

Fire detection and fire alarm devices for dwellings —

Part 3: Specification for smoke alarm kits for deaf and hard of hearing people

ICS 11.180.99; 13.220.20

Committees responsible for this British Standard

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- British Fire Protection Systems Association
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- Consumer Policy Committee of BSI
- Department of Health — NHS Estates
- Energy Industries Council
- London Fire and Emergency Planning Authority
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Foreword

This part of BS 5446 has been prepared by Subcommittee FSH/12/2.

It is an addition to the BS 5446 series and specifies requirements and test methods for smoke alarm kits for deaf and hard of hearing people.

The start and finish of text introduced or altered by Amendment No. 1 is indicated in the text by tags **[A1]** **[A1]**.

Guidance on the siting, installation and maintenance of smoke alarms for deaf and hard of hearing people in dwellings, and on user actions, is given in BS 5839-6.

Product certification/inspection/testing. Users of this British Standard are advised to consider the desirability of third-party certification of product conformity with this British Standard. Appropriate conformity attestation arrangements are described in the appropriate part of the BS EN ISO 9000 series. Users seeking assistance in identifying appropriate conformity assessment bodies or schemes may ask BSI to forward their enquiries to the relevant association.

Attention is drawn to the Consumer Protection Act 1987 [1], the Batteries and Accumulators (Containing Dangerous Substances) Regulations 1994 [2] and the Electrical Equipment (Safety) Regulations 1994 [3].

It has been assumed in the preparation of this British Standard that the execution of its provisions will be entrusted to appropriately qualified and experienced people, for whose use it has been produced.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

Compliance with a British Standard cannot confer immunity from legal obligations.

Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 35 and a back cover.

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Introduction

Smoke alarms for use in dwellings have been available for many years, and are specified in BS 5446-1. These devices are intended to warn of the presence of a potential fire condition by emitting a loud piercing sound. However, people with hearing loss can be unaware of such an alarm sound.

There are recognized methods of alerting deaf and hard of hearing people, including the use of vibro-tactile and visual alarm devices. To provide a fire warning for those who are deaf or hard of hearing, it has become common practice for such devices to be coupled to domestic smoke alarms. For example, vibrating pads can be used to awaken deaf or hard of hearing people, and visual alarms to alert those already awake, in the event of the associated smoke alarm(s) detecting smoke. There has therefore been an increasing need for standardization of such smoke alarm systems. This part of BS 5446 addresses that need by specifying requirements for smoke alarm kits that include smoke alarms and associated warning devices used in dwellings to warn deaf and hard of hearing people in the event of fire. This standard does not claim to provide an exclusive or definitive solution to the problem of providing reliable fire safety protection to people with impaired hearing. It is recognized that other techniques or products might be developed which would currently fall outside the scope of this standard.

This standard includes tests and requirements for vibro-tactile and visual alarm devices, for smoke alarms by reference to BS 5446-1, and for the interconnections of these components. The tests specified in this standard are type tests and are not intended as manufacturers' tests to maintain uniformity of quality in production, which is dealt with in the BS EN ISO 9000 series. While the tests are intended to assess the most important features of the design and construction of the components of smoke alarm systems for deaf and hard of hearing people, they cannot remove the necessity for regular inspection and maintenance, which is essential for reliable operation.

The kits specified in this part of BS 5446 are specifically intended to give warning in the event of fire. However, it is recognized that smoke alarm systems might also be designed to alert deaf and hard of hearing people to events other than fire, such as door bell, telephone, alarm clock, baby alarm, carbon monoxide, etc. These are often referred to as multi-alerting systems. In such cases, it is essential to ensure that any additional signals given by the system or by any component of the kit are not confused with that of the smoke alarm.

The sound from a smoke alarm conforming to BS 5446-1 is intended to be audible during both day and night, but for a person with significant hearing loss, a combination of vibration and flashing light and sound is generally required in order to provide an equivalent level of protection. Some medical conditions might require specialist medical advice as to appropriate alarm equipment.

