



**SLOVENSKI STANDARD**  
**oSIST prEN 54-3:2009**  
**01-junij-2009**

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Uufa ]fUb^Y!'Nj c bYbUdfUj Y

Fire detection and fire alarm systems - Part 3: Fire alarm devices - Sounders

Brandmeldeanlagen - Teil 3: Aukausische Alarmlerungseinrichtungen

Systèmes de détection et d'alarme incendie - Partie 3: Dispositifs sonores d'alarme feu

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13.220.20	Ú[ 0æ} æÁ æz āæ	Fire protection
13.320	Alarmni in opozorilni sistemi	Alarm and warning systems

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EUROPEAN STANDARD  
NORME EUROPÉENNE  
EUROPÄISCHE NORM

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**prEN 54-3**

March 2009

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ICS 13.220.20

English Version

## Fire detection and fire alarm systems - Part 3: Fire alarm devices - Sounders

Systèmes de détection et d'alarme incendie - Partie 3:  
Dispositifs sonores d'alarme feu

Brandmeldeanlagen - Teil 3: Aukausische  
Alarmierungseinrichtungen

This draft European Standard is submitted to CEN members for enquiry. It has been drawn up by the Technical Committee CEN/TC 72.

If this draft becomes a European Standard, CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

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Recipients of this draft are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

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EUROPÄISCHES KOMITEE FÜR NORMUNG

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## Foreword

This document (prEN 54-3:2009) has been prepared by Technical Committee CEN/TC 72 "Fire detection and fire alarm systems", the secretariat of which is held by BSI.

This document is currently submitted to the CEN Enquiry.

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.

This edition of EN 54-3 cancels and replaces EN 54-3:2001, EN 54-3: 2001/A1: 2002 and EN 54-3: 2001/A2: 2006, which have been extensively revised.

## Introduction

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

This standard recognizes that the exact nature of the sound requirements, i.e. its frequency range, temporal pattern and output level will vary according to the nature of the installation, the type of risk present and appropriate measures to be taken, the type of signals used by other non-emergency alarms (see, for example, EN 457) and national differences in custom and practice. The resulting standard specifies, therefore, a common method for the testing of the operational performance of sounders against the specification declared by the manufacturer rather than imposing common requirements.

Attention is drawn to ISO 8201:1987, *Acoustics – Audible emergency evacuation signal*, the international standard which specifies the temporal pattern and the required sound pressure level of an audible emergency evacuation signal.

This standard gives common requirements for the construction and robustness of sounders as well as for their performance under climatic, mechanical and electrical interference conditions which are likely to occur in the service environment. The sounders have been classified in either an indoor or an outdoor application environment category.

In fire detection and fire alarm systems, voice sounders are used as alarm devices for warning the occupants of a building of the occurrence of a fire risk, using a combination of an attention drawing signal and dedicated voice message(s). The requirements, test methods and performance criteria specified in EN 54-3:2001 for sounders are also applicable to voice sounders. Additional requirements, test methods and performance criteria specific to voice sounders are also incorporated.

## 1 Scope

This European Standard specifies the requirements, test methods and performance criteria for fire alarm sounders in a fixed installation intended to signal an audible warning of fire detection and fire alarm systems 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 external source such as a fire alarm system.

This standard is also intended to cover voice sounders by the application of specific requirements, tests and performance criteria.

This standard specifies fire alarm sounders for two types of application environment, Type A for indoor use and Type B for outdoor use.

This standard does not cover:

- a) loudspeaker type devices primarily intended for emitting emergency voice messages that are generated from an external audio source;
- b) supervisory sounders, for example, within the control and indicating equipment.

## 2 Normative references

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

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

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

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

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

EN 60068-1:1994, *Environmental testing — Part 1: General and guidance (IEC 60068-1:1988 + Corrigendum 1988 + A1:1992)*

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

EN 60068-2-2:1993, *Basic environmental testing procedures — Part 2-2: Tests — Tests B — Dry heat (IEC 60068-2-2:1974 + IEC 60068-2-2 A:1976)*

EN 60068-2-2:1993/A1:1993, *Basic environmental testing procedures — Part 2-2: Tests — Tests B — Dry heat — (IEC 60068-2-2:1974/A1:1993)*

EN 60068-2-2:1993/A2:1994, *Basic environmental testing procedures — Part 2-2: Tests — Tests B — Dry heat — (IEC 60068-2-2:1974/A2:1994)*

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

EN 60068-2-27:1993, *Basic environmental testing procedures — Part 2: Tests — Test Ea and guidance: Shock (IEC 60068-2-27:1987)*

