BRITISH STANDARD

BS 7860 : 1996

Incorporating
Amendment No. 1

Specification for

Carbon monoxide detectors (electrical) for domestic use

ICS 13.320

Committees responsible for this British Standard

The preparation of this British Standard was entrusted by Technical Committee GEL/31, Electrical apparatus for explosive atmospheres, to Subcommittee GEL/31/19, Gas detectors, upon which the following bodies were represented:

Association of British Mining Equipment Companies
BLWA Ltd. (The Association of the Laboratory Supply Industry)
British Gas plc
Council of Gas Detection and Environmental Monitoring
Council for Electrical Equipment for Flammable Atmospheres (BEAMA Ltd.)
Engineering Equipment and Materials Users' Association
ERA Technology Ltd.
GAMBICA (BEAMA Ltd.)
Safety Equipment Association
SIRA Ltd.
Health and Safety Executive

The following bodies were also represented in the drafting of the standard, through panels:

Co-gas Safety
Consumer Policy Committee of BSI
Consumers' Association
Department of the Environment (Building Research Establishment)
Department of Trade and Industry (Consumer Safety Unit, C A Division)
Gas Consumers' Council
Institution of Gas Engineers
LP Gas Association
Royal Society for the Prevention of Accidents
Society of British Gas Industries

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Summary of pages

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Foreword

This British Standard has been prepared by subcommittee GEL/31/19. It applies to electrical apparatus which detects the presence of carbon monoxide (CO) at a particular location inside domestic premises. The apparatus gives an alarm when a particular concentration of the gas in air, measured in parts per million at the detector, is maintained for a period in excess of a specified time.

It is emphasized that a CO detection device should not be seen as a substitute for proper installation and servicing of fuel-burning appliances, or sweeping of chimneys. Such omissions, together with blocking of normal ventilation routes, have been found to be the cause of most hazardous accumulations of CO in domestic premises. Equally, a CO detector is not a substitute for a smoke alarm or a combustible gas detector.

This standard also specifies requirements for units fitted with an optional "hush" feature. The purpose of this feature is to effect a temporary reduction of amplitude of an audible alarm signal in order to allow the user time to think and to take appropriate action. A hush feature is designed so as to operate only at lower CO concentrations and only once during any exposure to CO.

Annex A of this standard describes the effects of the accumulation of carbon monoxide in the human bloodstream.

Product certification. Users of this British Standard are advised to consider the desirability of third party certification of product conformity to this British Standard, based on testing and continuing product surveillance which may be coupled with assessment of a supplier's quality systems against the appropriate standard in the BS EN ISO 9000 series.

Enquiries as to the availability of third party certification schemes are forwarded by BSI to the Association of British Certification Bodies. If a third party certification scheme does not already exist, users should consider approaching an appropriate body from the list of Association members.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Specification

1 Scope

This British Standard specifies general requirements for the construction, testing and performance of electrically operated gas detection apparatus, designed for continuous use in domestic premises, to give a warning alarm in the event of a hazardous accumulation of carbon monoxide (CO). Such apparatus is aimed at enabling a room occupant to react before being exposed to significant risk, but without creating false alarms (see annex A).

NOTE 1. Conformity to this standard does not imply that the apparatus is suitable for non-domestic installations.

NOTE 2. Apparatus conforming to this standard may not protect people who are at special risk from CO exposure, by reason of age or medical condition for example.

2 Normative references

This British Standard incorporates, by dated or undated reference, provisions from other publications. These normative references are made at the appropriate places in the text and the cited publications are listed on the inside back cover. For dated references, only the edition cited applies; any subsequent amendments to or revisions of the cited publication apply to this standard only when incorporated in the reference by amendment or revision. For undated references, the latest edition of the cited publication applies, together with any amendments.

3 Definitions

For the purposes of this British Standard, the following definitions apply.

3.1 ambient air

The normal atmosphere surrounding the apparatus.

3.2 clean air

Ambient air which is free of carbon monoxide and interfering or contaminating substances.