Since any smoke alarm that forms part of a kit for deaf and hard of hearing people is required to conform to BS 5446-1, it will incorporate a functioning sounder. BS 5446-3 therefore specifies requirements for the additional vibration and flashing light functions.

1 Scope

This part of BS 5446 specifies requirements and test methods for kits and their components intended to be assembled to create smoke alarm systems for deaf and hard of hearing people, for the purpose of life safety in dwellings. It also specifies requirements and test methods for such smoke alarm kits intended for use in leisure accommodation vehicles (LAVs).

NOTE 1 Although this part of BS 5446 provides the specification for smoke alarm kits for dwellings, it is recognized that these kits, or components thereof, might be used in other situations, where similar requirements could be anticipated.

This part of BS 5446 does not cover:

- the use of stand-alone smoke alarms;
- extensions or modifications to existing installations;
- outdoor use of any component of a kit.

NOTE 2 Equipment conforming to this part of BS 5446 might not be suitable for use in boats, due to the corrosive atmosphere.

This part of BS 5446 does not cover medical vibrating devices as defined in BS EN ISO 9999; these are covered by BS EN 12182.

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.

BS 5446-1:2000, *Fire detection and fire alarm devices for dwellings — Part 1: Specification for smoke alarms*.

BS 5839-6, *Fire detection and alarm systems for buildings — Code of practice for the design, installation and maintenance of fire detection and fire alarm systems in dwellings*.

BS 7671, *Requirements for electrical installations — IEE Wiring Regulations — Sixteenth edition*.

BS EN 60068-2-1, *Environmental testing — Part 2: Test methods — Section 2-1: Tests A — Cold*.

BS EN 60068-2-6, *Environmental testing — Part 2: Test methods — Section 2-6: Test Fc — Vibration (sinusoidal)*.

BS EN 60068-2-32:1993, *Environmental testing — Part 2: Test methods — Section 2-32: Test Ed — Free fall*.

BS EN 60068-2-42, *Environmental testing — Part 2: Test methods — Section 2-42: Test Kc — Sulphur dioxide test for contacts and connections*.

BS EN 60068-2-75, *Environmental testing — Part 2: Test methods — Section 2-75: Test Eh — Hammer tests*.

BS EN 60068-2-78, *Environmental testing — Part 2: Test methods — Section 2-78: Test Cab — Damp heat, steady state*.

BS EN 60529:1992, *Specification for degrees of protection provided by enclosures (IP code)*.

BS EN 60950-1, *Information technology equipment — Safety — Part 1: General requirements*.

BS EN ISO 2439:2001, *Flexible cellular polymeric materials — Determination of hardness (indentation technique)*.

BS EN ISO 13943, *Fire safety — Vocabulary*.

3 Terms and definitions

For the purposes of this part of BS 5446, the terms and definitions in BS 5446-1, BS 5839-6 and BS EN ISO 13943 and the following apply.

3.1

control unit

unit housing components for such functions as supply of power and monitoring of circuits

3.2

deaf or hard of hearing person

person who, as a result of a significant degree of hearing loss (including total hearing loss), is unable to rely on hearing audible alarm signals under typical conditions of use from smoke alarms conforming to BS 5446-1 without the use of a hearing aid

3.3

smoke alarm kit for deaf and hard of hearing people

number of components, including at least one smoke alarm, which, when the components are correctly interconnected **[A]** (wired or wireless) **[A]** and installed, constitutes a system for warning deaf and hard of hearing people in the event of fire

NOTE 1 This is referred to throughout the text as a “kit”.

NOTE 2 Components include any interconnecting cable needed.

NOTE 3 Further components might be necessary to extend the system.

3.4

system

interconnected and installed components of a kit

3.5

vibrating pad

device intended for installation underneath a mattress or pillow to rouse a deaf or hard of hearing person from sleep by subjecting the person to vibrations

3.6

vibrating pager

radio-linked device intended to alert a deaf or hard of hearing person, while awake, by subjecting the person to vibrations

NOTE If a separate charging unit is supplied for this component, it is considered to be part of the component.

