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## Fire detection and alarm systems —

### Part 23: Visual alarm devices

*Systèmes de détection et d'alarme d'incendie —*

*Partie 23: Dispositifs d'alarme visuels*

ICS 13.220.20

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## Foreword

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ISO 7240-23 was prepared by Technical Committee ISO/TC 21, *Equipment for fire protection and fire fighting*, Subcommittee SC 3, *Fire detection and alarm systems*.

This second/third/... edition cancels and replaces the first/second/... edition (), [clause(s) / subclause(s) / table(s) / figure(s) / annex(es)] of which [has / have] been technically revised.

ISO 7240 consists of the following parts, under the general title *Fire detection and alarm systems*:

- Part 23: *Visual alarm devices*
- Part [n]:
- Part [n+1]:
- Part 23: *Visual alarm devices*
- Part [n]:
- Part [n+1]:
- Part 1: *General and definitions*
- Part 2: *Control and indicating equipment*
- Part 3: *Audible alarm devices*
- Part 4: *Power supply equipment*
- Part 5: *Point type heat detectors*
- Part 6: *Carbon monoxide fire detectors using electro-chemical cells*
- Part 7: *Point type smoke detectors using scattered light, transmitted light or ionization*
- Part 8: *Carbon monoxide fire detectors using an electro-chemical cell in combination with a heat sensor*

- *Part 9: Test fires for fire detectors* [Technical report]
- *Part 10: Point type flame detectors*
- *Part 11: Manual call points*
- *Part 12: Line type smoke detectors using a transmitted light beam*
- *Part 13: Compatibility assessment of system components*
- *Part 14: Guidelines for drafting Codes of Practice for design, installation and use of fire detection and fire alarm systems in and around buildings* [Technical report]
- *Part 15: Point type fire detectors using scattered light, transmitted light or ionization sensors in combination with a heat sensor*
- *Part 16: Sound system control and indicating equipment*
- *Part 17: Short-circuit isolators*
- *Part 18: Input/output devices*
- *Part 19: Design, installation, commissioning and service of sound systems for emergency purposes*
- *Part 21: Routing equipment*
- *Part 22: Smoke detection equipment for ducts*
- *Part 23: Visual alarm devices*
- *Part 24: Sound system loudspeakers*
- *Part 25: Components using radio links*
- *Part 27: Carbon monoxide fire detectors using optical or ionization smoke sensors, electrochemical cell carbon monoxide sensors and heat sensors*
- *Part 28: Fire protection control equipment*

## Introduction

The purpose of a visual fire alarm device is to warn person(s) within, or in the vicinity of, a building of the occurrence of a fire emergency in order to enable such person(s) to take appropriate measures.

This part of ISO 7240 allows manufacturers to specify visual alarm devices in terms of the range at which the required illumination is met. Three categories of device are defined, one for ceiling mounted devices, one for wall mounted devices and an open category. The maximum range of the visual alarm device is tested by measuring the light output in a hemisphere surrounding it to determine its light distribution. As the light output of some visual alarm devices can change over time due, for example, to the effect of self-heating, a specific test checks that the variation of light output over time is within acceptable limits.

This part of ISO 7240 gives common requirements for the construction and robustness of visual alarm devices as well as for their performance under climatic, mechanical and electrical interference conditions which are likely to occur in the service environment. Visual alarm devices can be classified in one of two application environment types.

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# Fire detection and alarm systems —

## Part 23:

## Visual alarm devices

### 1 Scope

This part of ISO 7240 specifies the requirements, test methods and performance criteria for visual alarm devices in a fixed installation intended to signal a visual warning of a fire between a fire detection and alarm system and the occupants of a building. ~~It is intended to cover only those devices which derive their operating power by means of a physical electrical connection to an external source such as a fire alarm system.~~

This part of ISO 7240 specifies visual alarm devices for two types of application environment, Type A, generally for indoor use, and B, generally for outdoor use and Type C for use in harsh environments such as mining.

This part of ISO 7240 applies only to pulsing or flashing visual alarm devices, for example xenon beacons or rotating beacons. Devices giving continuous light output are excluded from this part of ISO 7240 .

This part of ISO 7240 is not intended to cover visual indicators, for example, on detectors or on the control and indicating equipment.

