause 9 and shall meet the requirements of the tests.

### 4.2 Power sources

There shall be at least two power sources for the power supply of a fire detection and fire alarm system; the main power source and the standby power source. The main power source shall be designed to operate from the public electricity supply or an equivalent system.

At least one standby power source shall be a rechargeable battery.

The p.s.e. shall include charging equipment to charge the battery and maintain it in a fully charged state.

Each power source, on its own, shall be capable of operating those parts of the fire detection and fire alarm system for which it is intended.

When the main power source is available, it shall be the exclusive source of power to the fire detection and fire alarm system, other than for currents associated with battery monitoring.

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

If the p.s.e. is integrated within other equipment of the fire detection and fire alarm system, the switching from one power source to the other shall not cause any change in status or indications other than those relating to the power supply.

If the p.s.e. is separated from other equipment of the fire detection and fire alarm system, and 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.

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.

NOTE The compatibility of the separated p.s.e. with the other equipment, for example, the c.i.e., will be dealt with in EN 54-13 *System requirements* (to be published).

## 5 Functions

### 5.1 Power supply from the main power source

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

- a) shall be capable of operating in accordance with its specification given in the manufacturer's data irrespective of the condition of the standby power source. This includes any charge condition of the battery, or open-circuit or short-circuit of the connection to the battery;
- b) shall additionally be able to supply any required charging current for the battery or batteries;
- c) may allow battery charging to be limited or interrupted when the p.s.e. is delivering a short duration maximum output load (see note to Table 1).

### 5.2 Power supply from the standby power source (battery)

**5.2.1** When operated from the standby 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 main power source.

NOTE The standby and alarm periods required in any specific application should conform to the application guidelines (EN 54-14, to be published).

**5.2.2** The battery shall:

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

If the battery is mounted in a cabinet which houses other fire detection and fire alarm equipment, it shall be of the sealed type and shall be mounted in accordance with the manufacturer's data.

### 5.3 Charger

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

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

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

### 5.4 Faults

The p.s.e. shall be capable of recognizing and signalling the following faults:

- a) loss of the main power source, within 30 minutes of the occurrence;
- b) loss of the standby power source, within 15 minutes of the occurrence;
- c) reduction of the battery voltage to less than 0,9 of the final voltage, within 30 minutes of the occurrence;
- d) loss of the battery charger, within 30 minutes of the occurrence.

If the p.s.e. is separately housed from the c.i.e., at least a fault output common to the above-mentioned faults shall be provided.

If the p.s.e. is housed within the cabinet of the c.i.e., the above-mentioned faults shall be indicated in accordance with Clause 8 of EN 54-2 either on the c.i.e. or on the p.s.e. itself.



## 6 Materials, design and manufacture

### 6.1 Manufacturer's declaration

In order to assist the process of design inspection, the manufacturer shall declare the following in writing:

- a) that the design has been carried out in accordance with a quality management system which incorporates a set of rules for the design of all elements of the p.s.e.;
- b) that the components of the p.s.e. have been selected for the intended purpose and are expected to operate within their specification when the environmental conditions outside the cabinet of the p.s.e. conform to class 3K5 of IEC 721-3-3.

### 6.2 Mechanical design

**6.2.1** The cabinet of the p.s.e. shall be of robust construction, consistent with the method of installation recommended in the documentation. It shall meet at least classification IP 30 of IEC 529:1989.

**6.2.2** The p.s.e. may be housed either in a separate cabinet or in cabinets associated with other fire detection and fire alarm system equipment.

**6.2.3** If the p.s.e. is housed in the c.i.e., manual controls, fuses, calibration elements etc. for disconnection and adjustment of the power sources shall be accessible only at access level 3 of EN 54-2.

**6.2.4** If the p.s.e. is not housed in the c.i.e., manual controls, fuses, calibration elements etc. for disconnection and adjustment of the power sources shall be accessible only by the use of a tool or key.

**6.2.5** All manual controls, fuses, calibration elements and cable terminals shall be clearly labelled (e.g. to indicate their function, rating or reference to appropriate drawings).

**6.2.6** If mandatory indicators required by EN 54-2 are repeated on a separately housed p.s.e., the indicators shall meet the requirements of EN 54-2.

### 6.3 Electrical design

**6.3.1** All outputs shall have appropriate power limitations in order to ensure that in case of external short-circuits no danger exists because of heat production.

**6.3.2** The p.s.e. shall have safety characteristics in accordance with IEC 950:1991 for protection against direct and indirect contact, for the separation of the extra low voltage d.c. circuits from the low voltage a.c. circuits and for earthing of metal parts.

### 6.4 Power supply interface

If the p.s.e. is designed to be used with a c.i.e. contained in a separate cabinet, an interface shall be provided for at least two transmission paths to the c.i.e., such that a short-circuit or interruption in one path does not affect the other.

