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ISO 7240-24

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Fire detection and fire alarm systems —

Part 24: Sound-system loudspeakers

Systèmes de détection d'incendie et d'alarme —

Partie 24: Haut-parleurs pour systèmes d'alarme vocale

Reference number
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Foreword

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International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 7240-24 was prepared by Technical Committee ISO/TC 21, *Equipment for fire protection and fire fighting*, Subcommittee SC 3, *Fire detection and alarm systems*.

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

- *Part 1: General and definitions*
- *Part 2: Control and indicating equipment*
- *Part 3: Audible alarm indicators*
- *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 Specification]
- *Part 10: Point-type flame detectors*
- *Part 11: Manual call points*
- *Part 12: Line type smoke detectors using a transmitted optical 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 20: Aspirating smoke detectors*

— *Part 21: Routing equipment*

— *Part 22: Smoke-detection equipment for ducts*

— *Part 24: Sound-system loudspeakers*

— *Part 25: Components using radio transmission paths*

— *Part 27: Point-type fire detectors using a scattered-light, transmitted-light or ionization smoke sensor, an electrochemical-cell carbon-monoxide sensor and a heat sensor*

— *Part 28: Fire protection control equipment*

A Part 23, dealing with visual alarm indicators, is under development.

Introduction

This part of ISO 7240 is based on European standard EN 54-24, prepared by the European Committee for Standardization's Technical Committee CEN/TC 72, *Fire detection and fire alarm systems*.

The purpose of a sound-system loudspeaker as a component of a sound system for emergency purposes (see ISO 7240-19) is to provide intelligible warning to people in or within the vicinity of a building in which a fire emergency has occurred and to enable such person(s) to take appropriate measures in accordance with a predetermined evacuation plan.

The primary reason for using a sound system for emergency purposes, instead of coded warnings given by aural alarm indicators (see the future ISO 7240-3) is to reduce the time taken for those at risk to recognize that an emergency exists, and to give clear instructions on what to do next. This means that sound-system loudspeakers are required to achieve a minimum acoustical performance, as well as constructional and environmental requirements, to be suitable for use in a sound system for emergency purposes.

This part of ISO 7240 recognizes that the exact nature of the acoustical requirements for sound-system loudspeakers varies according to the nature of the space into which they are installed. It therefore specifies the minimum requirements that apply to sound-system loudspeakers and a common method for testing their operational performance against parameters specified by the manufacturers.

This part of ISO 7240 gives common requirements for the construction and robustness of sound-system loudspeakers as well as their performance under climatic and mechanical conditions that are likely to occur in the service environment. As the types of loudspeaker considered in this part of ISO 7240 are passive electromechanical devices not involving sensitive electronic circuits, electromagnetic compatibility (EMC) tests have not been included. The loudspeakers have been classified for either an indoor or an outdoor application environment category.

This part of ISO 7240 requires that manufacturers specify certain characteristics in a consistent manner so that designers can make objective decisions about which loudspeaker to use in specific applications.

Fire detection and fire alarm systems —

Part 24: Sound-system loudspeakers

1 Scope

This part of ISO 7240 specifies requirements, test methods and performance criteria for loudspeakers intended to broadcast a warning of fire between a fire detection and alarm system and the occupants of a building (see item C_4 of ISO 7240-1:2005).

This part of ISO 7240 specifies loudspeakers for two types of application environment: type A, generally for indoor use, and type B, generally for outdoor use.

This part of ISO 7240 does not cover loudspeakers for special applications, for example loudspeakers for use in hazardous applications, if such applications require additional or other requirements or tests other than those given in this part of ISO 7240.

This part of ISO 7240 is not intended to cover addressable loudspeakers or loudspeakers with active components.

Audible alarm indicators are covered in the future ISO 7240-3.

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

ISO 9001:2008, *Quality management systems — Requirements*

IEC 60068-1, *Environmental testing — Part 1: General and guidance*

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

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

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

IEC 60068-2-27, *Environmental testing — Part 2-27: Tests — Test Ea and guidance: Shock*

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

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

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

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

IEC 60268-1:1985, *Sound system equipment — Part 1: General*

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

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

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

IEC 61260, *Electroacoustics — Octave-band and fractional-octave-band filters*

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

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

3 Terms, abbreviated terms and definitions

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

3.1 Terms and definitions

3.1.1
1/3 octave
frequency band as defined in IEC 61260

3.1.2
coverage angle
smallest angle between two directions on either side of the reference axis at which the sound pressure level is 6 dB less than the sound pressure level on the reference axis

NOTE This angle is measured in the vertical and horizontal planes.

3.1.3
free-field condition
acoustical environment in which the sound pressure decreases with the distance, r, from a point source according to a $1/r$ law, with an accuracy of ± 10 %, in the region that is occupied by the sound field between the loudspeaker system and the microphone during the measurements

EXAMPLE An anechoic room, a quiet outdoor space.

3.1.4
frequency response
sound pressure level at a distance of 4 m from the reference point on the reference axis, produced at 1/3 octave frequency bands, from 100 Hz to 10 kHz (centre frequencies)

NOTE This is also referred to as magnitude or amplitude response.

3.1.5
ground plane measurement
measurement under half-space free-field conditions used to simulate a free-field condition in which the loudspeaker is mounted above an acoustically totally reflective boundary surface and aimed so that its reference axis points towards a measurement microphone that is placed directly on the boundary surface

NOTE In order to achieve measurement results that are comparable with a free-field condition, ground-plane measurements need to be corrected by −6 dB at all frequencies.

3.1.6
half-space free-field condition
acoustical environment that is confined by a plane of sufficient size and in which the free-field exists in a hemisphere, so that the sound pressure from a point source mounted in the surface of that plane decreases in the manner defined in the free-field condition

EXAMPLE A half-space anechoic room.

3.1.7
horizontal plane
virtual plane of the loudspeaker containing the reference axis, as specified by the manufacturer

NOTE There may be several horizontal planes corresponding to several reference axes.

EXAMPLE See Annex C.

3.1.8
loudspeaker
transducer that converts electrical energy into acoustical energy, comprised of one or more drive units, one or more enclosures, a cable termination block and relevant devices such as filters, transformers and any passive element

NOTE Some loudspeakers are a combination of one or more loudspeaker housing(s) and a termination box interconnected by a cable. The loudspeaker housing(s), cable(s) and terminal box should be considered to be "the loudspeaker" for the purposes of this part of ISO 7240. Examples of such loudspeakers include pendant types and loudspeakers with mechanically adjustable orientation such as horn or column loudspeakers and loudspeaker arrays.

3.1.9
loudspeaker enclosure
any parts of the outer physical envelope of the loudspeaker that prevents or restricts access of solid foreign objects to the sound transducer, internal components and cable termination block

3.1.10
maximum sound pressure level
total sound pressure level at 4 m from the reference point on the reference axis of a loudspeaker supplied with a simulated program signal at the rated noise power

3.1.11
measuring distance
distance between the reference point and the measuring microphone

3.1.12
pink noise
random noise signal with a spectral density that decreases by 3 dB per octave, giving constant energy per octave

3.1.13
rated impedance
value of pure resistance, stated by the manufacturer, that is substituted for the loudspeaker when defining the required power of the source

3.1.14
rated noise power
electrical power calculated from the formula U_n^2/R, where U_n is the rated noise voltage and R is the rated impedance

NOTE 1 For transformer-coupled loudspeakers, the rated noise power is the highest power setting specified by the manufacturer.

NOTE 2 The rated noise power is also called power-handling capacity.

3.1.15
rated noise voltage
RMS voltage, as specified by the manufacturer, of the simulated program signal that the loudspeaker can sustain without thermal or mechanical damage

NOTE 1 See Annex B.

NOTE 2 For transformer-coupled loudspeakers, the rated noise voltage typically equals 50 V, 70 V or 100 V.

3.1.16
reference axis
virtual axis of the loudspeaker as specified by the manufacturer

NOTE There may be several reference axes.

EXAMPLE See Annex C.

3.1.17
reference plane
virtual plane perpendicular to the reference axis as specified by the manufacturer

EXAMPLE See Annex C.

3.1.18
reference point
point at the intersection of the reference plane and the reference axis

EXAMPLE See Annex C.

3.1.19
sensitivity
sound pressure level, S, of a loudspeaker supplied with a 1 W pink noise signal from 100 Hz to 10 kHz measured at a distance of 4 m from the reference point on the reference axis

3.1.20
simulated program signal
signal whose mean power spectral density closely resembles the average of the mean power spectral densities of a wide range of audio signals

EXAMPLE See Annex B.

3.1.21
type A loudspeaker
loudspeaker that is primarily intended for indoor applications

NOTE Type A loudspeakers may be suitable for some protected outdoor situations.

3.1.22
type B loudspeaker
loudspeaker that is primarily intended for outdoor applications

NOTE Type B loudspeakers may be more suitable than type A for some indoor situations where high temperature or humidity is present.

3.1.23
vertical plane
virtual plane of the loudspeaker perpendicular to the horizontal plane and containing the reference axis

EXAMPLE See Annex C.

3.2 Abbreviated terms

— DC direct current

— RMS root mean square

4 Requirements

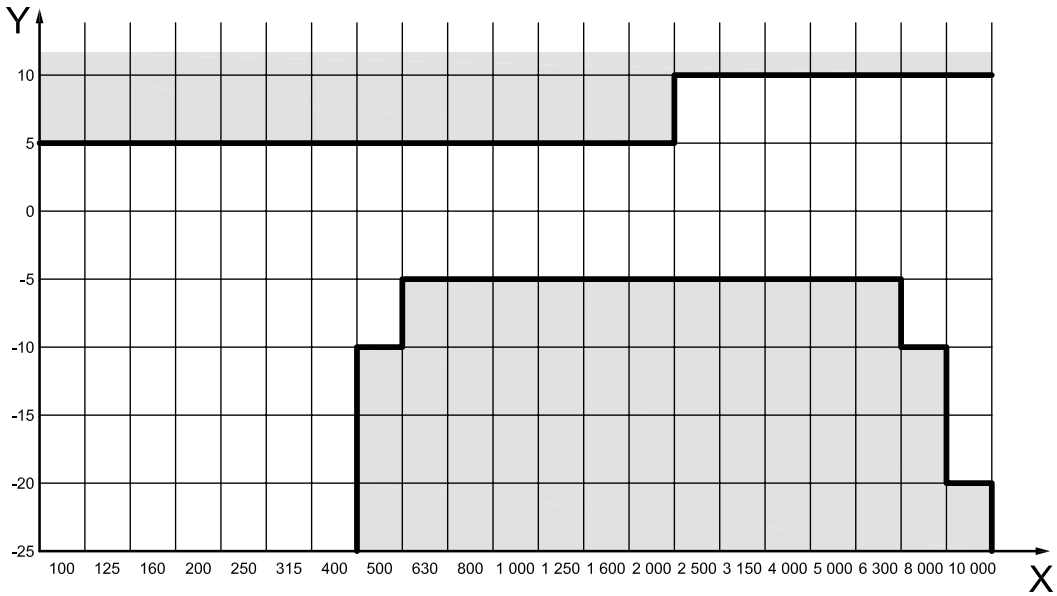
4.1 Compliance

In order to conform to this part of ISO 7240, loudspeakers 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 Frequency response limits

The loudspeaker frequency response shall fit within the unshaded area shown in Figure 1.

NOTE If the frequency response shown in Figure 1 can be achieved only by means of a frequency equalizer that is specified by the manufacturer for normal use [see 4.5.2 h)], it is acceptable to insert a dedicated equalizer in the measurement setup (see 5.1.6).



Key

X 1/3 octave band centre frequency, expressed in hertz

Y relative level, expressed in decibels

Figure 1 — Frequency response limit

4.3 Durability

The loudspeaker shall be rated for at least 100 h operation at the rated noise power specified by the manufacturer (refer to the test procedure described in 5.6).

4.4 Construction

4.4.1 Provision for external conductors

The loudspeaker shall provide space within its enclosure for entry and termination of external conductors. Entry holes for conductors or cables shall be provided or the location where such holes can be made shall be indicated by providing a template or some other suitable means.

Terminals for connecting external conductors shall be designed so that they are clamped between metal surfaces without being damaged.

4.4.2 Materials

The loudspeaker shall be constructed of material(s) capable of withstanding the tests specified in Clause 5. In addition, the material(s) of plastic enclosures shall conform to 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 RMS or 42,4 V DC and dissipating less than 15 W;

b) IEC 60695-11-20 Class 5VB for devices operating from a voltage source greater than 30 V RMS or 42,4 V DC and dissipating more than 15 W.

4.4.3 Ingress protection

The degree of protection provided by the enclosure of loudspeakers shall conform to the following requirements:

— for type A, indoor applications: Code IP21C of IEC 60529;

— for type B, outdoor applications: Code IP33C of IEC 60529.

4.4.4 Access

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

4.5 Marking and data

4.5.1 Marking

Each loudspeaker shall be clearly marked with the following information:

a) number of this part of ISO 7240 (i.e. ISO 7240-24);

b) classification (i.e. type A or type B);

c) name or trademark of the manufacturer or supplier;

d) manufacturer or supplier model designation (type or number);

e) wiring terminal designations;

f) for transformer-coupled loudspeakers, rated noise voltage;

g) for direct-coupled loudspeakers, rated impedance;

h) rated noise power (at the highest power setting);

i) power settings (e.g. transformer tapping options for transformer-coupled loudspeakers);

j) mark(s) or code(s) (e.g. a serial number or batch code), by which the manufacturer can identify at least the date or batch and place of manufacture.

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

It is not necessary that the marking 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.

4.5.2 Data

The information required in 4.5.1 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) frequency response for each stated reference axis;

b) sensitivity for the stated reference axis (see 5.1.5);

c) horizontal and vertical coverage angles at 500 Hz, 1 kHz, 2 kHz, 4 kHz for each stated reference plane, measured as described in 5.4.2;

d) maximum sound pressure level (at highest power setting) for each stated reference plane, measured as described in 5.5.2;

e) reference axis, reference plane and horizontal plane;

f) rated noise power, measured as described in 5.6.2;

g) rated impedance for each tapping, measured as described in 5.3.2;

h) 1/3 octave band frequency response of any dedicated active equalization that can be required;

i) any other information necessary to enable correct installation, operation and maintenance of the device;

j) acoustical measurement environment used for the specifications listed in this data sheet, e.g. free-field, half-space free-field, standard baffle.

If different settings, except power settings, are available on the loudspeaker, such as tone control or adjustable parts, the manufacturer shall specify the applicable configuration(s) for each setting.