4 General requirements for smoke alarm kits

A smoke alarm kit shall comprise at least one of each of the following items:

- a) smoke alarm (**5.1**);
 - b) control unit (**5.2**), which may be one self-contained unit or may be made up of several parts, each of which may be integrated with another component of the system;
 - c) visual alarm device (**5.3**);
 - d) vibrating pad (**5.4**);
 - e) power supply, which may be self-contained or may form a part or parts of other system components, e.g. control unit and smoke alarm;
- NOTE 1 Specific requirements for power supplies for control units are given in **5.2.3**.
- f) appropriate interconnecting cables (Clause **6**);
 - g) set of instructions for creating a system from the kit, and for operation of the system (Clause **8**).

When a vibrating pager is included in the kit, the associated radio transmission equipment (5.5 and 5.6) shall be supplied.

For any other radio-linked components, radio transmitter and receiver units shall be supplied as required (5.6).

NOTE 2 **[A₁]** Vibrating pagers are optional. **[A₁]**

NOTE 3 Specific requirements for power supplies for radio-linked systems are given in 5.6.6.

NOTE 4 For those who are unable to hear audible alarm signals from smoke alarms conforming to BS 5446-1 even with the use of a hearing aid, it might be necessary to provide additional visual alarm devices (5.3) and/or vibrating pads (5.4).

5 Requirements for components

NOTE The components of a kit should be suitable for use indoors in a domestic environment.

5.1 Smoke alarm

Every smoke alarm forming part of a kit shall conform to BS 5446-1 and to any additional requirements specified in this part of BS 5446.

NOTE Additional requirements given in this part of BS 5446 include requirements for connections and monitoring that are not needed for standard smoke alarms.

If the manufacturer claims that the smoke alarm kit is suitable for use in leisure accommodation vehicles (LAVs), then any smoke alarm(s) forming part of the kit shall meet the requirements of BS 5446-1:2000, Clause 30.

Every smoke alarm forming part of a kit shall be provided with the information specified in Clause 8.

5.2 Control unit

5.2.1 General

NOTE The control unit may be a separate self-contained component of the system, may be combined with another component, or may have its functions spread over more than one component of the system. It is usual for a kit to include a mains-operated control unit, incorporating a standby power supply, with a flashing warning beacon.

When tested in accordance with the general procedures specified in Annex A and the appropriate method specified in Annex B, in accordance with the test schedule given in B.1, control units shall meet the requirements specified in 5.2.2 to 5.2.9. If the manufacturer claims that the smoke alarm kit is suitable for use in leisure accommodation vehicles (LAVs), then control units shall also meet the requirements specified in 5.2.10.

Control units shall be marked in accordance with Clause 7 and shall be provided with the information specified in Clause 8.

5.2.2 Indicators

5.2.2.1 General

Indications from light-emitting indicators shall be visible in an ambient light intensity up to 500 lux, at any angle up to 22.5° from a line through the indicator perpendicular to its mounting surface, at a distance of 3 m.

Fire and fault warning indications shall be either steady or pulsing. If the indication is pulsing, the “on” and “off” periods shall be not less than 0.25 s, and the pulsing frequencies shall be not less than:

- 1 Hz for fire alarm indications;
- 0.2 Hz for fault indications.

5.2.2.2 Indication of power supply

When the control unit is connected in accordance with B.2.1, a visual indication shall be given by means of a steady green light-emitting indicator conforming to 5.2.2.1 to show that the system is supplied with power.

5.2.2.3 Indication of a fire alarm condition

When the control unit is tested in accordance with **B.2.1** and **B.2.2**, a visual indication shall be given upon the triggering of the alarm condition. This indication shall comprise a dedicated red light-emitting indicator conforming to **5.2.2.1**.

NOTE A dedicated red light-emitting indicator is not the same as an alarm device such as a visual alarm device or vibrating pad.

A1 The control unit shall respond to the triggering of an alarm condition at the smoke alarm within 3 s. Devices connected (wired or wireless) to the control unit shall be activated within a further 3 s. **A1**

5.2.2.4 Indication of a fault in the system

When the control unit is tested in accordance with **B.2.1** and **B.2.3**, a visual indication shall be given at the control unit (see Note 1) within **A1** 5 min **A1** of the occurrence of each of the fault conditions listed in the test method. This indication shall comprise an amber light-emitting indicator conforming to **5.2.2.1**.

NOTE 1 The low battery condition of the smoke alarm [see **B.2.3e**] may be indicated at either the control unit or the smoke alarm.

NOTE 2 A visual alarm device conforming to **5.3** may be used to provide additional indication of a fault condition.

5.2.2.5 Test facility

Where a test button is provided on the control unit, upon operation of the test button:

- a) the fire alarm outputs shall be given within 3 s, and shall continue until the test button is released; or
- b) an automated test sequence of these alarm outputs shall be visibly initiated within 3 s, and its duration shall not exceed 20 s.

5.2.3 Power supplies

5.2.3.1 General

NOTE 1 Control units normally feed power to vibrating pads, visual alarm devices, and smoke alarms (except where smoke alarms have primary battery power supplies).

The primary power supply for the control unit shall comprise a 230 V mains supply (see Note 2). A standby supply shall be provided in the form of a rechargeable secondary battery with an automatic charger.

NOTE 2 The mains voltage may be transformed and rectified as appropriate either within the control unit or within an external mains adaptor.

The mains connecting cable supplying power to the control unit shall be either permanently wired into the control unit or provided with a means of securing the cable to the control unit **A1** to prevent accidental disconnection **A1**.

A1 Note deleted **A1**

The marking of the power supplies for control units shall be in accordance with Clause 7.

5.2.3.2 Mains power supply

The connection to the mains power supply shall comprise a red plug [or a mains adaptor (see Note) if the supply to the system is at a lower voltage than mains voltage] marked with the text “Smoke alarm – DO NOT REMOVE PLUG OR SWITCH OFF” in white lettering on a red background, suitable for connection to a standard domestic 13 A socket.

NOTE A mains adaptor does not need to be red but it does need to be marked with white text on a red background.

When tested in accordance with **B.3.2**, the mains power supply shall be capable of supplying all the power for the kit, with the standby power supply (battery) disconnected.

5.2.3.3 Standby power supply

NOTE 1 The standby battery should be of a type that has an expected life of at least 4 years under the conditions of use likely to be experienced in the smoke alarm system. Where rechargeable batteries are used, information should be provided to indicate the period beyond which they should be replaced.

NOTE 2 The battery charger should be compatible with the batteries used.

When tested in accordance with **B.3**, the standby power supply shall be capable of supplying all the power for the kit with the mains supply disconnected for the period of 72 h, followed by 15 min in alarm condition.

When tested in accordance with **B.3**, the battery voltage at the end of the 15 min in alarm condition shall be greater than or equal to the minimum specified battery voltage [see **A.4.2d**].

5.2.4 Operation

When a fire alarm condition is simulated:

- a) the fire alarm outputs shall be given within 3 s;
- b) the fire alarm outputs shall continue until the fire alarm condition ceases.

5.2.5 Resistance to damp heat

When the control unit is tested in accordance with **B.4**:

- a) when the functional testing is carried out during the last 30 min of conditioning (**B.4.3**), a visual indication of power supply shall be given as specified in **5.2.2.2** upon connection of the control unit, and a visual indication of alarm shall be given as specified in **5.2.2.3** upon triggering of the alarm condition;
- b) when the functional testing is carried out after the recovery period (**B.4.4**):
 - 1) a visual indication of power supply shall be given as specified in **5.2.2.2** upon connection of the control unit;
 - 2) a visual indication of alarm shall be given as specified in **5.2.2.3** upon triggering of the alarm condition;
 - 3) a visual indication of fault condition shall be given as specified in **5.2.2.4** upon generation of each of the faults listed.

5.2.6 Resistance to corrosion

When the control unit is tested in accordance with **B.5**, when the functional testing is carried out after the recovery period (**B.5.2**), visual indications of power supply, alarm and fault condition shall be given as specified in **5.2.5b**).

5.2.7 Resistance to cold

When the control unit is tested in accordance with **B.6**:

- a) when the functional testing is carried out during the last 30 min of conditioning (**B.6.3**), a visual indication of power supply shall be given as specified in **5.2.2.2** upon connection of the control unit, and a visual indication of alarm shall be given as specified in **5.2.2.3** upon triggering of the alarm condition;
- b) when the functional testing is carried out after the recovery period (**B.6.4**), visual indications of power supply, alarm and fault condition shall be given as specified in **5.2.5b**).

5.2.8 Resistance to impact

NOTE This requirement is applicable only to control units that are intended for mounting on walls.

When the control unit is tested in accordance with **B.7**, visual indications of power supply, alarm and fault condition shall be given as specified in **5.2.5b**).

5.2.9 Resistance to dropping

NOTE This requirement is applicable only to control units that are intended for free-standing use (e.g. on a bedside table).

When the control unit is tested in accordance with **B.8**, visual indications of power supply, alarm and fault condition shall be given as specified in **5.2.5b**).

5.2.10 Smoke alarm kits suitable for use in leisure accommodation vehicles (LAVs)

If the manufacturer claims that the smoke alarm kit is suitable for use in leisure accommodation vehicles (LAVs), then visual indications of power supply, alarm and fault condition shall be given as specified in **5.2.5b**), when the control unit is tested in accordance with Annex C.

5.3 Visual alarm device

5.3.1 General

NOTE Examples of typical visual alarm devices include:

- flashing xenon beacon;
- continuously powered incandescent lamp with a rotating reflector;
- incandescent lamp powered to flash on and off;
- ultra-bright LED array.

When tested in accordance with the general procedures specified in Annex A and the appropriate method specified in Annex D, in accordance with the test schedule given in **D.1**, visual alarm devices shall meet the requirements specified in **5.3.2** to **5.3.8**. If the manufacturer claims that the smoke alarm kit is suitable for use in leisure accommodation vehicles (LAVs), then visual alarm devices shall also meet the requirements specified in **5.3.9**.

Visual alarm devices shall be marked in accordance with Clause 7 and shall be provided with the information specified in Clause 8.

If the visual alarm device $\boxed{A_1}$ incorporates a radio link $\boxed{A_1}$, the system shall conform to the additional requirements specified in **5.6**.

5.3.2 Colour and intensity of emitted light

The light from a visual alarm device shall be white and of an effective light intensity of not less than 15 cd.

When the visual alarm device is tested in accordance with **D.2**:

- a) when the alarm condition is triggered in the minimum voltage condition (**D.2.2.2** and **D.2.2.3**), the effective intensities measured for both the horizontal and the vertical dispersion shall be not less than the values given in Table 1, and the flash rate measured in the 0° position shall fall within the range of 30 to 130 flashes per minute after a delay of not more than 3 s;
- b) when the alarm condition is triggered in the maximum voltage condition (**D.2.2.4**), the effective intensity measured for the 0° position shall be not less than the value given in Table 1 and the flash rate shall meet the requirement specified in **5.3.2a**;
- c) if a further measurement is carried out in accordance with **D.2.2.5**, the effective intensity shall be not less than the value given in Table 1.