### 2 Normative references

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

ISO 2813:2000, *Paints and varnishes — Determination of specular gloss of non-metallic paint films at 20 degrees, 60 degrees and 85 degrees*

ISO 7240-1, *Fire detection and alarm systems — Part 1: General and definitions*

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

ISO 23539:2005, *Photometry — The CIE system of physical photometry*

IEC 60068-1:1988/Corr. 1:1988/A1:1992, *Environmental testing — Part 1: General and guidance*

IEC 60068-2-1:2007, *Environmental testing — Part 2-1: Tests — Test A: Cold*

IEC 60068-2-2:2007, *Environmental testing — Part 2-2: Tests — Test B — Dry heat*

IEC 60068-2-6:2007, *Environmental testing — Part 2-6: Tests — Test Fc: Vibration (sinusoidal)*

IEC 60068-2-27:2008, *Basic environmental testing procedures — Part 2: Tests — Test Ea and guidance: Shock*

IEC 60068-2-30:2005, *Environmental testing — Part 2-30: Tests — Test Db: Damp heat, cyclic (12 h + 12 h cycle)*

IEC 60068-2-42:2003, *Environmental testing — Part 2-42: Tests — Test Kc: Sulphur dioxide test for contacts and connection*

IEC 60068-2-75:1997, *Environmental testing — Part 2-75: Tests — Test Eh: Hammer*

IEC 60068-2-78:2001, *Environmental testing — Part 2-78: Tests — Test Cab: Damp heat, steady state*

IEC 60529:2001/Corr. 1:2003/Corr. 2:2007, *Degrees of protection provided by enclosures (IP code)*

IEC 60695-11-10:2003, *Fire hazard testing — Part 11-10: Test flames — 50 W horizontal and vertical flame test methods*

IEC 60695-11-20:2003, *Fire hazard testing — Part 11-20: Test flames — 500 W flame test methods*

~~IEC 61672-1:2002, *Electroacoustics — Sound level meters — Part 1: Specifications*~~

EN 50130-4:1995/A1:1998/A2:2003, *Alarm systems — Part 4: Electromagnetic compatibility — Product family standard: immunity requirements for components of fire, intruder and social alarm systems*

### 3 Terms, definitions and abbreviations

For the purposes of this document, the terms, definitions and abbreviations given in ISO 7240-1 and the following apply.

#### 3.1 Definitions

##### 3.1.1

##### **coverage volume**

volume within which the required illumination is achieved

##### 3.1.2

##### **normal axis**

axis normal to the mounting plane which passes through the reference point

##### ~~3.1.3~~

##### ~~**effective luminous intensity**~~

~~measurement corresponding to the light output of the visual alarm device measured using the equipment and method detailed in Annex A~~

##### ~~3.1.4~~

##### ~~**light output level**~~

~~measurement corresponding to the light output of the visual alarm device measured using the equipment and method detailed in Annex B~~

##### ~~3.1.3~~

##### ~~**mode (of operation)**~~

~~one of a possible number of pre-defined light output selected by means specified by the manufacturer. pre-defined light outputs of the visual alarm device which can be selected by means specified by the manufacturer~~

##### ~~3.1.4~~

##### ~~**reference point**~~

~~point representing the optical centre within or on the surface of the visual alarm device specified by the manufacturer~~

##### ~~3.1.5~~

##### ~~**required illumination**~~

~~an illumination of 0.4 lm/m<sup>2</sup> on a surface perpendicular to the direction of the light emitted from the device~~



**3.1.6****Type A v.a.d.**

device primarily intended for indoor applications

NOTE Type A v.a.d.s may be suitable for some protected outdoor situations.

**3.1.7****Type B v.a.d.**

device primarily intended for outdoor applications

NOTE Type B v.a.d.s may be more suitable than type A v.a.d.s for some indoor situations where high temperature and/or humidity are present.

**3.1.8****Type C v.a.d.**

device primarily intended for harsh environment applications

EXAMPLE Mining, including open-cast mining.

**3.1.9****visual alarm device****v.a.d.**

device which generates a flashing light to signal to the occupants of a building that a fire condition exists

**3.2 Abbreviations**

ACa.c. alternating current

DCd.c. direct current

RMSr.m.s. root mean square

v.a.d. visual alarm device

**4 Requirements****4.1 Compliance**

In order to comply with this part of ISO 7240, v.a.d.s shall meet the requirements of Clause 4, which shall be verified by visual inspection or engineering assessment, shall be tested as described in Clause 5 and shall meet the requirements of the tests.

**4.2 Device category**

**4.2.1** V.a.d.s shall meet the requirement for coverage volume<sup>7</sup> of at least<sup>7</sup> one of the following three categories:

- a) 'C', ceiling mounted devices;
- b) 'W', wall mounted devices;
- c) 'O', open class devices.

**4.2.2** Category C devices shall be further specified as **C-x-y** (see 4.12-10.2 d) 1)), where:

- **x** is ~~either 3, 6 or 9, representing~~ the maximum height, in metres, between 2,5 m and 10 m at which the device may be mounted, and

- **y** is the diameter, in metres, of the coverage cylindrical volume when the device is mounted at the ceiling height.