3.3 domestic premises

Any place of residence of a household, family or person (whether temporary or permanent), including boats and caravans, but not including sea-going vessels or commercial premises.

3.4 latching alarm

An alarm which, once activated, requires deliberate action to deactivate or reset it.

3.5 sensor

An assembly in which the sensing element is housed, and which may contain associated electronic components.

3.6 gas concentration

The amount of CO present in the ambient air, expressed as parts per million (ppm) by volume.

3.7 mains-powered

Apparatus designed to be energized by a normal domestic mains electrical supply, with or without battery back-up.

3.8 battery-powered

Apparatus designed to be energized from batteries alone, with the batteries either internal or external to the apparatus.

3.9 hush feature

An optional function that enables a short duration reduction of an audible alarm signal.

3.10 portable apparatus

A compact gas detecting instrument, intended for continuous use, that can be readily transferred from one location to another.

4 Construction, labelling and instructions

4.1 General requirements

The apparatus shall reliably detect the presence of carbon monoxide in domestic premises under the stated application conditions, and shall produce an audible and a visual alarm. It shall function safely under all conditions of use.

In general this principle is achieved by fulfilling the relevant requirements specified in this standard and conformity is checked by carrying out all the relevant tests.

NOTE. Attention is drawn to the fact that apparatus intended for use in boats may be required to meet additional requirements from the National Rivers Authority, the Broads Authority or British Waterways.

4.2 Construction

4.2.1 *General*

All parts of the apparatus, including the sensor, shall be constructed of materials not likely to be permanently affected by steam, other vapours and gases or chemical substances normally to be expected in a domestic environment.

Design of the apparatus shall be such that all materials used in the construction and all components, including electrical and electronic components, shall be suitable for their application and shall be used within the manufacturer's ratings or limits, as specified by the material or components supplier, unless otherwise certified by the manufacturer.

The overall protection of the enclosure shall be IP42 or better (as specified in BS EN 60529).

4.2.2 ***Indicators and alarms; requirements for construction and operation***

4.2.2.1 Visual indicators shall be fitted and coloured as follows.

a) For mains-powered apparatus the power supply indicator shall be coloured green, and shall be continuously illuminated during normal operation. For battery-powered apparatus the indicator shall be either:

1) continuously illuminated during normal operation; or

2) pulsed at a frequency of at least one pulse per minute during normal operation; or

3) operated by a special battery test button.

b) The alarm indicator shall be red or orange and shall have an intensity of at least 10 mcd, and a total viewing angle of 120° or more.

NOTE. In order to avoid confusion with similar domestic alarm devices, it may pulse at between 2 Hz and 5 Hz.

c) The indicators shall be labelled to show their function.

4.2.2.2 The apparatus shall have an audible alarm which, when tested in accordance with **5.3.2**, has an average output sound level of at least 85 dB(A) at 3 m.

NOTE. In order to avoid confusion with similar domestic alarm devices, output may be frequency or amplitude modulated at between 2 Hz and 5 Hz.

4.2.2.3 Visual and audible alarms shall operate as follows.

a) They shall not be activated within 60 min when exposed to 45 ppm CO/air mixture.

b) They shall be activated within 30 min when exposed to 150 ppm CO/air mixture, but not before 10 min.

c) They shall be activated within 6 min when exposed to 350 ppm CO/air mixture.

For apparatus incorporating a hush feature:

d) they also shall be activated in accordance with **5.3.12**.

Alarms shall remain activated for gas concentrations up to at least 5000 ppm.

NOTE. This may be accomplished by the use of latching alarms, if necessary.

It shall not be possible to make external adjustments that affect the sensitivity of the apparatus.

4.2.2.4 Apparatus which derives its power from internal batteries shall give an audible battery fault warning for a period of at least 30 days before the battery capacity falls to a point where either the apparatus sensitivity falls outside the requirements of **4.2.2.3** or the apparatus is unable to meet the alarm requirement of **4.2.2.2**. The battery fault warning shall be easily distinguished from the alarm.