## 7 Documentation

### 7.1 User's documentation

The manufacturer shall prepare installation and user documentation, which shall be submitted to the testing authority together with the p.s.e. This shall comprise at least the following:

- a) 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 and electrical compatibility with other components of the system (as described in EN 54-1) including:
  - 1) power requirements for recommended operation;
  - 2) the maximum and minimum electrical ratings for each input and output;
  - 3) information on the communication parameters employed by the transmission paths;
  - 4) fuse ratings;



- 5) the types and the maximum and minimum capacities of the batteries suitable for use with the p.s.e.;
- 6) the maximum current drawn from the battery by the p.s.e. when the main power source is disconnected;
- c) installation information, including:
  - 1) the suitability for use in various environments;
  - 2) mounting instructions;
  - 3) instructions for connecting inputs and outputs;
- d) commissioning instructions;
- e) operating instructions;
- f) maintenance information.

## 7.2 Design documentation

The manufacturer shall prepare design documentation, which shall be submitted to the testing authority together with the p.s.e. This documentation shall include drawings, parts lists, circuit diagrams, block diagrams and a functional description to such an extent that the compliance with the requirements of this European Standard can be checked and that a general assessment of the mechanical and electrical design is possible.

## 8 Marking

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

- a) the number of this European Standard (i.e. EN 54-4:1997);
- b) the name or trademark of the manufacturer or supplier;
- c) the type number or other designation of the p.s.e.;
- d) the code or number identifying the production period of the p.s.e.

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

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

## 9 Tests

### 9.1 General

#### 9.1.1 Standard atmospheric conditions for testing

Unless otherwise stated in a test method, the testing shall be carried out after the test specimen has been allowed to stabilize in the standard atmospheric conditions for testing as described in IEC 68-1:1988 as follows:

- temperature: 15 °C to 35 °C;
- relative humidity: 25 % to 75 %;
- 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.

#### 9.1.2 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.

### 9.1.3 Electrical connection

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

- a) it shall be connected to the mains and to a battery of maximum capacity;
- b) 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.

## 9.2 Functional tests

### 9.2.1 Object of the tests

The object of the functional tests is to check the compliance of the specimen to each requirement in the standard.

### 9.2.2 Table of functional tests

The functional tests are shown in Table 1.

Table 1 — Functional tests

Test	Mains supply voltage	State of battery	Output current load	Purpose of test	Duration of test (hours)
1	$V_n^{1)} + 10\%$	$V_{b \min.}^{2)}$	max. $a^{3)}$	no overheating	4
2	$V_n \pm 15\%$	$V_b \min.$	max. $a$	performance within specification and no overheating	4
3	Disconnected	$V_b \min.$	max. $b^{4)}$	output voltage within specification	
4	$V_n \pm 15\%$	$V_b = 0^{5)}$	max. $b$	output voltage within specification	
5	$V_n + 10\%$	$UV_b \min.$ and $kV_b \max.$ <sup>6)</sup> (charging capability disconnected)	min. <sup>7)</sup>	output voltage within specification	
6	$V_n + 10\%$	disconnected	max. $b$	ripple within specification	
7	$V_n \pm 15\%$	disconnected	max. $b$	ripple within specification	
8	$V_n + 10\%$	$V_b \max.$	min.	output voltage within specification	
9	$V_n$	$0,9 \times V_b \min.$	min.	fault signal	

<sup>1)</sup>  $V_n$  is the nominal voltage of the public electricity supply or equivalent.

<sup>2)</sup>  $V_b \min.$  is the final voltage of the battery.

<sup>3)</sup> Output current load max.  $a$  is the maximum continuous load specified by the p.s.e. manufacturer.

<sup>4)</sup> Output current load max.  $b$  is the maximum short duration load specified by the p.s.e. manufacturer. (If max.  $b$  is not specified by the manufacturer, then max.  $a$  shall be applied.)

<sup>5)</sup>  $V_b = 0$  means a short-circuit across the battery connection.

<sup>6)</sup>  $V_b \max.$  is the float voltage of the battery.

<sup>7)</sup> Output current load min. is the minimum current load specified by the p.s.e. manufacturer.

### 9.2.3 The full functional test

The test consists of all the nine tests with voltage combinations and output currents as given in Table 1. The output voltages and the test results shall be measured and recorded.

In test 1 the temperatures of components with high power dissipation, e.g. transformers, rectifiers and voltage regulators, shall be measured and recorded.

### 9.2.4 The reduced functional test

The test consists of the tests 7 and 8 as given in Table 1. The output voltages and test results shall be measured and recorded.

### 9.2.5 Requirements

**9.2.5.1** In the tests of **9.2.3** and **9.2.4** 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 standard.

**9.2.5.2** In test 1 of **9.2.3** the temperatures shall not exceed the maximum temperatures specified by the component manufacturers.

### 9.3 Test of the charger and the standby power source

#### 9.3.1 Test procedure

**9.3.1.1** 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 battery manufacturer. For other battery types, the discharge current shall be that for which the battery manufacturer specifies the rated capacity."

**9.3.1.2** Charge the battery for 72 hours with the appropriate charger connected to the nominal mains voltage ( $V_N$ ).