EXAMPLE **C-3-12** corresponds to a ceiling mounted device giving a coverage cylindrical volume of 12 m diameter at 3 m height.

**4.2.3** Category **W** devices shall be further specified as **W-x-y** (see 4.12-10.2 d) 2)), where:

- **x** is the maximum height of the devices on the wall, in metres, with a minimum value of 2,4 m, and
- **y** is the width of a square room, in metres, covered by the device.

EXAMPLE **W-2.4-6** corresponds to a wall mounted device giving a coverage cuboid volume of 2,4 m x 6 m x 6 m when mounted at a height of 2,4 m.

**4.2.4** For category **O** devices the coverage volume in which the required illumination is achieved shall be specified (see 4.12-10.2 d) 3)).

### 4.3 Minimum and maximum effective light intensity

When tested in accordance with 5.4, the v.a.d. shall produce an effective light intensity of at least 1 cd for 70 % of all measurement points and shall not exceed 500 cd for any measurement points.

### 4.4 Light colour

The v.a.d. shall emit a white or red flashing light.

### 4.5 Light pattern and frequency of flashing

The flash rate of the v.a.d. shall be between 0,5 Hz and 2 Hz measured between the 10 % of peak values of consecutive leading edges of the pulses ( $P_{10L}$ ).

NOTE The ~~light frequencies~~ **frequency of flashing** may vary in different countries. Reference needs to be made to local regulations. Some countries have adopted the ISO 8201 temporal pattern.

The maximum on-time, measured between the 10 % of peak values of the leading edge ( $P_{10L}$ ) and trailing edge ( $P_{10T}$ ) of the pulse shall not exceed 0,2 s.

If the light emitted consists of groups of several pulses ~~then and if~~ the time between the  $P_{10T}$  of one pulse and the  $P_{10L}$  of the next pulse is less than 0,04 s then the pulses shall be considered as a single event.

Any set of multiple pulses shall not exceed 0,2 s between the  $P_{10L}$  for of the first peak to the  $P_{10T}$  of the last peak.

A set of pulses where the minimum value does not drop below 10 % of the peak value is considered as a single pulse and shall not exceed 0,2 s between  $P_{10L}$  and  $P_{10T}$ .

### 4.6 Durability

The v.a.d. shall be rated for at least 100 h operation. No limitation on duty factor or maximum on-time shall prevent the device from operating the 1 h 'on' 1 h 'off' cycle required by the test procedure described in 5.5.

NOTE This requirement does not apply to the capacity of batteries which may be used within v.a.d.s as a means of local storage of operating power. The capacity and charging requirements of such batteries need to meet the requirement of the system.

## 4.7 Construction

### 4.7.1 Provision for external conductors

~~The v.a.d. shall provide space within its enclosure for entry and termination of external conductors. The v.a.d. shall provide space within its enclosure for external conductors to be brought in and terminated.~~ Entry holes for conductors or cables shall be provided or the location where such holes are to be made shall be indicated by providing a template or some other suitable means.

Terminals for connecting external conductors to the v.a.d. shall be designed so that the conductors are clamped between metal surfaces without being damaged.

~~Terminals for connecting external conductors shall be designed so that the conductors are clamped between metal surfaces without being damaged. Each terminal shall be capable of allowing the connection of any conductor having a cross-sectional area between 0,28 mm<sup>2</sup> and 1,5 mm<sup>2</sup> inclusive.~~

### 4.7.2 Materials

The v.a.d. shall be constructed of material(s) capable of withstanding the tests specified in 5.2 to 5.19. In addition, the material(s) of plastic enclosures shall meet the following flammability requirements:

- a) IEC 60695-11-10, Class V-2 or HB75 for devices operating from a voltage source less than or equal to 30 V ~~RMSr.m.s.~~ or 42,4 V ~~DGd.c.~~ and consuming less than 15 W of power;
- b) IEC 60695-11-20, Class 5VB for devices operating from a voltage source greater than 30 V ~~RMSr.m.s.~~ or 42,4 V ~~DGd.c.~~ and consuming more than 15 W of power.

NOTE Verification of conformance to 4.7.2 a) and 4.7.2 b) can be carried out by examination of a Certificate of Conformity or equivalent (see Annex D).

### 4.7.3 IP ratings

The degree of protection provided by the enclosure of v.a.d.s shall meet the following requirements:

- a) for Type A v.a.d.: Code IP21C of IEC 60529:2001;

~~b)~~ for Type B v.a.d.: Code IP33C of IEC 60529:2001;

~~b)c)~~ For Type C v.a.d: Code IP553C of IEC 60259.