The batteries specified by the manufacturer shall be capable of supplying the quiescent load of the apparatus, together with the additional load from any routine testing (see **4.3.3**g) recommended by the manufacturer, for at least one year before the battery fault warning is given. At the point when the battery fault warning commences, the batteries shall have sufficient capacity to give an alarm signal as specified in **4.2.2.2**, for at least 30 min, followed by a battery fault warning for at least 21 days.

4.2.2.5 Battery-powered apparatus shall give an immediate audible or visual indication of correct battery connection. This may be accomplished by use of a test button.

4.2.3 ***Safety requirements***

4.2.3.1 Mains-powered apparatus shall be provided with means of connection to the supply, in accordance with clause **25** of BS EN 60335-1 : 1995. For plug-in apparatus, the pins shall conform to the relevant specification.

4.2.3.2 The apparatus shall be so designed and constructed as to present no danger either in normal use or under fault conditions, providing particularly:

– personal protection against electric shock;

– protection against the effects of excessive temperature;

– protection against fire.

The apparatus shall be of one of the following classes with respect to protection against electric shock, in accordance with BS EN 60335-1: class I, class II, class III.

Mains-powered apparatus shall be tested, under normal operating conditions and under fault conditions in accordance with **4.2** and **4.3** of BS EN 60065 : 1994, for conformity to the following requirements.

a) *Heating under normal conditions*

The apparatus shall conform to the requirements of clause **7** of BS EN 60065 : 1994.

b) *Shock hazard under normal operating conditions*

When mounted in any orientation on a vertical surface or on the underside of a horizontal surface, the apparatus shall conform to the requirements of clause **9** of BS EN 60065 : 1994.

The requirement of **9.1.7** of BS EN 60065 : 1994 also applies to the pins of an appliance inlet on the apparatus following withdrawal of the connector attached to the mains supply wires.

When tested for IP42 in accordance with **12.2** and **12.3** of BS EN 60529 : 1992, it shall not be possible to contact any live parts when the test wire is applied.

c) *Insulation requirements*

Apparatus intended to be operated from a supply greater than 42 V a.c. peak or d.c. shall conform to the requirements of clause **10** of BS EN 60065 : 1994, disregarding the test specified for **10.1** of that standard.

d) *Fault conditions*

The apparatus shall conform to the requirements of clause **11** of BS EN 60065 : 1994.

e) *Parts connected to the mains supply*

Such parts shall conform to the requirements of clause **13** of BS EN 60065 : 1994.

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f) *Components*

Resistors, capacitors, inductors and transformers, the short circuiting or disconnecting of which would result in non-conformity to the requirements for operation under fault conditions in respect of overheating, fire or shock hazard, shall conform to the relevant requirements of clause **14** of BS EN 60065 : 1994.

Fusing and interrupting devices, mains switches, protective switches, voltage setting devices and the housing arrangements for batteries shall conform to the relevant requirements of clause **14** of BS EN 60065 : 1994.

g) *Resistance to the effects of heat and fire*

The apparatus shall conform to the requirements of **4.4.1**, **4.4.2**, **4.4.3**, **4.4.4**, **4.4.5**, and **4.4.6** of BS EN 60950 : 1992. In these subclauses reference to **5.1** shall be read as reference to clause **7** of BS EN 60065 : 1994; reference to **1.5.4** shall be disregarded; reference to **4.3.14**, **4.3.15** and **4.3.16** shall be read as references to **9.3.11** of BS EN 60065 : 1994; reference to **4.2.1** shall be disregarded.

4.2.4 *Degree of mechanical strength and protection*

4.2.4.1 When tested in accordance with the protection rating IP42 specified in BS EN 60529 : 1992, the apparatus, when subjected to penetration by a solid object or ingress of water, shall conform to the safety requirements specified in **4.2.3**, and there shall be no damage to the appratus.

Apparatus fitted with accessories such as knobs and handles shall conform to **12.2** of BS EN 60065 : 1994.