Table 1 — Minimum effective intensities

Dispersion angle degrees (°)	Effective intensity candela (cd)
0	15.0
±5 to ±25	13.5
±30 to ±45	11.25
±50	8.25
±55	6.75
±60	6.0
±65 and ±70	5.25
±75 and ±80	4.5
±85 and ±90	3.75

5.3.3 Durability

When the visual alarm device is tested in accordance with **D.3**, when the alarm condition is triggered (**D.3.3**), the effective intensity measured for the 0° position shall be not less than the value given in Table 1 and the flash rate shall meet the requirement specified in **5.3.2a**).

5.3.4 Resistance to damp heat

When the visual alarm device is tested in accordance with **D.4**:

- a) when the alarm condition is triggered during the last 30 min of conditioning (**D.4.3**), the flash rate shall meet the requirement specified in **5.3.2a**);
- b) when the alarm condition is triggered after the recovery period (**D.4.4**), the effective intensity measured for the 0° position shall be not less than the value given in Table 1 and the flash rate shall meet the requirement specified in **5.3.2a**).

5.3.5 Resistance to corrosion

When the visual alarm device is tested in accordance with **D.5**, when the alarm condition is triggered after the recovery period (**D.5.2**), the effective intensity measured for the 0° position shall be not less than the value given in Table 1 and the flash rate shall meet the requirement specified in **5.3.2a**).

5.3.6 Resistance to cold

When the visual alarm device is tested in accordance with **D.6**:

- a) when the alarm condition is triggered during the last 30 min of conditioning (**D.6.3**), the flash rate shall meet the requirement specified in **5.3.2a**);
- b) when the alarm condition is triggered after the recovery period (**D.6.4**), the effective intensity measured for the 0° position shall be not less than the value given in Table 1 and the flash rate shall meet the requirement specified in **5.3.2a**).

5.3.7 Resistance to impact

NOTE This requirement is applicable only to visual alarm devices that are intended for mounting on walls or ceilings.

When the visual alarm device is tested in accordance with **D.7**, when the alarm condition is triggered (**D.7.3**), the effective intensity measured for the 0° position shall be not less than the value given in Table 1 and the flash rate shall meet the requirement specified in **5.3.2a**).

5.3.8 Resistance to dropping

NOTE This requirement is applicable only to visual alarm devices that are intended for free-standing use (e.g. on a bedside table).

When the visual alarm device is tested in accordance with **D.8**, when the alarm condition is triggered (**D.8.2**), the effective intensity measured for the 0° position shall be not less than the value given in Table 1 and the flash rate shall meet the requirement specified in **5.3.2a**).

5.3.9 Smoke alarm kits suitable for use in leisure accommodation vehicles (LAVs)

If the manufacturer claims that the smoke alarm kit is suitable for use in leisure accommodation vehicles (LAVs), then the effective intensity measured for the 0° position shall be not less than the value given in Table 1 and the flash rate shall meet the requirement specified in **5.3.2a**), when the visual alarm device is tested in accordance with Annex C.

5.4 Vibrating pad

5.4.1 General

NOTE 1 Vibrating pads should be designed to be located under the mattress or pillow of a bed. The purpose of a vibrating pad is that, when energized, it vibrates with sufficient intensity to wake a sleeping deaf or hard of hearing person. It is desirable that a means be provided to prevent the vibrating pad from slipping out of position, particularly if it is located under the pillow.

NOTE 2 Examples of typical principles of operation for a vibrating pad include:

- electric motor and mechanical cam/eccentric;
- solenoid or other coil/armature arrangement.

NOTE 3 The connecting lead carrying the alarm signal should be retained at the point of entry to the pad, such that it is not possible for that lead to be pushed into or pulled out of the pad.

When tested in accordance with the general procedures specified in Annex A and the appropriate method specified in Annex E, in accordance with the test schedule given in **E.1**, vibrating pads shall meet the requirements specified in **5.4.2** to **5.4.7**. If the manufacturer claims that the smoke alarm kit is suitable for use in leisure accommodation vehicles (LAVs), then vibrating pads shall also meet the requirements specified in **5.4.8**.