During this period ensure that the p.s.e. supplies only the current for charging the battery and for operating the c.i.e. of the fire detection and fire alarm system in its normal operating condition.

NOTE This current value should be specified by the p.s.e. manufacturer.

**9.3.1.3** Repeat the procedure as in **9.3.1.1** and measure the discharge time ( $T_1$ ) in hours.

**9.3.1.4** Charge the battery again for 24 h at  $V_N$  p 15 %.

During this period ensure that the p.s.e. supplies only the current for charging the battery and for operating the c.i.e. of the fire detection and fire alarm system in its normal operating condition.

NOTE. This current value should be specified by the p.s.e. manufacturer.

**9.3.1.5** Discharge the battery again to its final voltage at a discharge current as in **9.3.1.1** and measure the discharge time ( $T_2$ ) in hours.

#### 9.3.2 Requirements

The product of the discharge time  $T_1$  and the discharge current  $I_d$  shall be not less than the rated capacity of the battery ( $C$ ).

The product of the discharge time  $T_2$  and the discharge current  $I_d$  shall be not less than  $0,8 \times$  the rated capacity of the battery ( $C$ ).

### 9.4 Environmental tests

#### 9.4.1 General

One, two or three specimens may be supplied for environmental testing.

If the p.s.e. is housed in the c.i.e. then the environmental tests described in Clause 15 of EN 54-2 shall be carried out. However, the functional tests required by **9.4.5** of this part of EN 54 shall be carried out in addition to the functional tests required by EN 54-2.

If the p.s.e. is housed separately from the c.i.e. then the tests shown in Table 2 shall be applied.

Table 2 — Environmental tests

Test	Operational or endurance	Clause number
Cold	Operational	9.5
Damp heat, steady state	Operational	9.6
Impact	Operational	9.7
Vibration, sinusoidal	Operational	9.8
Electrostatic discharge	Operational	9.9
Radiated electromagnetic interference	Operational	9.10
Voltage transients — fast transient bursts	Operational	9.11
Voltage transients — slow high energy surge	Operational	9.12
Mains voltage dips and interruptions	Operational	9.13
Damp heat, steady state	Endurance	9.14
Vibration, sinusoidal	Endurance	9.15

#### 9.4.2 Tests for one specimen

If a single specimen is supplied for environmental testing, the specimen shall be subjected to all the operational tests, which may be carried out in any order. After the operational tests the endurance tests shall be carried out on the same specimen in any order.

#### 9.4.3 Tests for two specimens

If two specimens are supplied for environmental testing, then the first test specimen shall be subjected to all the operational tests, which may be carried out in any order, followed by one of the endurance tests. The second specimen shall be subjected to the other endurance test.

#### 9.4.4 Tests for three specimens

If three specimens are supplied for environmental testing, then one test specimen is subjected to all the operational tests, which may be carried out in any order. The second specimen shall be subjected to one of the endurance tests, and the third specimen shall be subjected to the other endurance test.

#### 9.4.5 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 of 9.2.3; intermediate functional tests shall be the reduced functional test of 9.2.4.

NOTE The functional test after the conditioning of one environmental test may be taken as the functional test before the conditioning of the next environmental test.

#### 9.4.6 Requirements

When subjected to functional test each specimen shall satisfy the requirements of 9.2.5.

The output voltage(s) measured during conditioning shall comply with the manufacturer's specification.

### 9.5 Cold (operational)

#### 9.5.1 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.

#### 9.5.2 Test procedure

##### 9.5.2.1 General

The test procedures with gradual changes in temperature described in IEC 68-2-1:1990 shall be used. Test Ad shall be used for heat -dissipating specimens (as defined in IEC 68-2-1:1990) and test Ab shall be used for non-heat-dissipating specimens.

**9.5.2.2 Initial examination**

Before conditioning, subject the specimen to the functional test required by 9.4.5.

**9.5.2.3 State of the specimen during conditioning**

The specimen shall be mounted as required by 9.1.2, be connected as required by 9.1.3 and be operating.

**9.5.2.4 Conditioning**

Apply the following severity of conditioning:

- a) temperature:  $5\text{ }^{\circ}\text{C} \pm 3\text{ }^{\circ}\text{C}$ ;
- b) duration: 16 h.

**9.5.2.5 Measurements during conditioning**

Monitor the specimen during the conditioning period to check that output voltages are within the specifications. During the last hour of the conditioning period, subject the specimen to the reduced functional test.

**9.5.2.6 Final measurements**

After the recovery period, subject the specimen to the functional test required by 9.4.5 and inspect it visually for mechanical damage both externally and internally.

**9.6 Damp heat, steady state (operational)****9.6.1 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.

**9.6.2 Test procedure****9.6.2.1 General**

The test procedure described in IEC 68-2-3:1969 shall be used.

**9.6.2.2 Initial examination**

Before conditioning, subject the specimen to the functional test required by 9.4.5.

**9.6.2.3 State of the specimen during conditioning**

The specimen shall be mounted as required by 9.1.2, be connected as required by 9.1.3 and be operating.