Mains powered apparatus shall withstand an impact energy of 2 J when tested as described in **B.1** of BS 6941 : 1988. In addition, portable, free-standing apparatus, whether mains or battery powered, shall conform to **12.1.1**, **12.1.2** and **12.2** of BS EN 60065 : 1994.

4.2.4.2 Portable, free-standing equipment, after having been subjected to a drop test in accordance with **5.3.8**, shall operate in accordance with **4.2.2.3**. When exposed to clean air, recovery from the alarm state shall occur, after manual resetting if necessary, within 6 min.

4.2.4.3 Apparatus intended for use in boats or touring caravans shall also be designed to withstand the vibration and temperature conditioning specified in **23.10** of BS 5446 : Part 1 : 1990, when subsequently tested in accordance with **5.3.1** of this standard.

4.2.5 *Electromagnetic compatibility*

4.2.5.1 *Performance requirements*

The apparatus shall conform to BS EN 50081-1 : 1992 on electromagnetic emission.

The apparatus shall suffer no loss of function nor give any alarm when tested in accordance with BS EN 50082-1 : 1992 on electromagnetic immunity.

4.2.5.2 *Test*

The apparatus, including the sensor and interconnecting wiring, is tested in clean air, for electromagnetic compatibility in accordance with BS EN 50081-1 : 1992 and BS EN 50082-1 : 1992.

4.3 Labelling and instructions

4.3.1 *Identification*

Durable label(s) shall be carried on the apparatus, or moulded into the casing, giving the following information:

a) the manufacturer's or supplier's name, trademark or other means of identification;

b) the type of apparatus, e.g. 'carbon monoxide alarm', and model name or number;

c) the number and year of this British Standard;

d) the manufacturer's serial number and/or production batch date code;

e) the mains supply, if appropriate, marked in accordance with **5.3** of BS EN 60065 : 1994;

f) replacement battery requirements, if appropriate.

Items a) to c) shall be clearly visible when the apparatus is installed in the normal position. Item f) shall be clearly visible if batteries are being changed.

After testing in accordance with annex A of BS 7348 : 1990, the label(s) shall not be removable and shall be legible, with no curling.

4.3.2 *Cautions*

All gas detection apparatus shall carry the following warning, either on a label attached to the apparatus, or on a removable label tied to it:

'Caution. Read and follow the manufacturer's instructions, which should be retained'.

4.3.3 *Instructions*

The apparatus shall be provided with an instruction booklet or leaflet, conforming to BS 4884 : Part 1 :1992. This shall give complete, clear and accurate instructions for the installation, safe and proper operation and regular checking of the apparatus, and shall include the following:

a) the correct operating voltage, frequency, fuse-rating and method of connection for mains-powered units;

b) the correct battery type(s), the method of replacing batteries and the method for verifying that this has been done correctly;

c) warnings against the use of the apparatus on an intermittent basis, or as a portable detector for the spillage of combustion products from fuel-burning appliances or chimneys;

d) an explanation of all warnings and other indications, including resetting and hush features, where relevant;

e) the wording of annex B, which specifies where to locate the detector and the actions to be taken when the apparatus alarms, together with drawings or diagrams where applicable;

f) warning of the possible hazards of electric shock or malfunction, if tampered with;

g) guidance on the life expectancy of the apparatus (and batteries, if appropriate) and any recommendations on routine testing frequency and procedure, where relevant;

h) warning that a CO detection device shall not be seen as a substitute for proper servicing of fuel-burning appliances, or sweeping of chimneys, or as a substitute for either a smoke alarm or a combustible gas detector;

i) the warning given in **4.3.4**;

j) details of the limitations of:

1) temperature range;

2) humidity range;

3) supply voltage range.

k) details of warm-up time for:

1) initial switch-on;

2) mains-powered apparatus after mains power failure or mains switch-off;

3) battery-powered apparatus after battery replacement.

l) statement of the life of the battery when the battery-powered detector is in the alarm condition, and giving advice that the detector will not protect against the risk of CO poisoning when the battery has drained.