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

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

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

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

EN 60529:1991, *Degrees of protection provided by enclosures (IP code) (IEC 60529:1989)*  
 EN 60529:1991/A1:2000, *Degrees of protection provided by enclosures (IP code) — Amendment A1 (IEC 60529:1989/A1:1999)*

EN 60695-11-10:1999, *Fire hazard testing — Part 11-10: Test flames — 50 W horizontal and vertical flame test methods (IEC 60695-11-10:1999)*

EN 60695-11-10:1999/A1:2003, *Fire hazard testing — Part 11-10: Test flames — 50 W horizontal and vertical flame test methods — Amendment A1 (IEC 60695-11-10:1999/A1:2003)*

EN 60695-11-20:1999, *Fire hazard testing — Part 11-20: Test flames — 500 W flame test methods (IEC 60695-11-20:1999)*

EN 60695-11-20:1999/A1:2003, *Fire hazard testing — Part 11-20: Test flames — 500 W flame test methods) — Amendment A1 (IEC 60695-11-20:1999/A1:2003)*

EN 61672-1:2003, *Electroacoustics. Sound level meters. Specifications (IEC 61672-1:2002)*

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

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### **3 Definitions and abbreviations** (standards.iteh.ai)

For the purposes of this European Standard, the following terms and definitions and those given in EN 54-1 apply.

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#### **3.1 Definitions**

##### **3.1.1**

##### **A-weighted sound level**

sound pressure, expressed in dB(A), which is 20 times the logarithm to base ten of the ratio of the A-weighted sound pressure to the reference pressure of 20 µPa at 1 kHz

NOTE The A-weighting characteristics are given in IEN 61672-1:2003

##### **3.1.2**

##### **fire alarm sounder**

sounder generating device intended to signal an audible warning of fire between a fire detection and fire alarm system and the occupants of a building

##### **3.1.3**

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

one of a possible number of pre-defined sound of the audible alarm device which can be selected by means specified by the manufacturer

EXAMPLE Sound patterns, sound levels.

##### **3.1.4**

##### **reference point**

point representing the origin of the sound within or on the surface of the sounder as specified by the manufacturer



NOTE The reference point is used in Annex A.

### 3.1.5

#### sound pattern

pre-defined acoustic alarm signal

NOTE Sound pattern is also often referred to as tone.

### 3.1.6

#### supervisory sounder

audible device on a piece of equipment used for drawing attention to a change of status

NOTE Supervisory sounders are often mounted within the fire detection and fire alarm control and indicating equipment.

### 3.1.7

#### type A sounder

device primarily intended for indoor applications

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

### 3.1.8

#### type B sounder

device primarily intended for outdoor applications

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

### 3.1.9

#### volume control

means for adjusting sound level

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## 3.2 Abbreviations

AC Alternating current

DC Direct current

RMS Root mean square

VAD Visual alarm device

## 4 Requirements

### 4.1 Compliance

In order to comply with this standard, sounders shall meet the requirements of this clause, which shall be verified by visual inspection or engineering assessment and shall be tested as described in clause 5 and shall meet the requirements of the tests.

### 4.2 Sound level

The standard requires that the manufacturer declare sound levels in the data required under 4.6.2. The manufacturer may declare different sound levels for operation under different conditions, for example, when operating on different voltage ranges or with different sound patterns. If this is the case the sound level of each specimen shall be measured under each mode of operation (see 5.3).

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When tested in accordance with 5.3 the fire alarm sounder shall produce A-weighted sound levels of at least 65 dB in one direction.

NOTE A maximum sound level received by occupants may be specified by National regulations.

**4.3 Frequency and sound pattern**

This standard covers sounders which produce different frequencies and sound patterns and, therefore, does not specify a minimum and maximum frequency or specific sound pattern. However, the main sound frequency(ies), frequency range(s) and sound pattern(s) shall be declared in the data required under 4.8.2.

NOTE 1 The sound patterns and frequencies required may vary in different countries. Reference needs to be made to local regulations.

NOTE 2 Annex C gives information on some of the national standards that applies in Europe and on ISO 8201. ISO 8201 specifies a standard international evacuate signal.

**4.4 Requirements for voice sounders****4.4.1 General**

Voice sounders shall be capable of producing an audible warning signal and a voice message or messages.

All messages related to fire safety shall be declared by the manufacturer and shall be considered by the testing authority. The message determined to be worst case shall be subject to the conformance assessment.

NOTE 1 When selecting the worst case message, message length, loudness and repetition timing should be considered.

For messages that require immediate action, the warning signal and message sequence broadcast by the device shall be within the following limits:

- warning signal, lasting for 2 s to 10 s; followed by
- silence, lasting for 0,25 s to 2 s; followed by
- voice message; followed by
- silence, lasting for 0,25 s to 5 s.

The time for each cycle shall not exceed 30 s.