**9.6.2.4 Conditioning**

Apply the following severity of conditioning:

- a) temperature:  $40\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$ ;
- b) relative humidity:  $93^{+2}_{-3}\%$  ;
- c) duration: 4 days.

Precondition the specimen at the conditioning temperature ( $40\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$ ) until temperature stability has been reached to prevent the formation of water droplets on the specimen.

**9.6.2.5 Measurements during conditioning**

Monitor the specimen during the conditioning period to check that output voltages are within the specifications. During the last hour of the conditioning period, subject the specimen to the reduced functional test.

**9.6.2.6 Final measurements**

After the recovery period, subject the specimen to the functional test required by 9.4.5 and inspect it visually for mechanical damage both externally and internally.

## 9.7 Impact (operational)

### 9.7.1 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.

### 9.7.2 Test procedure

#### 9.7.2.1 General

Apply the test apparatus and procedure described in IEC 817:1984.

#### 9.7.2.2 Initial examination

Before conditioning, subject the specimen to the functional test required by 9.4.5.

#### 9.7.2.3 State of the specimen during conditioning

The specimen shall be mounted as required by 9.1.2, be connected as required by 9.1.3 and be operating.

#### 9.7.2.4 Conditioning

Apply impacts to all surfaces of the specimen which are accessible without special tools.

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

In case of doubts, the defect shall be disregarded and a further three blows shall be applied to the same position on a new specimen.

Apply the following severity of conditioning:

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

#### 9.7.2.5 Measurements during conditioning

Monitor the specimen during the conditioning periods to check that output voltages stay within the specifications and ensure that results of three blows do not influence subsequent series.

#### 9.7.2.6 Final measurements

After the recovery period, subject the specimen to the functional test required by 9.4.5 and inspect it visually for mechanical damage both externally and internally.

## 9.8 Vibration, sinusoidal

### (operational) 9.8.1 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.

### 9.8.2 Test procedure

#### 9.8.2.1 General

The test procedure described in IEC 68-2-6:1982 shall be used.

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.

#### 9.8.2.2 Initial examination

Before conditioning, subject the specimen to the functional test required by 9.4.5.

#### 9.8.2.3 State of the specimen during conditioning

The specimen shall be mounted as required by 9.1.2 and in accordance with IEC 68-2-47:1982, be connected as required by 9.1.3 and be operating.

**9.8.2.4 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:  $0,981 \text{ m} \cdot \text{s}^{-2}$  ( $0,1 \text{ g}_n$ );
- c) number of axes: 3;
- d) number of sweep cycles per axis: 1 for each functional condition.

**9.8.2.5 Measurements during conditioning**

Monitor the specimen during the conditioning periods to check that output voltages stay within the specifications.

**9.8.2.6 Final measurements**

After the recovery period, subject the specimen to the functional test required by 9.4.5 and inspect it visually for mechanical damage both externally and internally.

**9.9 Electrostatic discharges (operational)****9.9.1 Object of the test**

The object of the test is to demonstrate the immunity of the equipment to electrostatic discharges caused by personnel, who may have become electrostatically charged, touching the equipment or other equipment near by.

**9.9.2 Test procedure****9.9.2.1 General**

The test procedure for type tests performed in laboratories shall be used, as described in IEC 801-2:1991. The tests consist of:

- a) direct electrostatic discharges onto parts of the equipment accessible to the operator (i.e. at access level 2, as specified in EN 52-2);
- b) indirect electrostatic discharges onto adjacent coupling planes.

**9.9.2.2 Initial examination**

Before conditioning, subject the specimen to the functional test required by 9.4.5.

**9.9.2.3 State of the specimen during conditioning**

The specimen shall be mounted as required by 9.1.2, be connected as required by 9.1.3 and be operating.

**9.9.2.4 Conditioning**

Apply the following severity of conditioning:

- a) test voltage: 2 kV, 4 kV and 8 kV for air discharges at insulating surfaces;  
2 kV, 4 kV and 6 kV for contact discharges to conducting surfaces and to coupling planes;
- b) polarity: positive and negative;
- c) number of discharges: 10 per pre-selected spot;
- d) time between successive discharges: at least 1 s.

**9.9.2.5 Measurements during conditioning**

Monitor the specimen during the conditioning period to check that output voltages stay within the specifications.



#### **9.9.2.6 Final measurements**

After conditioning, subject the specimen to the functional test required by 9.4.5 and inspect it visually for mechanical damage both externally and internally.

### **9.10 Radiated electromagnetic interference (operational)**

#### **9.10.1 Object of the test**

The object of the test is to demonstrate the immunity of the equipment to electromagnetic fields such as those produced by portable radio transceivers, etc.

#### **9.10.2 Test procedure**

##### **9.10.2.1 General**

The type test procedure of IEC 801-3:1984 shall be used.

##### **9.10.2.2 Initial examination**

Before conditioning, subject the specimen to the functional test required by 9.4.5.

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

The specimen shall be mounted as required by 9.1.2, be connected as required by 9.1.3 and be operating.

##### **9.10.2.4 Conditioning**

Apply the following severity of conditioning:

- a) frequency range: 1 MHz – 1 GHz;
- b) field strength: 10 V/m;
- c) sinusoidal amplitude modulation: 80 % at 1 kHz.

##### **9.10.2.5 Measurements during conditioning**

Monitor the specimen during the conditioning period to check that output voltages stay within the specifications.

##### **9.10.2.6 Final measurement**

After conditioning, subject the specimen to the functional test required by 9.4.5 and inspect it visually for mechanical damage both externally and internally.

### **9.11 Voltage transients — Fast transient bursts (operational)**

#### **9.11.1 Object of the test**

The object of the test is to demonstrate the immunity of the equipment to bursts of fast low energy transients which may be produced by relays, contactors, switching inductive loads etc. and may be induced into signal and data circuits.

#### **9.11.2 Test procedure**

##### **9.11.2.1 General**

Use the test procedure described in IEC 801-4:1988.

The test procedures for type tests performed in laboratories shall be used.

##### **9.11.2.2 Initial examination**

Before conditioning, subject the specimen to the functional test required by 9.4.5.

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

The specimen shall be mounted as required by 9.1.2, be connected as required by 9.1.3 and be operating.

**9.11.2.4 Conditioning**

Apply the following severity of conditioning:

- a) 2 kV to mains power supply terminals of the associated p.s.e. and protective earth conductor via a coupling/decoupling network;
- b) 1 kV to each type of d.c. extra low voltage terminals and other inputs, signal-, data- and control-terminals via a capacitive coupling clamp.

**9.11.2.5 Measurements during conditioning**

Monitor the specimen during the conditioning period to check that output voltages stay within the specifications.

**9.11.2.6 Final measurement**

After conditioning, subject the specimen to the functional test required by 9.4.5 and inspect it visually for mechanical damage both externally and internally.

**9.12 Voltage transients — Slow high energy transients (operational)****9.12.1 Object of the test**

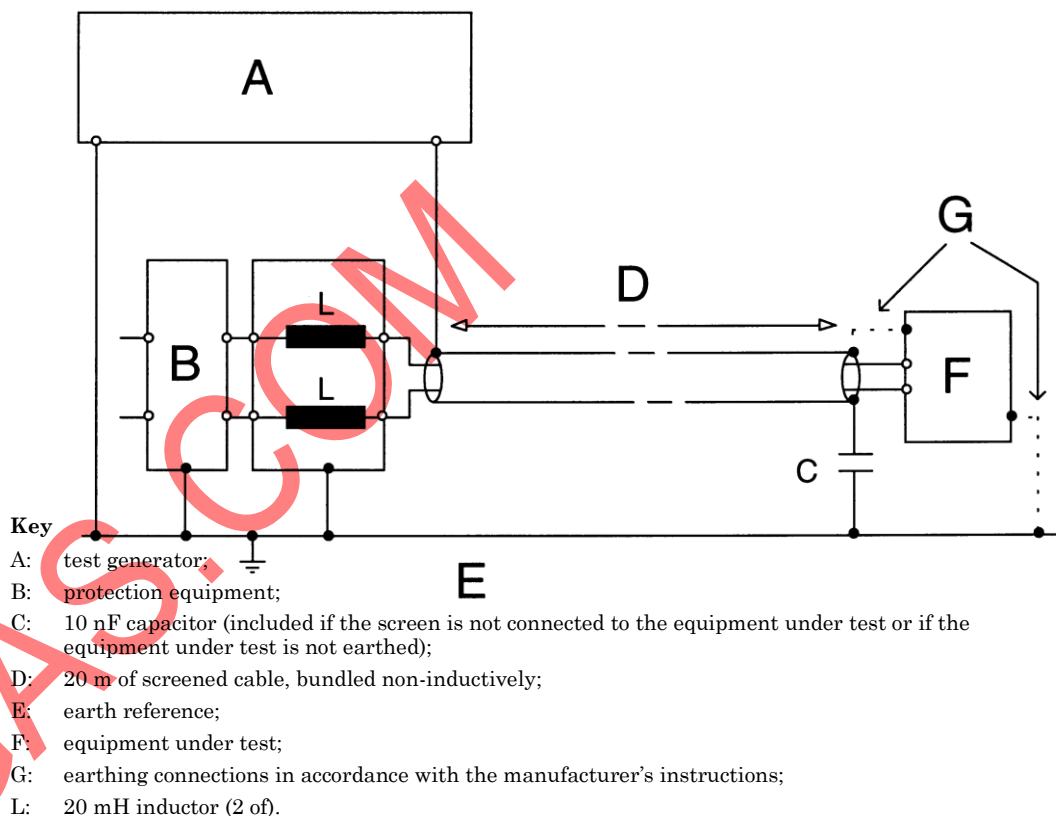
The object of the test is to demonstrate the immunity of the equipment to relatively slow high energy transients which may be included in power and signal cables from lightning strikes in the vicinity or by switching in power distribution systems or large voltage networks, including the switching of large capacitor batteries.

**9.12.2 Test procedure****9.12.2.1 General**

The test apparatus and procedure shall be generally as described in ENV 50142:1994 and hereafter.

A.C. mains power lines shall be subjected to transients injected by both line -to- line and line-to-ground coupling modes. With line-to-ground coupling the transients shall be injected via a 10  $\Omega$  series resistor. The length of the power lines between the p.s.e. and the coupling/decoupling network shall be  $\geq 2$  m. At least 20 pulses of each polarity shall be applied at each of the voltage levels shown for the appropriate severity. These pulses shall be synchronized with the mains voltage wave such that at least 5 pulses are applied at each of the zero crossing points and at the maximum and minimum points. The pulses may be applied at a maximum rate of 1 per 5 s, however, it is necessary to ensure that any failures are not due to applying the pulses too frequently, and that if this is not clear then the failed devices should be replaced and the test repeated with the pulses applied at a rate of less than 1 per min.

Extra low voltage and signal lines shall be subjected to transients injected by line-to-ground coupling mode only, via a 40  $\Omega$  series resistor. If the equipment has a large number of identical inputs/outputs (e.g. detector loops) then representative samples of each type of input/output may be selected for testing. The length of the signal lines between the p.s.e. and coupling/decoupling network(s) shall be  $\geq 2$  m. However, if it is specified that certain signal lines must only be connected with screened cables, then in these cases the transients shall be applied to the screen of a 20 m length of screened cable as shown in Figure 1. At least 5 pulses of each polarity shall be applied at each of the voltage levels shown for the appropriate severity. The pulses may be applied at a maximum rate of 1 per 5 s, however, it is necessary to ensure that any failures are not due to applying the pulses too frequently, and that if this is not clear then the failed devices should be replaced and the test repeated with pulses applied at a rate of less than 1 per min.



**Figure 1 — Transient injection into screened cable**

#### 9.12.2.2 Initial examination

Before conditioning, subject the specimen to the functional test required by 9.4.5.

#### 9.12.2.3 State of the specimen during conditioning

The specimen shall be arranged and connected in accordance with the manufacturer's installation instructions and shall be operating. Apart from the manufacturer's specified earth connections, the specimen and interconnecting cables shall be insulated from the ground reference.

#### 9.12.2.4 Conditioning

Apply the following severity of conditioning:

a) for a.c. mains power lines:

- line-to-line: 500 V and 1 kV;
- line-to-ground: 500 V, 1 kV and 2 kV via a 10  $\Omega$  series resistor.

NOTE The above levels are open-circuit voltages.

b) for d.c. extra low voltage and signal lines:

- line-to-ground: 500 V and 1 kV via a 40  $\Omega$  series resistor.

NOTE The above levels are open-circuit voltages.

**9.12.2.5 Measurements during conditioning**

Monitor the specimen during the conditioning periods to check that output voltages stay within the specifications.

**9.12.2.6 Final measurements**

After conditioning, subject the specimen to the functional test required by 9.4.5.

**9.13 Mains voltage dips and interruptions (operational)****9.13.1 Object of the test**

The object of the test is to demonstrate the immunity of the equipment to short duration dips (reductions) and interruptions in the a.c. mains such as those caused by load switching and operation of protective devices on the mains distribution networks.

**9.13.2 Test procedure****9.13.2.1 General**

No reference can be made to any internationally accepted standard at present.

A test generator capable of producing the required reductions in the amplitude of one or more half-cycles of the a.c. mains voltage, starting and finishing at zero crossings, shall be used.

The specimen shall be in the operating condition and monitored during conditioning.

The supply voltage shall be reduced from nominal value by the percentage reduction specified for the specified period.

Each of the reductions shall be applied ten times, with intervals between applications of not less than 1 s and not more than 1,5 s.

**9.13.2.2 Initial examination**

Before conditioning, subject the specimen to the functional test required by 9.4.5.

**9.13.2.3 State of the specimen during conditioning**

The specimen shall be mounted as required by 9.1.2, be connected as required by 9.1.3 and be operating.

**9.13.2.4 Conditioning**

Apply the severity of conditioning shown in Table 3.

**Table 3**

Voltage reduction	Duration of the reduction in half-cycles
50 %	20
100 %	10

**9.13.2.5 Measurements during conditioning**

Monitor the specimen during the conditioning period to check that output voltages are within the specifications.

**9.13.2.6 Final measurement**

After conditioning, subject the specimen to the functional test required by 9.4.5.

**9.14 Damp heat, steady state****(endurance) 9.14.1 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, galvanic corrosion etc.).

**9.14.2 Test procedure****9.14.2.1 General**

Use the test procedure described in IEC 68-2-3:1969.

#### 9.14.2.2 Initial examination

Before conditioning, subject the specimen to the functional test required by 9.4.5.

#### 9.14.2.3 State of the specimen during conditioning

The specimen shall be mounted as required by 9.1.2. The specimen shall not be supplied with power during the conditioning.