4.3.4 *Packaging*

The apparatus packaging shall either carry the same information as in **4.3.1** a), b), c) and e) or shall allow it to be clearly seen. The packaging shall also carry the instruction that the detector is to be installed according to the manufacturer's instructions, together with the following warning:

'APPARATUS CONFORMING TO THIS STANDARD MAY NOT PROTECT PEOPLE WHO ARE AT SPECIAL RISK FROM CARBON MONOXIDE EXPOSURE BY REASON OF AGE, PREGNANCY OR MEDICAL CONDITION. IF IN DOUBT, CONSULT YOUR MEDICAL PRACTITIONER.

A CARBON MONOXIDE DETECTOR IS NOT A SUBSTITUTE FOR A SMOKE ALARM OR A COMBUSTIBLE GAS DETECTOR.'

5 Type testing

5.1 General

5.1.1 *Performance requirements*

The performance requirements for type testing are that when tested in accordance with **5.3.1**:

a) the alarm shall not be activated during or after procedure b) or before the first 10 min of procedure d);

b) the alarm shall be activated within the time limits specified in procedures d) and f). Following both procedures d) and f), the apparatus shall recover from the alarm state, after being reset if necessary, within 6 min in clean air.

The apparatus shall conform to all the requirements specified for a particular test.

5.1.2 *Samples and sequence of tests*

For the purposes of type testing, one sample of the apparatus shall be subjected to the tests given in **5.3.2** to **5.3.8**, but a further sample may be used for the test in **5.3.9**. The tests in **5.3.2** to **5.3.9** may be performed in a sequence chosen at the discretion of the test house, but tests shall first be carried out to ensure that the apparatus satisfies the appropriate constructional requirements of **4.2**.

5.1.3 *Preparation of samples*

The sample apparatus shall be prepared and mounted in accordance with the manufacturer's instructions (see **4.3.3**).

5.1.4 *Test mask or chamber*

The apparatus shall be tested either in a suitable test chamber or using a mask to present test gases to the sensor unit. The construction of the test chamber shall be such as to ensure that the gas sensor is exposed to a specific concentration of test gas in a reproducible manner.

When a mask is used, the design and operation of the mask shall not have an inadmissible influence on the measurement.

5.2 Conditions for tests

5.2.1 *General*

The normal test conditions specified in **5.2.2** to **5.2.7** shall be used for all tests. Unless otherwise stated, all tests shall be carried out in clean air or test gas, as appropriate. Before commencing any test, the apparatus shall be switched on in clean air, for a minimum period of 1 h.

5.2.2 *Test gas*

The apparatus shall be tested with 45 ppm, 150 ppm and 350 ppm CO/air mixtures. The tolerance on the test gas shall not exceed 10 % of concentration by volume. The test gas concentration shall be known within ± 2 % of concentration by volume. For the over-range test (see **5.3.9**) the apparatus shall be tested with a 5000 ppm CO/air mixture to the same tolerance.

For the test of **5.3.10** a 600 ppm ethanol/air mixture by volume shall be used, with a tolerance of ± 100 ppm.

5.2.3 *Air velocity*

Unless otherwise specified for the particular test, the velocity of clean air or test gas in the vicinity of the sensor shall not be greater than 0.5 m/s in any direction.

5.2.4 *Power supply*

Unless otherwise specified for the particular test, voltages shall be within ± 2 % of the nominal values quoted by the manufacturer.

5.2.5 *Temperature*

Unless otherwise specified for the particular test, the ambient air and test gas shall be at a constant temperature ± 2 °C, within the range 17 °C to 23 °C for the duration of each test.

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5.2.6 ***Humidity***

Unless otherwise specified for the particular test, the ambient air and test gas shall be at a constant relative humidity ± 5 % r.h., within the range 40 % r.h. to 60 % r.h. for the duration of each test. This shall not apply for temperatures below 0 °C. At temperatures below 0 °C, the water vapour content of the atmosphere shall be that of air in equilibrium with ice at the relevant temperature.

5.2.7 ***Pressure***

The tests shall be performed at any atmospheric pressure between 86 kPa and 106 kPa.