### 4.7.4 Access

Means shall be provided to limit access for removal of parts or the whole device, e.g. special tool, codes, hidden screws, seals, etc.

## 4.8 Manufacturer's adjustments

It shall not be possible to change the manufacturer's settings except by special means (e.g. the use of a special code or tool) or by breaking removing a seal.

## 4.9 On-site adjustment of mode or behaviour

If there is provision for on-site adjustment of the behaviour of the v.a.d.:

- a) for each setting at which compliance with this standard is claimed, the v.a.d. shall comply with the requirements of this part of ISO 7240 and access to the adjustment means shall only be possible by the use of a code or special tool or by removing the v.a.d. from its base or mounting, and

- b) any setting(s) at which compliance with this part of ISO 7240 is not claimed, shall only be accessible by the use of a code or special tool and it shall be clearly marked on the v.a.d. or in the associated data that when these setting(s) are used, the v.a.d. does not comply with the standard.

NOTE These adjustments may be carried out at the v.a.d. or at the control and indicating equipment.

## 4.10 Marking and data

### 4.10.1 Marking

Each v.a.d. shall be clearly marked with the following information:

- a) number of this standard (i.e. ISO 7240-23:2011);
- b) environment Type (i.e. Type A, Type B or Type C (see ~~Clause 3~~));
- c) device category (see 4.2);
- d) name or trademark of the manufacturer or supplier;
- e) manufacturer or supplier model designation (type or number of the v.a.d.);
- f) terminal designations;
- g) a mark(s) or code(s) (e.g., serial number or batch code), by which the manufacturer can identify, at least, the date or batch and place of manufacture and the version number(s) of any software contained within the device.

For detachable v.a.d.s, the detachable part shall be marked with a), b), c), d), e) and g), and the base shall be marked with, at least e) (i.e. its own model designation) and f).

Where any marking on the device uses symbols or abbreviations not in common use then these shall be explained in the data supplied with the device.

The marking need not be discernible when the device is installed and ready for use but shall be visible during installation and shall be accessible during maintenance.

The markings shall not be placed on screws or other easily removable parts of the device.

~~NOTE — Where ZA.3 covers the same information as this clause, the requirements of this clause are met.~~

### 4.10.2 Data

The information required in 4.10.1, together with the following, shall be supplied with the device, or shall be given in a data sheet or technical manual identified on, or with each device:

- a) rated supply voltages or voltage ranges (~~ACa.c.~~ or ~~DCd.c.~~);
- b) power and current consumption;
- c) supply frequency ranges, where relevant;
- d) the coverage characteristics:
  - 1) for category C devices, the information shall clearly show or state:
    - i) the maximum allowable height of the device above the floor level, given in metres, i.e. parameter x in the category specification as described in 4.2.2,

- ii) the cylindrical volume with its central axis extending vertically downwards from the device,
  - iii) the diameter of the above cylindrical volume, given in metres, i.e. parameter y in the category specification as described in 4.2.2;
- 2) for category W devices, the information shall clearly show or state:
  - i) the device correct orientation,
  - ii) features of the device used to align the device to the orientation given in 4.10.2 d) 2) i),
  - iii) the maximum allowable mounted height of the device, given in metres, i.e. parameter x in the category specification as described in 4.2.3,
  - iv) the cuboid volume with its vertical side equal to the height at which the device is mounted and with the device in the centre of one top edge,
  - v) the length of the other two sides of the cuboid, given in metres, i.e. parameter y in the category specification as described in 4.2.3;
- 3) for category O devices, the information shall clearly show or state:
  - i) the recommended mounting position of the device,
  - ii) any specific requirement for mounting the device in a particular orientation, and how this orientation can be identified on the device,
  - iii) any restrictions on the minimum and maximum allowable mounted height,
  - iv) the volumetric shape, its dimensions and how it is related to the device;
- e) the light pattern and frequency of flashing;
- f) IP Code to IEC 60529:2001;
- g) any other information necessary to allow correct installation, operation and maintenance of the device.

#### 4.11 Additional requirements for software controlled v.a.d.s

##### 4.11.1 General

For v.a.d.s which rely on software control in order to fulfil the requirements of this part of ISO 7240, the requirements of 4.11.2, 4.11.3 and 4.11.4 shall be met.

##### 4.11.2 Software documentation

**4.11.2.1** manufacturer shall submit documentation which gives an overview of the software design. This documentation shall be in sufficient detail for the design to be inspected for compliance with this part of ISO 7240 and shall include at least the following:

- a) a functional description of the main program flow (e.g. as a flow diagram or structogram) including:
  - 1) a brief description of the modules and the functions that they perform,
  - 2) the way in which the modules interact,
  - 3) the overall hierarchy of the program,