#### 9.14.2.4 Conditioning

Apply the following severity of conditioning:

- a) temperature:  $40\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$ ;
- b) relative humidity:  $93\text{ }^{+2}_{-3}\text{ }%$ ;
- c) duration: 21 days.

Pre-condition the specimen at the conditioning temperature ( $40 \pm 2$ )  $^{\circ}\text{C}$  until temperature stability has been reached to prevent the formation of water droplets on the specimen.

#### 9.14.2.5 Final measurement

After conditioning, subject the specimen to the functional test required by 9.4.5 and inspect it visually for mechanical damage both externally and internally.

### 9.15 Vibration, sinusoidal (endurance)

#### 9.15.1 The 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.

#### 9.15.2 Test procedure

##### 9.15.2.1 General

Use the test procedure described in IEC 68-2-6:1982.

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.

##### 9.15.2.2 Initial examination

Before conditioning, subject the specimen to the functional test required by 9.4.5.

##### 9.15.2.3 State of the specimen during conditioning

The specimen shall be mounted as required by 9.1.2 and in accordance with IEC 68-2-47:1982. The specimen shall not be supplied with power during the 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:  $4,905\text{ m}\cdot\text{s}^{-2}$  ( $0.5\text{ g}_n$ );
- c) number of axes: 3;
- d) number of sweep cycles: 20 per axis.

##### 9.15.2.5 Final measurement

After conditioning, subject the specimen to the functional test required by 9.4.5 and inspect it visually for mechanical damage both externally and internally.

**Annex A (normative)***Text deleted***Annex ZA (informative)****Clauses of this European Standard addressing essential requirements of the Construction Products or other provisions of EU Directives****ZA.1 Scope and relevant clauses**

This European Standard has been prepared under the mandate M/109 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 construction product covered by this European Standard for its intended use according to Clause 1 (Scope) of this standard.

**WARNING** Other requirements and other EU Directives may be applicable to the product(s) falling within the scope of this 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). 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 website on EUROPA (CREATE, accessed through <http://europa.eu.int/comm/enterprise/construction/internal/hygiene.htm>).

This Annex ZA has the same scope, in relation to the products covered, as Clause 1 of this standard. This Annex establishes the conditions for the CE marking of power supply equipment intended for the use shown below and identifies the relevant clauses applicable.

**Construction Product:****Power supply equipment for fire detection and fire alarm systems for buildings.****Intended use:****Fire Safety:****Table ZA.1 — Relevant clauses**

Essential characteristics	Clauses in this European Standard	Mandated level(s)	Notes
Performance under fire condition	4, 5, 6	None	<sup>a</sup>
Operational reliability	4, 5, 6, 7, 8, 9.3		
Durability of operational reliability	9.5, 9.6		
Temperature resistance			
Durability of operational reliability	9.7, 9.8, 9.15		
Vibration resistance			
Durability of operational reliability	9.9 to 9.13		
Electrical stability			
Durability of operational reliability	9.6, 9.14		
Humidity resistance			

<sup>a</sup> The products covered by this standard are assumed to operate, in an event of fire, before the fire becomes so large as to affect their functioning. There is therefore no requirement to function when exposed to direct attack from fire.

## !ZA.2 Procedures for the attestation of conformity of power supply equipment covered by this standard

### ZA.2.1 System of attestation of conformity

The mandate requires that the attestation of conformity system to be applied shall be that shown in Table ZA.2.

**Table ZA.2 — Attestation of conformity system**

Product	Intended use	Levels or classes	Attestation of conformity system
Fire detection/Fire alarm: Power supply equipment	Fire safety	None	1
System 1: See CPD Annex III.2.(i), without audit-testing of samples.			

This requires:

- a) tasks to be provided by the manufacturer:
  - 1) factory production control (see **ZA.2.2b**);
  - 2) testing of samples taken at the factory by the manufacturer in accordance with a prescribed test plan;
- b) tasks to be undertaken under the authority of a Notified Production Certification Body<sup>1)</sup>:
  - 1) type testing of the product;
  - 2) inspection of the factory and factory production control;
  - 3) continuous/periodic surveillance, assessment and approval of the factory production control.

### ZA.2.2 Evaluation of conformity

The evaluation of conformity of power supply equipment covered by this European Standard shall be by the following:

#### a) Type testing

Type testing of the product shall be carried out in accordance with the clauses shown in Table ZA.1. The products tested shall be representative of the manufacturer's normal production with regard to their construction, operation and calibration. Tests previously performed in accordance with the provisions of this standard may be taken into account providing that they were made to the same system of attestation of conformity on the same product or products of similar design, construction and functionality, such that the results may be considered applicable to the product in question. Wherever a change, for example in the product design, materials or supplier of the components or of the production process occurs, which could change significantly one or more of the characteristics, the type testing shall be repeated for the relevant product performance.

#### b) Factory production control

The manufacturer shall establish, document and maintain a permanent factory production control system to ensure that the products placed on the market conform with the stated performance characteristics. The factory production control system shall consist of procedures, regular inspections and tests and/or assessments and the use of the results to control incoming materials or components, equipment, the production process and the product.

The production control procedure shall be adequately extensive and detailed so that the conformity of the products is made apparent to the manufacturer and so that irregularities can be detected at the earliest possible stage."

<sup>1)</sup> !A Notified Product Certification Body is an approved product certification body notified to the Commission by a member state, for this purpose, in accordance with article 18 of the Construction Products Directive (89/106/EEC)."



A factory production control system conforming with the requirements of EN ISO 9001, and made specific to the requirements of this standard, should be considered to satisfy the above requirements.

The production control procedure shall be recorded in a manual, which shall be made available for inspection.

The factory production control shall be recorded. These records shall be available for inspection and shall include at least the following:

- 1) identification of the product tested;
- 2) the dates of sampling;
- 3) the test methods applied;
- 4) the test and inspection results;
- 5) the date of tests;
- 6) the identification of the responsible authority within the factory;
- 7) calibration records;
- 8) actions taken.

### **ZA.3 CE Marking and labelling and accompanying documentation**

The CE-marking symbol (in accordance with Directive 93/68/EEC) shall be placed on the product and be accompanied by:

- i) the identification number of the Notified Production Certification Body;
- ii) the number of the EC certificate of conformity.

The CE marking symbol shall in addition be shown on the accompanying commercial documentation supplemented by:

- a) the identification number of the Notified Product Certification Body;
- b) the name or identifying mark and registered address of the manufacturer;
- c) the last two digits of the year in which the marking was affixed;
- d) the number of the EC certificate of conformity;
- e) the reference to this European Standard (EN 54-4);
- f) the description of the construction product (e.g. Power supply equipment for fire detection and fire alarm systems for buildings);
- g) the type/model designation of the product;
- h) the data required by Clause 7.1 or a reference to a document, which shall be uniquely identifiable and available from the manufacturer, containing these data.

Where the product exceeds the minimum performance levels stated in this standard, and where the manufacturer so desires, the CE marking may be accompanied by an indication of the parameter(s) concerned and the actual test result(s).

Figure ZA.1 shows an example of the information to be given on the accompanying commercial documentation."

<div data-bbox="563 322 892 499" data-label="Image"> </div> <p>0123</p>
<p><b>AnyCo Ltd, P.O. Box 21, B1050</b></p> <p><b>01</b></p> <p>0123 – CPD – 001</p>
<p>EN 54-4</p> <p>Power supply equipment for fire detection and fire alarm systems for buildings</p> <p>ABC 123</p> <p>Technical data: see Doc.123/2000 held by the manufacturer.</p>

**Figure ZA.1 — Example of CE marking information on the accompanying commercial documentation**

#### ZA.4 EC Certification and declaration of conformity

The manufacturer, or his agent established in the EEA, shall prepare and retain a declaration of conformity, which authorizes the affixing of the CE marking. This declaration shall include:

- the name and address of the manufacturer, or his authorized representative established in the EEA, and the place of production;
- the description of the construction product (i.e. power supply equipment for fire detection and fire alarm systems for buildings);
- the type/model designation of the product;
- the provisions to which the product conforms (i.e. Annex ZA of this European Standard);
- any particular conditions applicable to the use of the product [if necessary];
- the name and address (or identification number) of the Notified Product Certification Body;
- the name of and position held by the person empowered to sign the declaration on behalf of the manufacturer or of his authorized representative."

The declaration shall contain a certificate of conformity with the following information:

- the name and address of the Notified Product Certification Body;
- the certificate number;
- the name and address of the manufacturer, or his authorized representative established in the EEA;
- the description of the construction product (i.e. power supply equipment for fire detection and fire alarm systems for buildings);
- the type/model designation of the product;
- the provisions to which the product conforms (i.e. Annex ZA of this European Standard);
- any particular conditions applicable to the use of the product [if necessary];
- any conditions and period of validity of the certificate, where applicable;
- the name of and position held by the person empowered to sign the certificate.

The above mentioned declaration and certificate shall be presented (if requested) in the official language or languages of the Member State in which the product is to be used."

FIRE-GAS

## Bibliography

EN ISO 9001, *Quality management systems — Requirements (ISO 9001)*.

EU Directive 93/68/EC, *COUNCIL DIRECTIVE 93/68/EEC of 22 July 1993 amending Directives 87/404/EEC (simple pressure vessels), 88/378/EEC (safety of toys), 89/106/EEC (construction products), 89/336/EEC (electromagnetic compatibility), 89/392/EEC (machinery), 89/686/EEC (personal protective equipment), 90/384/EEC (non-automatic weighing instruments), 90/385/EEC (active implantable medicinal devices), 90/396/EEC (appliances burning gaseous fuels), 91/263/EEC (telecommunications terminal equipment), 92/42/EEC (new hot-water boilers fired with liquid or gaseous fuels) and 73/23/EEC (electrical equipment designed for use within certain voltage limits).*"

**Adjustment :**  
**Ali Mohammad**  
**Akhavan**

**DATE : 12 June 2017**



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