5.3 Performance test methods

5.3.1 ***General***

The test procedure to be used is as follows.

a) Ensure that the apparatus is switched on and allowed to warm up for the period recommended by the manufacturer.

b) Expose to the 45 ppm CO/air test gas for 60 min.

c) Expose to clean air for 15 min.

d) Expose to the 150 ppm CO/air test gas for 30 min.

e) Expose to clean air for 15 min.

f) Expose to the 350 ppm CO/air test gas for 6 min.

g) Expose to clean air for 15 min.

h) After the full sequence of tests has been carried out, check any external label(s) for legibility.

5.3.2 ***Alarm sound level***

Mount the apparatus on a flat surface which is at least 3 m from any other surface. Measure the average sound level of the audible alarm signal to establish conformity to **4.2.2.2**.

5.3.3 ***Unpowered storage***

Expose the apparatus (including the battery, if the manufacturer supplies this item with the product) sequentially to a temperature of (−10 ± 2) °C for 24 h, (20 ± 2) °C for 24 h, (40 ± 2) °C for 24 h and (20 ± 2) °C for 24 h. Then energize the apparatus, and test it in accordance with **5.3.1**.

5.3.4 ***Supply voltage***

Test mains-powered apparatus in accordance with **5.3.1**, with the supply voltage at the maximum and minimum variations permitted by BS 7697.

5.3.5 ***Temperature***

Expose the apparatus to a temperature of (−5 ± 2) °C for at least 6 h and then test it in accordance with **5.3.1**.

Expose the apparatus to a temperature of (40 ± 2) °C for at least 6 h and then test it again in accordance with **5.3.1**.

5.3.6 ***Humidity***

Expose the apparatus to (30 ± 5) % r.h. at (15 ± 2) °C for at least 1 h, and then test it in accordance with **5.3.1**.

Expose the apparatus to (90 ± 5) % r.h. at (40 ± 2) °C for at least 1 h, and then test it in accordance with **5.3.1**.

5.3.7 ***Wind velocity***

Test the apparatus in accordance with **5.3.1**, when exposed to a wind velocity of (1.2 ± 0.05) m/s, across its face.

5.3.8 ***Drop test***

Drop the apparatus from a height of 1 m, in each of three mutually perpendicular attitudes, onto a concrete floor. Then test the apparatus in accordance with **5.3.1**.

5.3.9 *Battery fault warning*

With the batteries removed, connect the apparatus to the circuit illustrated in figure 1.

With the series resistor R set to zero, decrease the supply voltage in steps of 0.1 V, at intervals of at least 1 min until the battery fault alarm is given. Maintain the supply voltage at this level and test the apparatus in accordance with **5.3.1**.

With the supply voltage set to the rated battery voltage, increase the value of the series resistor from zero, in increments of 0.1 Ω at intervals of at least 1 min, until the battery fault alarm is given. Set the series resistor at this value and test the apparatus in accordance with **5.3.1**.

5.3.10 *Stability and over-range*

Energize the apparatus in clean air for a continuous period of 3 months. Test it once per month, firstly in accordance with **5.3.1**, and then exposed to a 5000 ppm CO/air mixture for 15 min, during which time the alarm shall remain activated.

When exposed to clean air, the apparatus shall recover from the alarm state within 30 min, after being reset if necessary.

5.3.11 *Test for interfering gases or vapours*

Switch the apparatus on and allow it to warm up in clean air for the period recommended by the manufacturer, with a minimum of 1 h.

Expose the apparatus to the 600 ppm ethanol/air test gas for 15 min. The alarm shall not be activated.

5.3.12 *Hush feature*

For apparatus incorporating a hush feature, the following test procedure shall be used in addition to that specified in **5.3.1**.

Expose the apparatus to a CO concentration of 150 ppm until an audible alarm signal is obtained, then operate the alarm hush feature. Maintain the CO level at 150 ppm.

The audible alarm signal shall reinstate within 6 min.

Once the audible alarm signal has reinstated, operate the hush feature again and maintain the CO level at 150 ppm.

The audible alarm shall remain activated.

Expose the apparatus to clean air for 15 min.

Expose the apparatus to a CO concentration of 350 ppm until an audible alarm signal is obtained, then operate the alarm hush feature. Maintain the CO level at 350 ppm.

The audible alarm shall remain activated.

Expose the apparatus to clean air for 15 min.

Expose the apparatus to a CO concentration of 150 ppm until an audible alarm signal is obtained, then operate the alarm hush feature. Maintain the CO level at 150 ppm.

The audible alarm signal shall reinstate within 6 min.

Once the audible alarm signal has reinstated, operate the hush feature again and maintain the CO level at 150 ppm.

The audible alarm shall remain activated.

6 Routine verification of performance

Before despatch, test each unit with a CO/air mixture for conformity to either **4.2.2.3**b or **4.2.2.3**c.

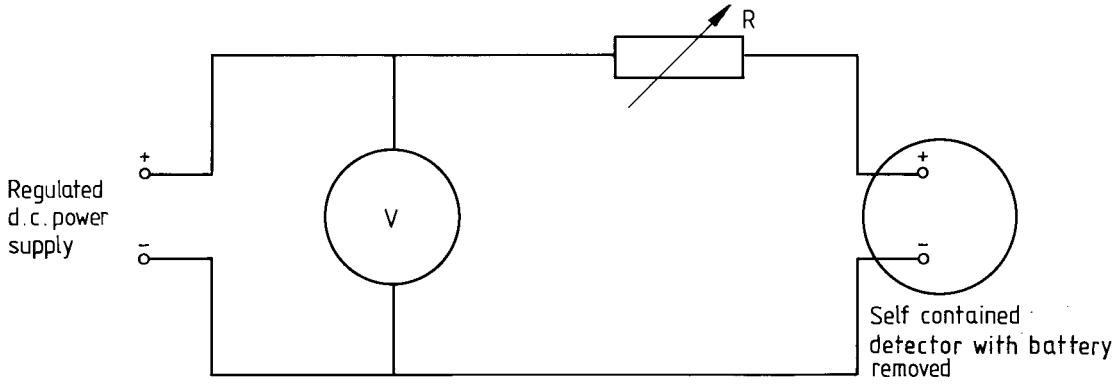

Figure 1. Battery fault warning test circuit

Annexes

Annex A (informative)

Carbon monoxide in domestic premises

Carbon monoxide (CO) is a colourless and odourless gas, which is toxic because of its ability to combine reversibly with haemoglobin in the blood. Like oxygen, CO absorbs into the blood through the lungs, and desorbs from the body by the same route. The product formed in the red blood cells is carboxyhaemoglobin (COHb) which is much more stable than oxyhaemoglobin (O_2Hb) although the processes of absorption and desorption of CO are much slower than for oxygen.

An accumulation of COHb in the blood not only reduces its oxygen carrying capacity, but also the ability of the remaining O_2Hb to release oxygen to the tissues. If the CO level in the inhaled air is constant, the level of COHb in the blood will approach a well defined equilibrium. However, the rate at which this equilibrium is reached depends on many factors, e.g. lung ventilation rate (i.e. the level of physical activity), blood volume, lung health and the oxygen concentration in the ambient air.

From a consideration of all the various factors, BSI committee GEL/31/19 has determined that, for the purposes of this standard, COHb levels in the bloodstream of people in domestic premises should be less than 20 % in worst case conditions, and less than 10 % under typical conditions (see table A.1).

It is possible to experience harmless releases of CO at low concentrations for short durations inside domestic premises, for example during initial start-up of some cookers or fires. It is therefore necessary to include a minimum response limit for the apparatus in order to prevent nuisance to room occupants.