The periods of silence may need to be longer than indicated in certain circumstances, for example in spaces with long reverberation times, but shall not be such that the time between the start of each cycle exceeds 30 s.

NOTE 2 For other messages, it is permitted to extend either or both the silence period after the voice message and the period within which the message is repeated.

Access to the message recording function shall be restricted as specified in 4.7.4.

NOTE 3 Persons trained in the proper use of microphones should be used to record the messages. The recordings should be made in a room with a controlled acoustic environment having an ambient noise level not greater than 30 dBA and a reverberation time not greater than 0,5 s from 150 Hz to 10 kHz.

#### 4.4.2 Synchronization – Optional function

Voice alarm indicators may interact acoustically when they are installed in close proximity. To prevent this, voice sounders may have provision for synchronising warning signals and messages with that of other devices. Message synchronization shall meet the requirements of 5.20.3.

When power interruption is used for synchronisation purposes, this shall not adversely affect the warning signal or the voice message.

NOTE Synchronisation can be achieved by internal circuitry, the addition of a trigger wire connected between devices or by other means as defined by the manufacturer.

### 4.5 Construction

#### 4.5.1 Provision for external conductors

**4.5.1.1** The sounder 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.

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

#### 4.5.2 Materials

The sounder shall be constructed of material(s) capable of withstanding the tests described in 5.2 to 5.17. In addition, the material(s) of plastic enclosures shall meet the following flammability requirements:

EN 60695-11-10:1999 as amended by EN 60695-11-10:1999/A1:2003 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 consuming less than 15 W of power; <https://standards.itih.ai/catalog/standards/sist/ef92d52-21d9-4850-8c80-4976c21ee63e/osist-pren-54-3-2009>

EN 60695-11-20:1999 as amended by EN 60695-11-20:1999/A1:2003 Class 5VB for devices operating from a voltage source greater than 30 V RMS. or 42,4 V DC and consuming more than 15 W of power.

NOTE Verification of conformance to 4.5.2 a) and 4.5.2 b) can be carried out by examination of a Certificate of Conformity for the material used in the construction of the enclosure (see Annex D).

#### 4.5.3 IP ratings

The degree of protection provided by the enclosure of the sounders shall meet the following requirements:

for Type A audible alarm devices – Sounder: Code IP21C of EN 60529:1991 as amended by EN 60529:1991/A1:2000;

for Type B audible alarm devices – Sounder: Code IP33C of EN 60529:1991 as amended by EN 60529:1991/2000.

#### 4.5.4 Access

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

NOTE The use of a special tool is intended to discourage unauthorized persons from easily accessing the equipment.

**prEN 54-3:2009 (E)****4.6 On-site adjustment of the mode of operation**

If there is provision for on-site adjustment of the mode of operation of the sounder:

for each setting, at which the manufacturer claims compliance with this standard, the sounder shall comply with 4.5.4..

any setting(s), at which the manufacturer does not claim compliance with this standard, shall comply with 4.5.4 and:

for volume controls, the limits of the compliant range of sound levels shall be clearly marked on the sounder and shown in the associated data,

for sound pattern, the compliant setting(s) shall be clearly marked in the associated data.

NOTE These adjustments may be carried out at the sounder or at the control and indicating equipment.

**4.7 Durability**

The sounder shall be rated for at least 100 hours operation. No limitation by the manufacturer 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 5.4.

NOTE This requirement does not apply to the capacity of batteries which may be used within sounders 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.

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**4.8 Marking and data****4.8.1 Marking**

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Each fire alarm sounder shall be clearly marked with the following information:

number of this standard (i.e. EN 54-3);

environmental type, [i.e. Type A or Type B (see clause 3)];

name or trademark of the manufacturer or supplier;

manufacturer or supplier model designation (type or number);

terminal designations;

rated supply voltages or voltage ranges (AC. or DC.);

a mark(s) or code(s) (for example, 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.

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.

#### 4.8.2 Data

The information required in 4.7.1 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:

operating voltage range(s);

maximum and/or average current consumption, where applicable;

NOTE For sounders used in an addressable system, it may not be relevant to declare the current consumption as system configuration and the loading of addressable circuit(s) is configured at the control and indicating equipment.

for all modes of operation,

for all specified modes of operation for which compliance with this standard is claimed, the minimum A-weighted sound level in dB(A) at a distance of 1 m from the reference point of the device for the following directions of radiation:

surface mounted device: at 30° intervals from 15° to 165° through a semi-circular arc in front of the device and centred at the intersection of its normal mounting surface and its principal axis, for two perpendicular planes corresponding to the horizontal and vertical planes of the device in its designed position (see Annex A, Figure A3),

pole mounted device: at 30° intervals through a 360° circle centred at the intersection of the horizontal plane containing its principal axis and the vertical line through the geometric centre of the sound diffusing assembly for two perpendicular planes corresponding to the horizontal and vertical planes of the device in its designed position (see Annex A, Figure A3);

sound pattern(s) that comply with this standard and, where applicable, sound pattern(s) that comply with national standards;

IP code to EN 60529:1991 as amended by EN 60529:1991/A1:2000 ,

any other information necessary to allow correct installation, operation and maintenance of the device.