Table A.1 Health effects of carboxyhaemoglobin in the blood

% COHb	Health effect
0.1 − 1	Normal background endogenous level (higher during pregnancy, in new-born infants and anaemic patients).
1 − 5	Selective increase in blood-flow to vital organs, to compensate for reduced oxygen carrying capacity of the blood.
5 − 10	Visual light threshold increased. No subjective effects.
10 − 20	Tightness across forehead. Mild headache.
20 − 30	Headache and nausea. Fine manual dexterity impaired.
30 − 40	Severe headache, dizziness, nausea and vomiting.
40 − 50	Increased pulse and respiration rate. Collapse.
50 − 60	Intermittent convulsions. Coma.
60 − 70	Depressed heart action. Death possible.
70 − 80	Weak pulse and slowed respiration. Death likely.

Annex B (normative)

Wording of the instructions for the location of the detector and actions when the alarm is activated

IN WHICH ROOM TO PUT THE DETECTOR

Ideally, you should have a detector in or near every room that contains a fuel burning appliance.

However, if you have more than one appliance, but only one detector, you should take the following into consideration when deciding where best to put the detector.

If there is an appliance in the room where you sleep, you should put the detector in that room.

If there is an appliance in a room that you use a lot, e.g. a sitting room, you should put it in that room.

If you live in a bedsit, put the detector as far away from the cooking appliances as possible, but near to the place where you sleep.

If the appliance is in a room not normally used (e.g. a boiler room), put the detector just outside the room so that you will be able to hear the alarm more easily.

WHERE TO PLACE THE DETECTOR

The recommended position for the detector should be at least 1.5 metres (5 feet) above floor level unless the manufacturer specifies otherwise.

The detector should be at least 1.85 metres (6 feet) from the appliance.

DO NOT PUT THE DETECTOR:

Outside the building.

In or below a cupboard.

In a damp or humid area.

Directly above a sink or cooker.

Next to a door or window or anywhere that it would be affected by draughts.

Where it would be obstructed by curtains or furniture.

In an area where the temperature could drop below −5 °C or rise above 40 °C.

Where dirt or dust could block the sensor and stop it working.

Where it could be easily knocked or damaged, or where it could be accidentally turned off or removed.

WHAT TO DO WHEN THE ALARM SOUNDS:

Open the doors and windows to ventilate.

Turn off the appliance where possible and stop using the appliance.

In the case of a detector incorporating a hush feature, follow the manufacturer's instructions.

Evacuate the property leaving the doors and windows open. A latching alarm will need to be reset in accordance with the user instructions.

Ring your gas or other fuel supplier on their emergency number; keep the number in a prominent place.

Do not re-enter the property until the alarm has stopped.

Get medical help immediately for anyone suffering the effects of carbon monoxide poisoning (headache, nausea), and advise that carbon monoxide poisoning is suspected.

Do not use the appliance again until it has been checked by an expert. In the case of gas appliances this must be a CORGI registered installer.

List of references

Normative references

BSI publications

BRITISH STANDARDS INSTITUTION, London

BS 4884	*Technical manuals*
BS 4884 : Part 1 : 1992	*Specification for presentation of essential information*
BS 5446	*Components of automatic fire alarm systems for residential premises*
BS 5446 : Part 1 : 1990	*Specification for self-contained smoke alarms and point-type smoke detectors*
BS 6941 : 1988	*Specification for electrical apparatus for explosive atmospheres with type of protection N*
BS 7348 : 1990	*Specification for electrical apparatus for the detection of combustible gases in domestic premises*
BS 7697 : 1993	*Nominal voltages for low voltage public electricity supply systems*
BS EN ISO 9000	*Quality systems*
BS EN 50081	*Electromagnetic compatibility. Generic emission standard*
BS EN 50081-1 : 1992	*Residential, commercial and light industry*
BS EN 50082	*Electromagnetic compatibility. Generic immunity standard*
BS EN 50082-1 : 1992	*Residential, commercial and light industry*
BS EN 60065 : 1994	*Safety requirements for mains operated electronic and related apparatus for household and similar general use*
BS EN 60335	*Safety of household and similar electrical appliances*
BS EN 60335-1 : 1995	*General requirements*
BS EN 60529 : 1992	*Degrees of protection provided by enclosures (IP code)*
BS EN 60950 : 1992	*Specification for safety of information technology equipment, including electrical business equipment*

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