### 4.9 Additional requirements for software controlled sounders

#### 4.9.1 General

For sounders which rely on software control in order to fulfil the requirements of this standard, the requirements of 4.9.2, 4.9.3 and 4.9.4 shall be met.

#### 4.9.2 Software documentation

**4.8.2.1** The 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 standard and shall include at least the following:

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,
- 4) the way in which the software interacts with the hardware of the sounder,

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5) the way in which the modules are called, including any interrupt processing.

a description of which areas of memory are used for the various purposes (e.g. the program, site specific data and running data);

a designation, by which the software and its version can be uniquely identified.

**4.8.2.2** The manufacturer shall have available detailed design documentation, which only needs to be provided if required by the testing authority. It shall comprise at least the following:

an overview of the whole system configuration, including all software and hardware components;

c) a description of each module of the program, containing at least:

the name of the module,

a description of the tasks performed,

a description of the interfaces, including the type of data transfer, the valid data range and the checking for valid data.

d) full source code listings, as hard copy or in machine-readable form (e.g. ASCII-code), including all global and local variables, constants and labels used, and sufficient comment for the program flow to be recognized;

e) details of any software tools used in the design and implementation phase (e.g. CASE-tools, compilers).

**4.9.3 Software design**

**(standards.iteh.ai)**

In order to ensure the reliability of the sounder, the following requirements for the software design shall apply:

the software shall have a modular structure; <https://standards.iteh.ai/catalog/standards/sist/ef92d52-21d9-4850-8c80-976c21ee63e/osist-pren-54-3-2009>

the design of the interfaces for manually and automatically generated data shall not permit invalid data to cause error in the program operation;

the software shall be designed to avoid the occurrence of deadlock of the program flow.

**4.9.4 The storage of programme and data**

The programme necessary to comply with this standard and any preset data, such as manufacturer's settings, shall be held in non-volatile memory. Writing to areas of memory containing this program and data shall only be possible by the use of some special tool or code and shall not be possible during normal operation of the sounder.

Site-specific data shall be held in memory which will retain data for at least two weeks without external power to the sounder, unless provision is made for the automatic renewal of such data, following loss of power, within 1 h of power being restored.

## 5 Tests

### 5.1 General

#### 5.1.1 Atmospheric conditions for tests

Unless otherwise stated in a test procedure, the testing shall be carried out after the test specimen has been allowed to stabilize in the standard atmospheric conditions for testing described in EN 60068-1:1994, 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 test where these standard atmospheric conditions are applied.

#### 5.1.2 Operating conditions for tests

If a test method requires a specimen to be sounding, then the specimen shall be connected to suitable power supply equipment as specified in the data provided by the manufacturer. Where, in order to be sounding, a specimen also requires the application of a control signal or signals, this shall be provided in accordance with the data provided by the manufacturer and the control signals shall be arranged so that the specimen is in a non-sounding state.

Unless otherwise specified in the test procedure, the supply parameters applied to the specimen shall be set within the manufacturer's specified range(s) and shall remain constant throughout the tests. The value chosen for each parameter shall be the nominal value, or the mean of the specified range.

If the manufacturer has declared different sound levels for operation under different conditions (see 4.8.2), then, unless otherwise specified in the test procedure, the tests shall be conducted under one selected mode of operation only. Selection of the mode of operation shall be made with the aim to use that which consumes the most power. This will normally be the most continuous or the loudest mode.

NOTE All modes of operation and all voltages are tested in 5.3.

#### 5.1.3 Mounting arrangements

Unless otherwise specified, the specimen shall be mounted by its normal means of attachment in accordance with the manufacturer's instructions on a flat rigid backing board. If these instructions describe more than one method of mounting then the method considered to be most unfavourable shall be chosen for each test.

The detailed mounting arrangements are given in Annex A or Annex B for the different sound level tests used.

#### 5.1.4 Tolerances

The tolerances for the environmental test parameters shall be given in the basic reference standards for the test (e.g. the relevant part of EN 60068).

If a specific tolerance or deviation limit is not specified in a requirement or test procedure, then a deviation limit of  $\pm 5\%$  shall be applied.

#### 5.1.5 Provision for tests

The following shall be provided for testing compliance with this European Standard: