BRITISH STANDARD

BS EN 54-10:2002

Incorporating Amendment No. 1 and Corrigendum No. 1

Fire detection and fire alarm systems —

Part 10: Flame detectors — Point detectors

The European Standard EN 54-10:2001, with the incorporation of amendment A1:2005, has the status of a British Standard

ICS 13.220.20

BSI British Standards

National foreword

This British Standard is the official English language version of EN 54-10:2001 including amendment A1:2005.

The UK participation in its preparation was entrusted by Technical Committee FSH/12, Fire detection and alarm systems, to Subcommittee FSH/12/2, Fire detectors, which has the responsibility to:

— aid enquirers to understand the text;

— present to the responsible international/European committee any enquiries on the interpretation, or proposals for change, and keep UK interests informed;

— monitor related international and European developments and promulgate them in the UK.

A list of organizations represented on this subcommittee can be obtained on request to its secretary.

Cross-references

The British Standards which implement international or European publications referred to in this document may be found in the *BSI Catalogue* under the section entitled "International Standards Correspondence Index", or by using the "Search" facility of the *BSI Electronic Catalogue* or of British Standards Online.

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Summary of pages

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16593 Corrigendum No. 1	29 September 2006	Correction to EN foreword

EUROPEAN STANDARD

NORME EUROPÉENNE

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EN 54-10

January 2002

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English version

Fire detection and fire alarm systems - Part 10: Flame detectors - Point detectors

Systèmes de détection et d'alarme d'incendie - Partie 10: Détecteurs de flamme - Détecteurs ponctuels

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This European Standard was approved by CEN on 3 November 2001.

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. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Management Centre or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Management Centre has the same status as the official versions.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
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EUROPÄISCHES KOMITEE FÜR NORMUNG

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Contents

Foreword

This document (EN 54-10) has been prepared by Technical Committee CEN/TC 72 “Fire detection and fire alarm systems”, the secretariat of which is held by BSI.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by July 2002, and conflicting national standards shall be withdrawn at the latest by July 2004. For products which have complied with the relevant national standard before the date of withdrawal (dow), as shown by the manufacturer or by a certification body, this previous standard may continue to apply for production until July 2007.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard : Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

Information on the relationship between this European Standard and other standards of the EN 54 series is given in annex A of EN 54-1:1996.

The annexes A, C and D are normative. The annexes B and E are informative.

Foreword to amendment A1

This document (EN 54-10:2002/A1:2005) has been prepared by Technical Committee CEN/TC 72 “Fire detection and fire alarm systems”, the secretariat of which is held by BSI.

This Amendment to the European Standard EN 54-10:2002 shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by May 2006, and conflicting national standards shall be withdrawn at the latest by August 2007.

This Amendment to EN 54-10:2002 has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association and supports the essential requirements of the EU Construction Products Directive (89/106/EEC).

For relationship with EU Directive(s), see informative Annex ZA, which is an integral part of this document.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

Information on the relationship between this European Standard and other standards of the EN 54 series is given in annex A of EN 54-1:1996.

The annexes A, C and D are normative. The annexes B and E are informative.

1 Scope

This European Standard specifies requirements, test methods and performance criteria for point-type, resettable flame detectors that operate using radiation from a flame for use in fire detection systems installed in buildings.

This standard does not cover flame detectors working on different principles from those described in this standard (although the standard may be used as guidance in assessing such products).

2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

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

ISO 209-1, Wrought aluminium and aluminium alloys — Chemical composition and forms of products — Part 1: Chemical composition

IEC 60064, Tungsten filament lamps for domestic and similar general lighting purposes — Performance requirements

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

IEC 60068-2-1:1990, Environmental testing — Part 2: Tests — Tests A: Cold

IEC 60068-2-2:1974, Basic environmental testing procedures — Part 2: Tests —Tests B: Dry heat

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

IEC 60068-2-27:1987, Environmental testing — Part 2: Tests — Test Ea and guidance: Shock

IEC 60068-2-30:1980, Basic environmental testing procedure — Part 2: Test Db and guidance: Damp heat, cyclic (12 + 12-hour cycle)

IEC 60068-2-42:1982, Basic environmental testing procedure — Part 2: Test Kc: Sulphur dioxide test for contacts and connections

IEC 60068-2-56:1988, Environmental testing — Part 2: Tests — Test Cb: Damp heat, steady state, primarily for equipment

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 and definitions

For the purposes of this European Standard, the following terms and definitions apply.

3.1
infrared (IR) detector
a flame detector responding only to radiation having wavelengths greater than 850 nm

3.2
ultra-violet (UV) detector
a flame detector responding only to radiation having wavelengths less than 300 nm

3.3
multiband detector
a flame detector having two or more sensing elements, each responding to radiation in a distinct wavelength range and each of whose outputs may contribute to the alarm decision

NOTE The alarm decision may be based on any arithmetic or logical combination of the individual signals.

3.4
sensitivity
a measure of the ability of a flame detector to detect fires

NOTE Sensitivity is not necessarily directly related to the response point.

3.5
detector classification
a classification of flame detectors to indicate their relative sensitivity to fire

NOTE Class 1 indicates the highest sensitivity and Class 3 the lowest sensitivity acceptable within this European standard.

3.6
response point
distance D, measured in accordance with 5.1.5, at which the individual flame detector under test gives an alarm signal

3.7
sensitivity adjustment
any adjustment of the detector or of the alarm criteria within the supply and monitoring equipment (see 5.1.2) that leads to a change in sensitivity

4 General requirements

4.1 Compliance

In order to comply with this standard the detector shall meet the requirements of this clause, 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 Classification

Detectors shall conform to one or more of the following classifications: Class 1, Class 2 or Class 3 according to the requirements of the tests specified in 5.5.

4.3 Individual alarm indication

Each detector shall be provided with an integral red visual indicator, by which the individual detector, which released an alarm, may be identified, until the alarm condition is reset. Where other conditions of the detector may be visually indicated, they shall be clearly distinguishable from the alarm indication, except when the detector is switched into a service mode. For detachable detectors the indicator may be integral with the base or the detector head.

4.4 Connection of ancillary devices

Where the detector provides for connections to ancillary devices (e.g. remote indicators, control relays etc.), open- or short-circuit failures of these connections shall not prevent the correct operation of the detector.

4.5 Monitoring of detachable detectors

For detachable detectors, a means shall be provided for a remote monitoring system (e.g. the control and indicating equipment) to detect the removal of the head from the base, in order to give a fault signal.

4.6 Manufacturer's adjustments

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

4.7 On-site sensitivity adjustment

If there is provision for on-site sensitivity adjustment of the detector then:

a) for each setting, at which the manufacturer claims compliance with this standard, the detector shall comply with the requirements of this standard and shall achieve a classification corresponding to that marked on the detector for that setting;

b) for each setting in a), access to the adjustment means shall only be possible by the use of a code or special tool or by removing the detector from its base or mounting;

c) any setting(s), at which the manufacturer does not claim compliance with this standard, shall only be accessible by the use of a code or special tool, and it shall be clearly marked on the detector or in the associated data, that if these setting(s) are used, the detector does not comply with the standard.

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

4.8 Data

Detectors shall either be supplied with sufficient technical, installation and maintenance data to enable their correct installation and operation[1)] or, if all of these data are not supplied with each detector, reference to the appropriate data sheet shall be given on, or with each detector.

NOTE Additional information may be required by organisations certifying that detectors produced by a manufacturer conform to the requirements of this standard.

4.9 Additional requirements for software controlled detectors

4.9.1 General

For detectors 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.

1) To enable correct operation of the detectors, these data should describe the requirements for the correct processing of the signals from the detector. This may be in the form of a full technical specification of these signals, a reference to the appropriate signalling protocol or a reference to suitable types of control and indicating equipment etc.

4.9.2 Software documentation

4.9.2.1 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) 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 detector;

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

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

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

4.9.2.2 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:

a) an overview of the complete configuration of the product, including all software and hardware components;

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

   1) the name of the module;

   2) a description of the tasks performed;

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

c) 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;

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

4.9.3 Software design

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

a) the software shall have a modular structure;

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

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

4.9.4 The storage of programs and data

The program 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 detector.

Site-specific data shall be held in memory which will retain data for at least two weeks without external power to the detector, 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 as described in IEC 60068-1 as follows:

a) temperature : (15 to 35) °C

b) relative humidity : (25 to 75) %

c) air pressure : (86 to 106) kPa

NOTE If variations in these parameters have a significant effect on a measurement, then such variations should be kept to a minimum during a series of measurements carried out as part of one test on one specimen.

5.1.2 Operating conditions for tests

If a test method requires a specimen to be operational, then the specimen shall be connected to suitable supply and monitoring equipment with characteristics as required by the manufacturer's data. Unless otherwise specified in the test method, the supply parameters applied to the specimen shall be set within the manufacturer's specified range(s) and shall remain substantially constant throughout the tests. The value chosen for each parameter shall normally be the nominal value, or the mean of the specified range. If a test procedure requires a specimen to be monitored to detect any alarm or fault signals, then connections shall be made to any necessary ancillary devices (e.g. through wiring to an end-of-line device for conventional detectors) to allow a fault signal to be recognised.

Unless otherwise specified in the test method, detectors having adjustable sensitivity shall be set to their highest sensitivity for the conditioning.

NOTE The details of the supply and monitoring equipment and the alarm criteria used should be given in the test report.

5.1.3 Mounting arrangements

The specimen shall be mounted by its normal means of attachment in accordance with the manufacturer's instructions. If these instructions describe more than one method of mounting then the method considered to be most unfavourable shall be chosen for each test.

5.1.4 Tolerances

If a specific tolerance or deviation limit is not specified in a requirement or test procedure a deviation limit of ± 5 % shall be applied.

5.1.5 Determination of response point

5.1.5.1 Principle

The response point shall be measured by exposing the detector to the radiation from a suitable flame source and determining the greatest distance at which the detector will reliably produce an alarm condition within a time of 30 s.

5.1.5.2 Test apparatus

The test apparatus shall be as described in annex A.

The design and construction of the apparatus, and the surfaces surrounding the test area, shall be such that no significant radiation from the source reaches the detector apart from that which has passed through the aperture. (This means for example that there shall be no reflection of radiation from the walls or other parts of the apparatus, and no spurious radiation from hot flue gases or hot surfaces around the burner.)

Throughout this test method it is necessary to align the detector relative to its optical axis and to measure distances relative to the plane of the detector sensing element(s). If the detector does not have a well-defined optical axis then the manufacturer shall nominate an optical axis for the purposes of this test method. The position of this axis relative to an easily identifiable plane on the detector shall be noted in the test report.

Similarly, if the detector sensing elements do not lie in a well-defined plane then the manufacturer shall nominate a plane for the purposes of this test method. The position of this plane relative to an easily identifiable plane on the detector shall be noted in the test report.

5.1.5.3 Initial determination

A suitable area for the aperture shall be determined experimentally before the commencement of the test programme such that the response point of one detector, chosen at random from the specimens submitted for test, lies within the range 1300 mm to 1700 mm. The size and shape of the aperture used shall be recorded and shall be kept constant throughout the test programme. For detectors having adjustable sensitivity, and whose adjustment range covers more than one sensitivity class, it will be necessary to determine an appropriate aperture size for each sensitivity class of the detector.

5.1.5.4 Source stability

After determining a suitable aperture size, and before any determination of response points, the irradiance on the optical axis of the source shall be measured using the radiometer in accordance with A.5. This measurement shall be carried out with no modulation of the source and with the aperture unobstructed. The measured value of irradiance shall be recorded and used as a reference throughout the test programme to verify that the source radiance has not varied by more than 5 %.

5.1.6 Test procedure

The specimen shall be connected to its supply and indicating equipment and shall be allowed to stabilize for a period of 15 min or for a time specified by the manufacturer. During this stabilization period the specimen shall be shielded, using the shutter in accordance with A.3, from all sources of radiation which may affect the determination of the response point.

Before commencing any measurement of response point the burner shall be allowed to reach a stable working condition.

The distance of the specimen from the source shall be varied and at each distance the detector shall be exposed to the source for 30 s using the shutter. The response point D is the greatest distance, measured between the aperture and the plane of the specimen sensing element(s), at which the detector will reliably produce an alarm response within each 30 s exposure. If the detector response is known to be dependent on previous exposure to radiation then sufficient time shall be allowed before each exposure to ensure that previous exposures do not substantially affect the measurement of the response point.

For detectors having stochastic response behaviour each value of D shall come from at least six repetitions of each measurement, D beeing the mean value of these repetitions. Repetitions shall continue until an additional value changes the average value of D by less than 5 %.

5.1.7 Reduced functional tests

Where the test procedure calls for a reduced functional test, the detector shall be exposed to a source of radiation which is sufficient to cause an alarm response from the detector. The nature of the source used and the duration of the exposure shall be appropriate to the product in question.

5.1.8 Provision for tests

The followi hall be provided for testing compliance with this part of EN 54:

a) for detachable detectors, eight heads and eight bases; for non-detachable detectors, eight specimens

b) the data required in 4.8.

The specimens shall be themselves representative of the manufacturer's normal production with regard to their construction and calibration.

NOTE This implies that the mean response point of the eight specimens, found in the reproducibility test should also represent the production mean, and that the limits specified in the reproducibility test should also be applicable to the manufacturer's production.

5.1.9 Test schedule

The detectors shall be tested according to the test schedule given in Table 1. After the reproducibility test the four specimens having the largest value of response point (at the highest sensitivity setting) shall be numbered 1 to 4 and the remainder shall be numbered 5 to 8.

Table 1 — Test Schedule

Test	Clause	Specimen Number							
		1	2	3	4	5	6	7	8
Reproducibility	5.2	x	x	x	x	x	x	x	x
Repeatability	5.3	x							
Directional dependence	5.4	x							
Fire sensitivity	5.5	x	x	x	x	x	x	x	x
Dazzling (operational)	5.6	x							
Dry heat (operational)	5.7		x						
Cold (operational)	5.8		x						
Damp heat cyclic (operational)	5.9						x		
Damp heat steady state (endurance)	5.10						x		
Sulphur dioxide (SO_2) corrosion (endurance)	5.11					x			
Shock (operational)	5.12								x
Impact (operational)	5.13							x	
Vibration, sinusoidal (operational)	5.14				x				
Vibration, sinusoidal (endurance)	5.15				x				
Variation in supply parameters (operational)	5.16	x							
Electrostatic discharge (operational)	5.17	x							
Radiated electromagnetic fields (operational)	5.17			x					
Conducted disturbances induced by electromagnetic fields (operational)	5.17			x					
Fast transient bursts (operational)	5.17			x					
Slow high energy voltage surge (operational)	5.17		X						

5.2 Reproducibility

5.2.1 Object

To show that the response point of the detector does not vary unduly from specimen to specimen.

5.2.2 Test procedure

The response point of each of the test specimens shall be measured in accordance with 5.1.6 and each value of *D* shall be recorded. For detectors having adjustable sensitivity and whose range of adjustment covers more than one sensitivity class, the measurement shall be repeated for each marked class.

For each class setting, the highest value of *D* shall be designated D_{max}, the lowest value of *D* shall be designated D_{min}, and the mean value of *D* designated D_{mean}.

5.2.3 Requirements

For each class setting, the ratio D_{max}:D_{mean} shall not be greater than 1,15 and the ratio D_{mean}:D_{min} shall not be greater than 1,22.

5.3 Repeatability

5.3.1 Object

To show that the detector has a stable behaviour with respect to its response point even after a number of alarm conditions.

5.3.2 Test procedure

The response point of the specimen shall be measured in accordance with 5.1.6, six times.

The maximum response point shall be designated D_{max} and the minimum value designated D_{min}.

5.3.3 Requirements

The ratio of the response points D_{max}:D_{min} shall not be greater than 1,14.

5.4 Directional dependence

5.4.1 Object

To show that the sensitivity of the detector is not unduly dependent on the direction of the radiation incident on the detector.

5.4.2 Test procedure

The detector shall be mounted on the optical bench with its optical axis coincident with the source optical axis as shown in Figure 1. The detector shall then be rotated through an angle α about an axis normal to the optical axis and passing through the point of intersection of the optical axis and the plane of the sensing element(s). The response point of the detector shall be measured for

$$\alpha = 15°, 30° ... \alpha_{max}$$

where α_{max} is the maximum ½-angle of reception specified for that detector type by the manufacturer.

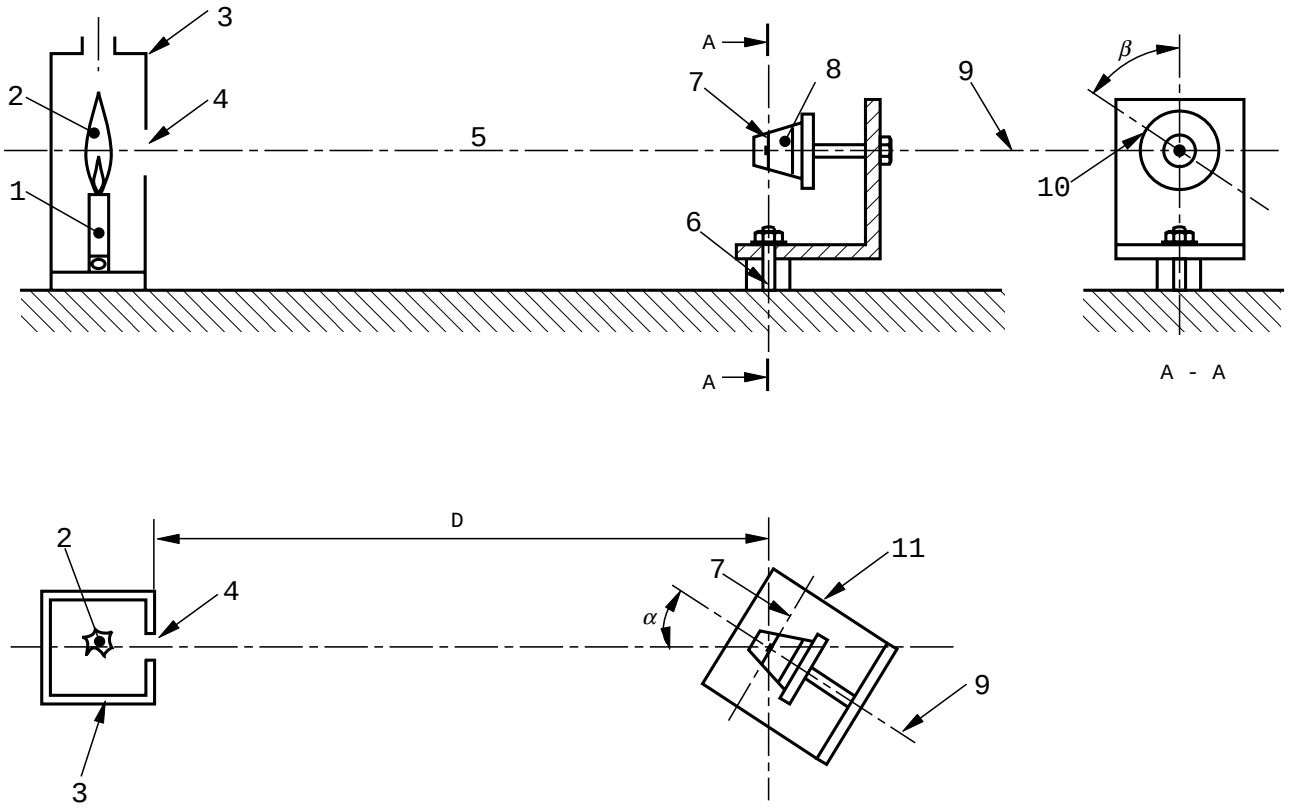
With the angle α set to α_{max} the specimen shall be rotated about its optical axis through an angle β and the response point measured a further seven times for

$$\beta = 45°, 90°, 135°, 180°, 225°, 270°, 315°$$

The maximum value of response point recorded at any angle in this test and that measured for the same specimen in the reproducibility test shall be designated D_{max} and the minimum value designated D_{min}.

5.4.3 Requirements

The ratio of the response points D_{max}:D_{min} shall not be greater than 1,41.



Key

1	Methane gas burner	7	Plane of sensing element(s)
2	Flame	8	Detector
3	Burner housing	9	Horizontal rotating axis
4	Aperture	10	Reference point
5	Optical axis	11	Detector support
6	Vertical rotating axis		

Figure 1 — Measurement of directional dependence

5.5 Fire sensitivity

5.5.1 Object

To show that the detector has adequate sensitivity to fire as required for general application in fire detection systems for buildings, and to determine the sensitivity class(es) appropriate for the detector.

5.5.2 Test procedure

The test consists of exposing the detectors to the radiation from two types of test fire at known distances, *d*, to determine if the detectors are capable of producing an alarm signal within 30 s. The distance shall be chosen in accordance with the manufacturers specification for the intended class(es) of the detector (see 5.5.3.)

The eight specimens shall be mounted on a support with their optical axes in the horizontal plane and at a height of 1500 mm ± 200 mm. The horizontal angle of incidence, I_H, as defined in Figure 2, shall be not greater than 5°. The detectors shall be connected to supply and monitoring equipment as described in 5.1.2.

The fire tray, containing n-heptane in accordance with C.1, shall be placed at a distance of 12 m from the plane of the detector sensing elements in an area where the fire will be unaffected by draughts. The area shall be free of radiation sources which may affect the response of the detectors to the test fire.

The detectors shall be shielded from radiation and shall be allowed to stabilize for at least 15 min or for a period specified by the manufacturer. The fuel shall be ignited and allowed to burn for at least 1 min. The shutter shall then be removed and the detectors exposed to the radiation from the fire for a period of 30 s. At the end of the 30 s period the detectors shall again be shielded from the fire radiation and the status of each detector recorded.

If all 8 specimens are in the alarm condition then the detector shall be deemed to respond to the test fire. If one or more of the specimens has failed to respond then the detector is deemed to have failed the test.

The procedure described above shall be repeated using the methylated spirit fire, in accordance with C.2, at a distance of 12 m.

If the manufacturer specifies class 2, the complete procedure shall be repeated with the distance between the fire and the detectors of 17 m. If the manufacturer specifies class 1, the complete procedure shall be repeated with the distance between the fire and the detectors of 17 m and 25 m.

For detectors having adjustable sensitivity the above tests shall be carried out for the extreme sensitivity settings. If the range of adjustment covers more than one sensitivity class then the tests shall be performed for settings corresponding to each of the marked classes (see 4.7 a)).

5.5.3 Classification

The detector shall be classified according to the greatest distance at which all eight specimens respond to each fire type within the 30 s exposure. The classes shall be:

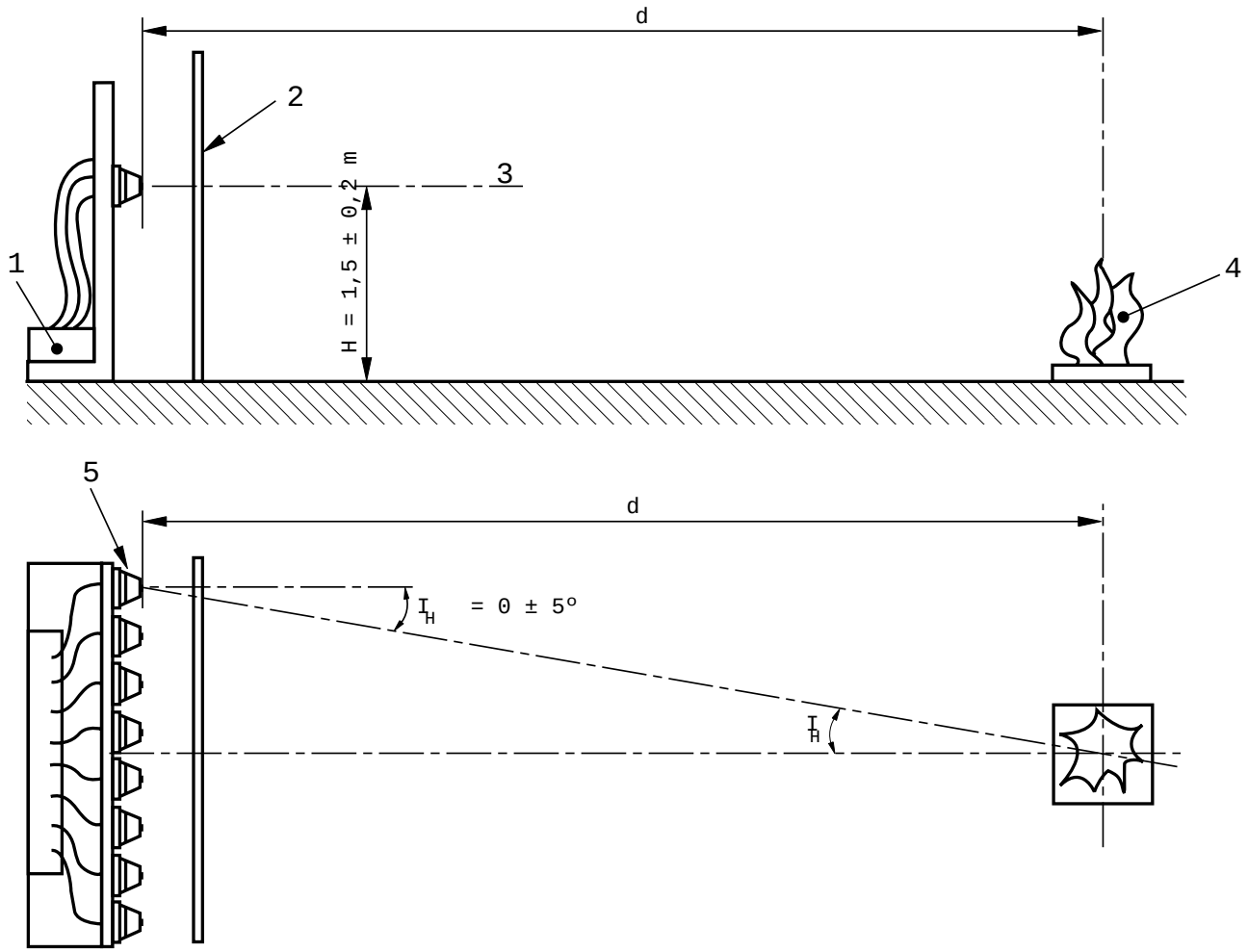
Class 1 if all specimens respond to both fire types at distances up to and including 25 m

Class 2 if all specimens respond to both fire types at distances up to and including 17 m

Class 3 if all specimens respond to both fire types at a distance of 12 m

If any specimen fails to respond to one or both fire types at a distance of 12 m, it shall not be classified.

At each tested setting for which the manufacturer claims compliance with this standard, the detector response shall be classified as Class 1, 2 or 3.



Key

1 Supply and monitoring equipment
2 Screen to be removed during test
3 Horizontal optical axis of detectors
4 Test fire
5 Detectors

Figure 2 — Fire sensitivity test

5.5.4 Requirements

The detector shall attain classification 1, 2 or 3 (see 5.5.3).

For detectors having adjustable sensitivity, and for which the adjustment covers more than one sensitivity class, the sensitivity class determined at each setting shall correspond to that marked on the detector.

5.6 Dazzling (operational)

5.6.1 Object

To demonstrate the immunity of the detector to stray light generated by artificial light sources.

5.6.2 Test procedure and apparatus

5.6.2.1 General

The test procedure and apparatus described in 5.6.2.2 to 5.6.2.6 and annex D shall be used.

5.6.2.2 State of the specimen during conditioning

The specimen shall be mounted on the optical bench as described in 5.1.3. It shall be operational as described in 5.1.2.

5.6.2.3 Conditioning

The specimen shall be allowed to stabilize for 1 h in a darkened room. The specimen shall then be exposed to the light source as follows:

a) incandescent light (modulated) 20 times 1 s on, 1 s off, followed by

b) incandescent light (continuous) 2 h

Modulation of the lamps shall be achieved by switching on and off the electrical supply.

5.6.2.4 Measurements during conditioning

The specimen shall be monitored to detect any alarm or fault signal during conditioning.

5.6.2.5 Final measurement (light source on)

Immediately after the continuous exposure (see 5.6.2.3 b), and with the light source still on, the response point shall be determined in accordance with 5.1.6.

The greater of the response points measured in this test and that measured for the same specimen in the reproducibility test shall be designated D_{max} and the lesser shall be designated D_{min}.

5.6.2.6 Final measurement (light source off)

Immediately after the completion of the measurement in 5.6.2.5 the light source shall be switched off and the specimen allowed to recover for a period of 5 min. At the end of the recovery period the response point shall be determined in accordance with 5.1.6.

The greater of the response points measured in this test and that measured for the same specimen in the reproducibility test shall be designated D_{max} and the lesser shall be designated D_{min}.

5.6.3 Requirements

No alarm or fault signals shall be given during the exposures a) and b) of 5.6.2.3.

The ratio D_{max}:D_{min} determined in 5.6.2.5 shall not be greater than 1,26.

The ratio D_{max}:D_{min} determined in 5.6.2.6 shall not be greater than 1,14.

5.7 Dry heat (operational)

5.7.1 Object

To demonstrate the ability of the detector to withstand a high ambient temperature appropriate to its application.

5.7.2 Test procedure and apparatus

5.7.2.1 General

The test procedure and apparatus shall be as required by IEC 60068-2-2:1974 Test Ba or Bb, and by 5.7.2.2 to 5.7.2.4.

5.7.2.2 State of the specimen during conditioning

The specimen shall be mounted as described in 5.1.3 and shall be connected to supply and monitoring equipment as described in 5.1.2.

5.7.2.3 Conditioning

The following conditioning shall be applied:

Temperature	(55 ± 2) °C
Duration	16 h

5.7.2.4 Measurements during conditioning

The specimen shall be monitored during the conditioning period to detect any alarm or fault signals. During the last thirty minutes of the conditioning the specimen shall be subjected to the reduced functional test in accordance with 5.1.7.

5.7.2.5 Final measurements

After the recovery period of at least 1 hour at standard laboratory conditions the response point of the specimen shall be measured in accordance with 5.1.6.

The greater of the response points measured in this test and that measured for the same specimen in the reproducibility test shall be designated D_{max} and the lesser shall be designated D_{min}.

5.7.3 Requirements

No alarm or fault signals shall be given during the transition to the conditioning temperature or during the conditioning.

The specimen shall give an alarm signal in response to the reduced function test.

The ratio D_{max}:D_{min} shall be not greater than 1,26.

5.8 Cold (operational)

5.8.1 Object

To demonstrate the ability of the detector to function correctly at low ambient temperatures appropriate to the anticipated service temperature.

5.8.2 Test procedure and apparatus

5.8.2.1 General

The test apparatus and procedure shall be as required by IEC 60068-2-1:1990 Test Ab, and by 5.8.2.2 to 5.8.2.4.

5.8.2.2 State of the specimen during conditioning

The specimen shall be mounted as described in 5.1.3 and shall be connected to supply and monitoring equipment as described in 5.1.2.

5.8.2.3 Conditioning

The following conditioning shall be applied:

Temperature	(-10 ± 3) °C
Duration	16 h

5.8.2.4 Measurements during conditioning

The specimen shall be monitored during the conditioning period to detect any alarm or fault signals. During the last thirty minutes of the conditioning the specimen shall be subjected to the reduced functional test in accordance with 5.1.7.

5.8.2.5 Final measurements

After the recovery period of at least 1 hour at standard laboratory conditions the response point of the specimen shall be measured in accordance with 5.1.6.

The greater of the response points measured in this test and that measured for the same specimen in the reproducibility test shall be designated D_{max} and the lesser shall be designated D_{min}.

5.8.3 Requirements

No alarm or fault signals shall be given during the transition to the conditioning temperature, or during the conditioning.

The specimen shall give an alarm signal in response to the reduced functional test.

The ratio D_{max}:D_{min} shall be not greater than 1,26.

5.9 Damp heat, cyclic (operational)

5.9.1 Object

To demonstrate the immunity of the detector to an environment with high relative humidity where condensation may occur on the equipment.

5.9.2 Test procedure and apparatus

5.9.2.1 General

The test apparatus and procedures shall be as required by IEC 60068-2-30:1980 using the Variant 1 test cycle and controlled recovery conditions and by 5.9.2.2 to 5.9.2.4.

5.9.2.2 State of the specimen during conditioning

The specimen shall be mounted as described in 5.1.3 and shall be connected to supply and monitoring equipment as described in 5.1.2.

NOTE Any self-test feature intended to monitor the transmission of the detector window may be disabled during this test.

5.9.2.3 Conditioning

The following severity of conditioning shall be applied:

Temperature (40 ± 2) °C

Number of cycles: 2

5.9.2.4 Measurements during conditioning

The specimen shall be monitored to detect any alarm or fault signal during the conditioning.

During the last thirty minutes of the high temperature phase of the last cycle the detector shall be subjected to the reduced functional test described in 5.1.7.

5.9.2.5 Final measurements

After the recovery period of at least 1 hour at standard laboratory conditions the response point of the specimen shall be measured in accordance with 5.1.6.

The greater of the response points measured in this test and that measured for the same specimen in the reproducibility test shall be designated D_{max} and the lesser shall be designated D_{min}.

5.9.3 Requirements

No alarm or fault signals shall be given during the transition to the conditioning temperature or during the conditioning.

The specimen shall give an alarm signal in response to the reduced functional test.

The ratio D_{max}:D_{min} shall be not greater than 1,26.

5.10 Damp heat, steady state (endurance)

5.10.1 Object

To demonstrate the ability of the detector to withstand the long term effects of humidity in the service environment (e.g. changes in electrical properties of materials, chemical reactions involving moisture, galvanic corrosion etc.).

5.10.2 Test procedure and apparatus

5.10.2.1 General

The test apparatus and procedure shall be as described in IEC 60068-2-56:1988 Test Cb, and as described in 5.10.2.2 to 5.10.2.4.

5.10.2.2 State of the specimen during conditioning

The specimen shall be mounted as described in 5.1.3 but shall not be supplied with power during the conditioning.

5.10.2.3 Conditioning

The following conditioning shall be applied:

Temperature	(40 ± 2) °C
Relative Humidity	(93 ± 3) %
Duration	21 days

5.10.2.4 Final measurements

After the recovery period of at least 1 hour at standard laboratory conditions the response point of the specimen shall be measured in accordance with 5.1.6.

The greater of the response points measured in this test and that measured for the same specimen in the reproducibility test shall be designated D_{max} and the lesser shall be designated D_{min}.

5.10.3 Requirements

The ratio D_{max}:D_{min} shall be not greater than 1,26.

5.11 Sulfur dioxide (SO_2) corrosion (endurance)

5.11.1 Object

To demonstrate the ability of the detector to withstand the corrosive effects of sulphur dioxide as an atmospheric pollutant.

5.11.2 Test procedure and apparatus

5.11.2.1 General

The test apparatus and procedure shall be generally as described in IEC 60068-2-42:1982 Test Kc, except that the conditioning shall be as described in 5.11.2.2 to 5.11.2.4

5.11.2.2 State of the specimen during conditioning

The specimen shall be mounted as described in 5.1.3. It shall not be supplied with power during the conditioning, but it shall have untinned copper wires, of the appropriate diameter, connected to sufficient terminals to allow the final measurement to be made, without making further connections to the specimen.

5.11.2.3 Conditioning

The following conditioning shall be applied:

Temperature	(25 ± 2) °C
Relative humidity	(93 ± 3) %
SO_2 concentration	(25 ± 5) ppm
Duration	21 days

5.11.2.4 Final measurements

Immediately after conditioning, the specimen shall be subjected to a drying period of 16 h at 40 °C and not more than 50 % relative humidity, followed by a recovery period of 1 h to 2 h at the standard laboratory conditions. After this recovery period the response point of the specimen shall be measured in accordance with 5.1.6.

The greater of the response points measured in this test and that measured for the same specimen in the reproducibility test shall be designated D_{max} and the lesser shall be designated D_{min}.

5.11.3 Requirements

The ratio D_{max}:D_{min} shall be not greater than 1,26.

5.12 Shock (operational)

5.12.1 Object

To demonstrate the immunity of the detector to mechanical shocks, which are likely to occur, albeit infrequently, in the anticipated service environment.

5.12.2 Test procedure and apparatus

5.12.2.1 General

The test apparatus and procedure shall be generally as described in IEC 60068-2-27:1987 Test Ea, except that the conditioning shall be as described in 5.12.2.2 to 5.12.2.5.

5.12.2.2 State of the specimen during conditioning

The specimen shall be mounted as described in 5.1.3 to a rigid fixture, and shall be connected to its supply and monitoring equipment as described in 5.1.2.

5.12.2.3 Conditioning

For specimens with a mass ≤ 4,75 kg the following conditioning shall be applied:

Shock pulse type	Half sine
Pulse duration	6 ms
Peak acceleration	$10 \times (100 - 20\boldsymbol{M})$ m s^{-2} (Where $\boldsymbol{M}$ is the specimen's mass in kilograms)
Number of directions	6
Pulses per direction	3

No test is applied to specimens with a mass > 4,75 kg.

5.12.2.4 Measurements during conditioning

The specimen shall be monitored during the conditioning period and for a further 2 min to detect any alarm or fault signals.

5.12.2.5 Final measurements

The response point of the specimen shall be measured in accordance with 5.1.6.

The greater of the response points measured in this test and that measured for the same specimen in the reproducibility test shall be designated D_{max} and the lesser shall be designated D_{min}.

5.12.3 Requirements

No alarm or fault signal shall be given during the conditioning period or the additional 2 min.

The ratio D_{max}:D_{min} shall be not greater than 1,26.

5.13 Impact (operational)

5.13.1 Object

To demonstrate the immunity of the detector to mechanical impacts upon its surface, which it may sustain in the normal service environment, and which it can reasonably be expected to withstand.

5.13.2 Test procedure and apparatus

5.13.2.1 Apparatus

The test apparatus shall consist of a swinging hammer incorporating a rectangular-section aluminium alloy head (Aluminium alloy Al Cu_4 Si Mg complying with ISO 209-1, solution treated and precipitation treated condition) with the plane impact face chamfered to an angle of 60° to the horizontal, when in the striking position (i.e. when the hammer shaft is vertical). The hammer head shall be (50 ± 2,5) mm high, (76 ± 3,8) mm wide and (80 ± 4) mm long at mid height as shown in Figure E.1. A suitable apparatus is described in annex E.

5.13.2.2 State of the specimen during conditioning

The specimen shall be rigidly mounted to the apparatus by its normal mounting means as in 5.1.3, and shall be positioned so that it is struck by the upper half of the impact face when the hammer is in the vertical position (i.e. when the hammerhead is moving horizontally). The azimuthal direction and position of impact, relative to the specimen, shall be chosen as that most likely to impair the normal functioning of the specimen. The specimen shall be connected to its supply and monitoring equipment as described in 5.1.2.

5.13.2.3 Conditioning

The following conditioning shall be applied:

Impact energy	(1,9 ± 0,1)	J
Hammer velocity	(1,5 ± 0,13)	m s^{-1}
Number of impacts	1	

5.13.2.4 Measurements during conditioning

The specimen shall be monitored during the conditioning period and for a further 2 min to detect any alarm or fault signals.

5.13.2.5 Final measurements

The response point of the specimen shall be measured in accordance with 5.1.6.

The greater of the response points measured in this test and that measured for the same specimen in the reproducibility test shall be designated D_{max} and the lesser shall be designated D_{min}.

5.13.3 Requirements

No alarm or fault signals shall be given during the conditioning period or the additional 2 min.

The ratio of the response points D_{max}:D_{min} shall not be greater than 1,26.

5.14 Vibration, sinusoidal, (operational)

5.14.1 Object

To demonstrate the immunity of the detector to vibration at levels considered appropriate to the normal service environment.

5.14.2 Test procedure and apparatus

5.14.2.1 General

The test apparatus and procedure shall be as described in IEC 60068-2-6:1995 Test Fc, and as described in 5.14.2.2 to 5.14.2.5.

5.14.2.2 State of the specimen during conditioning

The specimen shall be mounted on a rigid fixture as described in 5.1.3 and shall be connected to its supply and monitoring equipment as described in 5.1.2. The vibration shall be applied in each of three mutually perpendicular axes, in turn. The specimen shall be mounted so that one of the three axes is perpendicular to its normal mounting plane.

5.14.2.3 Conditioning

The following conditioning shall be applied:

Frequency range	2 Hz to 10 Hz
Displacement amplitude	1,24 mm
Frequency range	10 Hz to 150 Hz
Acceleration amplitude	5 m s^{-2} (≈0,5 g_n)
Number of axes	3
Sweep rate	1 octave min^{-1}
Number of sweep cycles per axis	1

NOTE The vibration operational and endurance tests may be combined such that the specimen is subjected to the operational test conditioning followed by the endurance test conditioning in one axis before changing to the next axis. Only one final measurement need be made.

5.14.2.4 Measurements during conditioning

The specimen shall be monitored during the conditioning period to detect any alarm or fault signals.

5.14.2.5 Final measurements

The final measurements specified in 5.15.2.4 are normally made after the vibration endurance test and only need be made here if the operational test is conducted in isolation.

5.14.3 Requirements

No alarm or fault signals shall be given during the conditioning.

The ratio of the response points D_{max}:D_{min} shall not be greater than 1,26.

5.15 Vibration, sinusoidal (endurance)

5.15.1 Object

To demonstrate the ability of the detector to withstand the long term effects of vibration at levels appropriate to the service environment.

5.15.2 Test procedure and apparatus

5.15.2.1 General

The test apparatus and procedure shall be as described in IEC 60068-2-6:1995 Test Fc, and as described in 5.15.2.2 to 5.15.2.4.

5.15.2.2 State of the specimen during conditioning

The specimen shall be mounted on a rigid fixture as described in 5.1.3, but shall not be supplied with power during conditioning. The vibration shall be applied in each of three mutually perpendicular axes, in turn. The specimen shall be mounted so that one of the three axes is perpendicular to its normal mounting axis.

5.15.2.3 Conditioning

The following conditioning shall be applied:

Frequency range	10 Hz to 150 Hz
Acceleration amplitude	10 m s^{-2} ($\approx$1,0 g_n)
Number of axes	3
Sweep rate	1 octave min^{-1}
Number of sweep cycles per axis	20

NOTE The vibration operational and endurance tests may be combined such that the specimen is subjected to the operational test conditioning followed by the endurance test conditioning in one axis before changing to the next axis. Only one final measurement need to be made.

5.15.2.4 inal measurements

The response point of the specimen shall be measured in accordance with 5.1.6.

The greater of the response points measured in this test and that measured for the same specimen in the reproducibility test shall be designated D_{max} and the lesser shall be designated D_{min}.

5.15.3 Requirements

The ratio of the response points D_{max}:D_{min} shall not be greater than 1,26.

5.16 Variation in supply parameters (operational)

5.16.1 Object

To show that, within the specified range(s) of the supply parameters (e.g. voltage), the response point of the detector is not unduly dependent on these parameters.

5.16.2 Test procedure

The response point of the specimen shall be measured in accordance with 5.1.6 at the upper and lower limits of the supply parameters (e.g. voltage) range specified by the manufacturer.

NOTE For conventional detectors the supply parameter is the dc voltage applied to the detector. For other types of detector (e.g. analogue addressable) signal levels and timing may need to be considered.

The greatest of the two response points measured in this test and the response points for any parameter variation measured for the same specimen in the reproducibility test shall be designated D_{max} and the least shall be designated D_{min}.

5.16.3 Requirements

The ratio D_{max}:D_{min} shall be not greater than 1,26.

5.17 Electromagnetic Compatibility (EMC), Immunity tests (operational)

5.17.1 Object

To demonstrate the immunity of the detector to electromagnetic disturbances considered appropriate to the normal service environment.

5.17.2 Test procedure and apparatus

5.17.2.1 General

The following EMC immunity tests shall be carried out, using the apparatus and procedures as described in EN 50130-4:

a) Electrostatic discharge[2)];

b) Radiated electromagnetic fields;

c) Conducted disturbances induced by electromagnetic fields;

d) Fast transient bursts;

e) Slow high energy voltage surges.

5.17.2.2 State of the specimen during conditioning

The specimen shall be mounted as described in 5.1.3 and shall be connected to supply and monitoring equipment as described in 5.1.2.

5.17.2.3 Measurements during conditioning

The specimen shall be monitored during the conditioning period to detect any alarm or fault signals.

[2)] For U.V. detectors which may respond to the radiation from the spark, the time between discharges may be increased up to a maximum of 30 s.

5.17.2.4 Final measurements

After conditioning, the response point of the specimen shall be measured in accordance with 5.1.6.

For each of the tests a) to e) the greater of the response points measured in the test and that measured for the same specimen in the reproducibility test shall be designated D_{max} and the lesser shall be designated D_{min}.

5.17.3 Requirements

For each test a) to e) the criteria for compliance specified in EN 50130-4 shall apply and the ratio D_{max}:D_{min} shall not be greater than 1,26.

6 Marking

Each detector shall be clearly marked with, or supplied with, the following information:

a) the number of this standard (i.e. EN 54-10);

b) the name or trademark of the manufacturer or supplier;

c) the model designation (type or number);

d) the classification of the detector, e.g. Class 1;

e) some 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 and the version number(s) of any software, contained within the detector;

f) the wiring terminal designations;

g) the angle of reception as determined in 5.4;

h) the operating wavelength band(s) e.g. UV, IR.

For detachable detectors, the detector head shall be marked with at least a), b), c), d) and e), and the base shall be marked with at least b), c) (i.e. its own model designation) and f).

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

The marking shall be visible during installation of the detector and shall be accessible during maintenance.

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

Annexe A
(normative)

Annex A Apparatus for response point determination

A.1 Optical bench

The apparatus uses an optical bench to allow the distance between the source and the detector to be adjusted while maintaining the relative alignment of the optical axes of the source and the detector. In order to allow for variations in response point the bench shall have an effective working length of at least 2,5 m.

The mounting stands used for the specimen and for other parts of the test equipment shall be constrained to move in a direction parallel to the axis of the bench. Means shall be provided to measure the distances between the individual bench-mounted items to an accuracy of ± 10 mm.

The detector mounting stand shall allow adjustment of the height and orientation of the detector such that its optical axis can be made coincident with the source optical axis. The detector mounting stand shall also allow the detector to be rotated about its optical axis and, independently, about a second axis perpendicular to the optical axis, and passing through the point of intersection of the optical axis and the plane of the detector sensing element(s). Means shall be provided to measure the angular rotations with an accuracy of ± 5°.

An example of a suitable optical bench arrangement is shown in Figure A.1.

A.2 Radiation source

The radiation shall be produced by a gas burner, burning methane of not less than 98 % purity, whose flame gives a stable (flicker-free) radiation output in the wavelength band in which the detector under test is intended to operate. The flicker in these bands shall be measured using an appropriate method. The root mean square (RMS) amplitude modulation of the radiation shall not exceed 5 %.

The effective radiation output shall be set by an aperture placed in front of the flame in such a position that the complete area of the aperture is filled by the flame when viewed from any allowable position of the detector under test. For the purposes of this test method the aperture shall be considered as the source of radiation. The perpendicular axis through the centre of the aperture shall be considered to be the optical axis of the source.

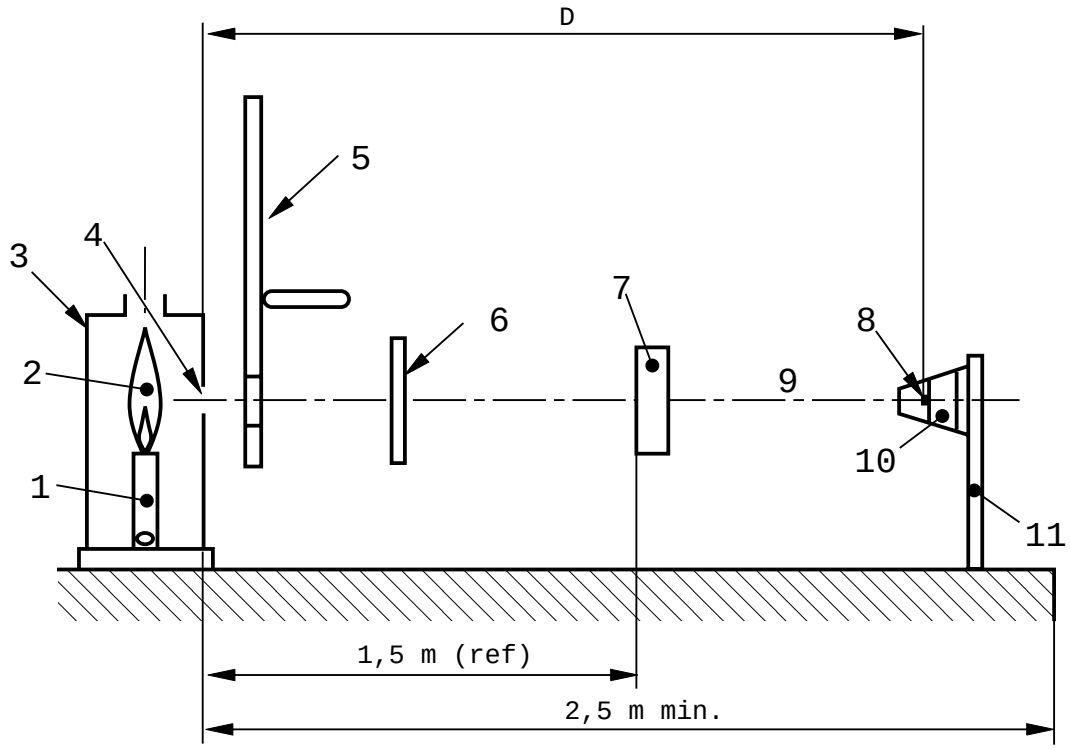
A gas burner suitable for use as a source is described in annex B.

A.3 Shutter

A shutter shall be provided such that the specimen can be shielded from the radiation source. The shutter shall allow the duration of the exposure of the detector to the source to be controlled with an accuracy of ± 2 s.

A.4 Modulator

The radiation from the source shall be modulated by suitable means (e.g. a rotating chopper disc) to provide the form of modulation specified by the manufacturer for the detector under test. The modulation frequency specified may be zero. If the manufacturer does not specify the modulation then measurements shall be carried out on a specimen chosen at random to determine the frequency corresponding to the peak of the detector's response. This frequency shall be noted and used for all subsequent measurements.



Key

1	Methane gas burner	7	Radiometer
2	Flame	8	Sensing element(s)
3	Burner housing	9	Optical axis
4	Aperture	10	Detector
5	Modulator (chopper disk)	11	Stand for detector
6	Shutter		

Figure A.1 — Optical bench arrangement

A.5 Radiometer

A radiometer shall be provided to monitor the irradiance produced by the source. The sensitive element of the radiometer shall be positioned at a point on the source optical axis at a distance in the range 1400 mm to 1600 mm from the aperture. The radiometer shall be fitted on a stand on the optical bench such that the distance from the aperture can be set within the specified range with a repeatability of ± 5 mm.

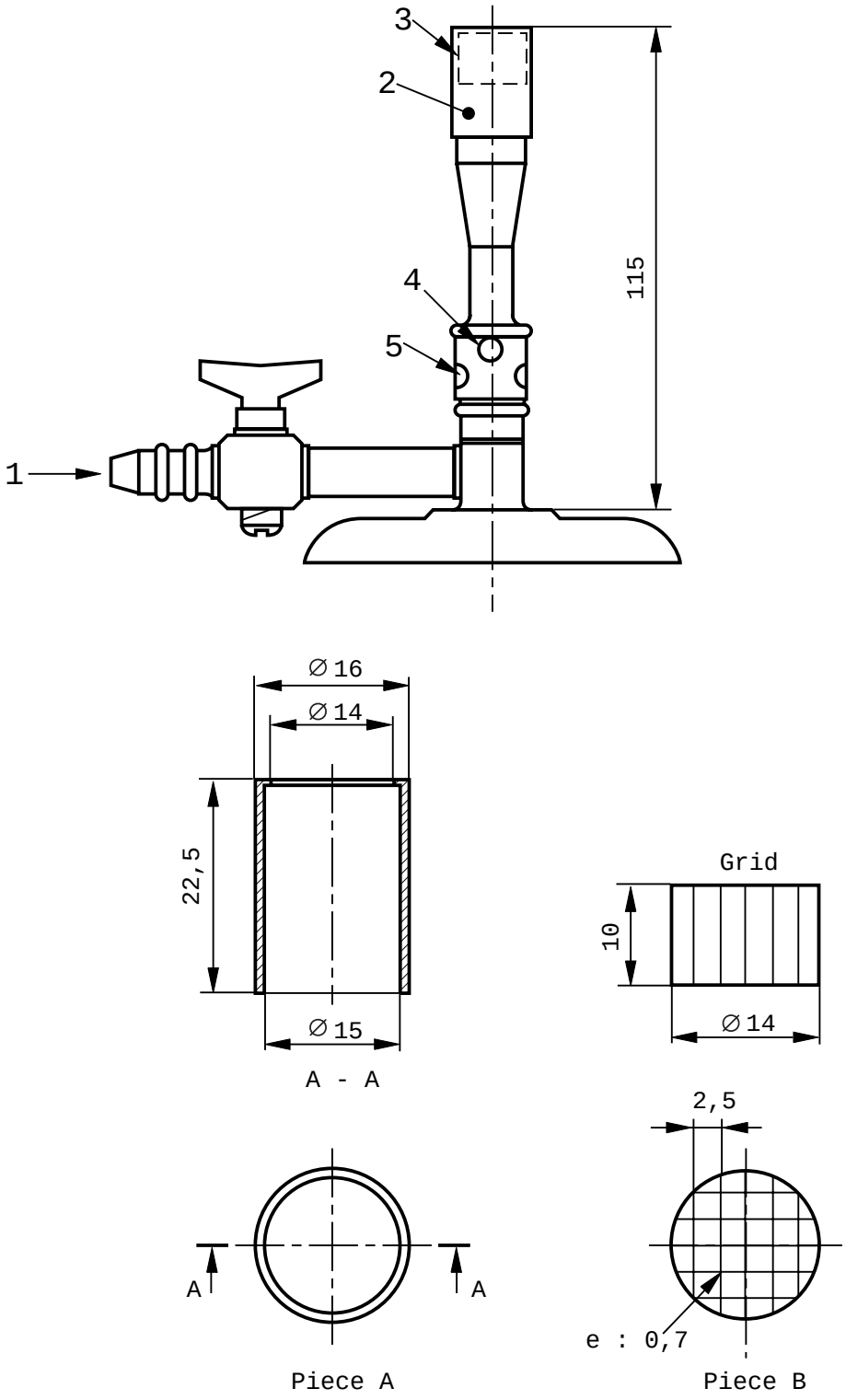
The wavelength response of the radiometer shall be appropriate to the detector under test and may be specified by the manufacturer. If the manufacturer does not specify a wavelength range then the radiometer shall respond to radiation only in the range 4,0 μm to 4,8 μm for IR detectors and 160 nm to 280 nm for UV detectors.

Annexe B
(informative)

Example of a methane burner

Figure B.1 shows an example of a burner (Meker burner) which is suitable for the source in A.2. The burner should be supplied with gas at a constant pressure to maintain constant radiated output.

Dimensions in millimetres



Key

1 Gas
2 Piece A
3 Piece B
4 4 holes
5 4 holes

Figure B.1 — Example of methane burner

Annexe C
(normative)

Test fires

C.1 n-heptane fire

This fire is intended to represent a fire burning with a yellow (sooty) flame.

a) Fuel:

Approximately 500 ml of n-heptane (pure) with approximately 3 % toluene (pure) by volume. The quantity of fuel used shall be sufficient to ensure that the complete base area of the tray is covered by fuel for the complete duration of the test(s).

b) Arrangement:

The heptane/toluene mixture shall be burned in a square tray made from 2 mm thick sheet steel, with dimensions 330 mm × 330 mm × 50 mm deep.

c) Initial temperature:

The initial temperature of the fuel shall be (20 ± 10) °C

d) Ignition:

Ignition shall be by any convenient means which does not affect the initial temperature or composition of the fuel.

e) End of test:

30 s after exposure of detectors to fire.

C.2 Methylated spirit fire

This fire is intended to represent a fire burning with a clear (invisible) flame.

a) Fuel:

Approximately 1500 ml of methylated spirit containing at least 90 % ethyl alcohol (C_2H_5OH) by volume. The quantity of fuel used shall be sufficient to ensure that the complete base area of the tray is covered by fuel for the complete duration of the test(s).

b) Arrangement:

The methylated spirit shall be burned in a square tray made from 2 mm thick sheet steel, with dimensions 500 mm × 500 mm × 50 mm deep.

c) Initial temperature:

The initial temperature of the fuel shall be (20 ± 10) °C

d) Ignition:

Ignition shall be by any convenient means which does not affect the initial temperature or composition of the fuel.

e) End of test:

30 s after exposure of detectors to fire.

Annexe D
(normative)

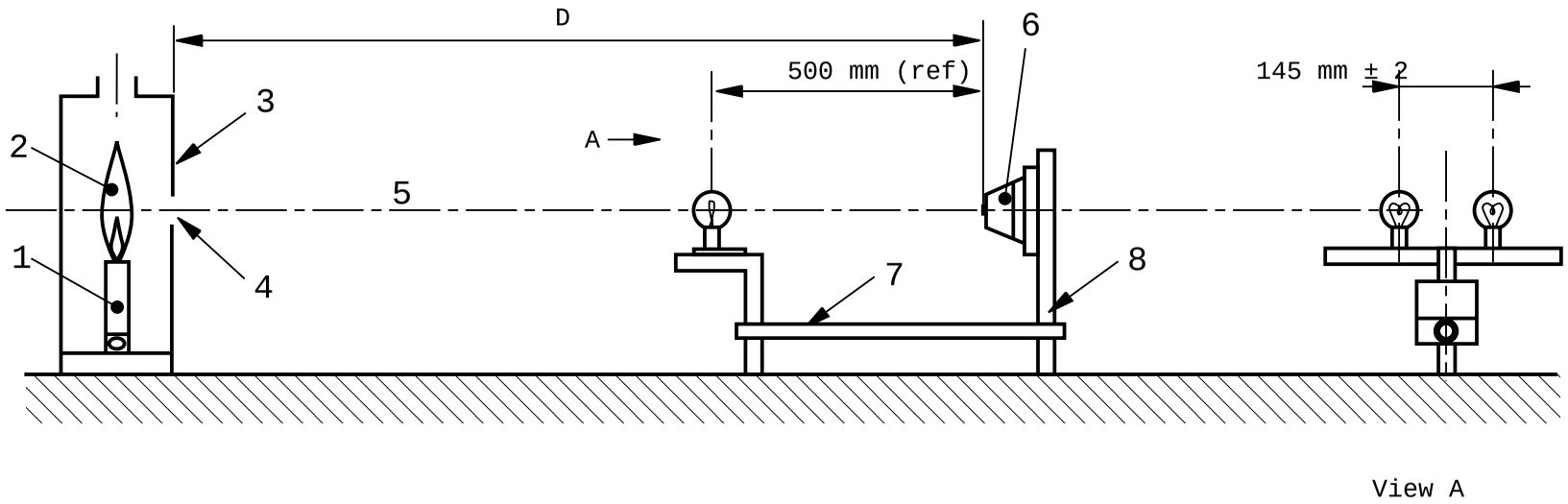
Apparatus for dazzling test

The test apparatus described in this annex and shown in Figure D.1 shall be manufactured so that it may be installed on the optical bench shown in Figure A.1, without impeding the determination of response points.

The light source shall consist of two identical 25 W tungsten incandescent lamps having clear glass envelopes and conforming to IEC 60064. The light source shall be supplied with 50 Hz a.c.

The light source shall be mounted so that the direct line of sight from the detector sensor to the radiation source on the apparatus shown in Figure D.1 is maintained. The light source and the detector sensor shall be connected in such a way that the distance between the lamp stand and the detector is approximately 500 mm and is maintained at this fixed distance when the detector stand is moved.

The voltage supply shall be adjusted so that the colour temperature of the lamps is 2850 K ± 100 K. The distance between the lamps and the detector shall then be adjusted so that the lamps provide an illuminance in the plane of the detector sensor(s) of 100 lux.



Key

1	Methane burner	5	Optical axis
2	Flame	6	Detector
3	Burner housing	7	Stand for lamps
4	Aperture	8	Stand for detectors

Figure D.1 — Apparatus for dazzling test

Annexe E
(normative)

Apparatus for impact test

The apparatus (see Figure E.1) consists essentially of a swinging hammer comprising a rectangular section head (striker), with a chamfered impact face, mounted on a tubular steel shaft. The hammer is fixed into a steel boss, which runs on ball bearings on a fixed steel shaft mounted in a rigid steel frame, so that the hammer can rotate freely about the axis of the fixed shaft. The design of the rigid frame is such as to allow complete rotation of the hammer assembly when the specimen is not present.

The striker is of dimensions 76 mm wide × 50 mm deep × 94 mm long (overall dimensions) and is manufactured from aluminium alloy ($AlCu_4$ SiMg to ISO 209-1), solution treated and precipitation treated condition. It has a plane impact face chamfered at (60 ± 1)° to the long axis of the head. The tubular steel shaft has an outside diameter of (25 ± 0,1) mm with walls (1,6 ± 0,1) mm thick.

The striker is mounted on the shaft so that its long axis is at a radial distance of 305 mm from the axis of rotation of the assembly, the two axes being mutually perpendicular. The central boss is 102 mm in outside diameter and 200 mm long and is mounted coaxially on the fixed steel pivot shaft, which is approximately 25 mm in diameter, however the precise diameter of the shaft will depend on the bearings used.

Diametrically opposite the hammer shaft are two steel counter balance arms, each 20 mm in outside diameter and 185 mm long. These arms are screwed into the boss so that the length of 150 mm protrudes. A steel counter balance weight is mounted on the arms so that its position can be adjusted to balance the weight of the striker and arms, as in Figure E.1. On the end of the central boss is mounted a 12 mm wide × 150 mm in diameter aluminium alloy pulley and round this an inextensible cable is wound, one end being fixed to the pulley. The other end of the cable supports the operating weight.

The rigid frame also supports the mounting board on which the specimen is mounted by its normal fixings. The mounting board is adjustable vertically so that the point of impact with the specimen, when the hammer is moving horizontally, is within the upper half of the impact face as shown in Figure E.2.

To operate the apparatus the position of the specimen and the mounting board is first adjusted as shown in Figure E.1 and the mounting board is then secured rigidly to the frame. The hammer assembly is then balanced carefully by adjustment of the counter balance weight with the operating weight removed. The hammer arm is then drawn back to the horizontal position ready for release and the operating weight is reinstated. On release of the assembly the operating weight will spin the hammer and arm through an angle of 270^{o} to strike the specimen.

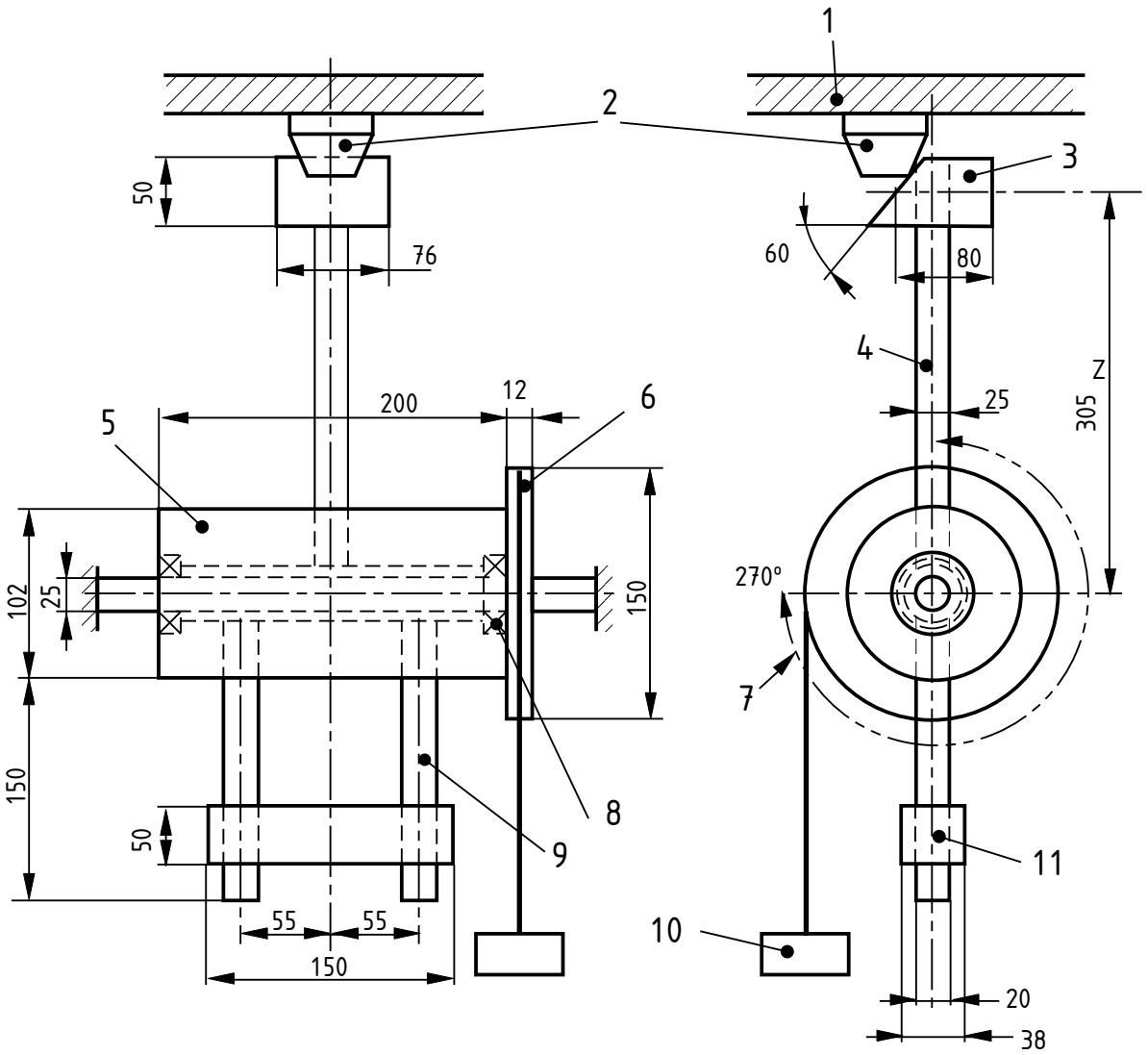
The mass of the operating weight to produce the required impact energy of 1,9 J equals:

$$\frac{0{,}388}{3\pi r}\,\text{kg}$$

where r is the effective radius of the pulley in metres. This equals approximately 0,55 kg for a pulley radius of 75 mm.

As the standard calls for a hammer velocity at impact of (1,5 ± 0,125) $m \cdot s^{-1}$ the mass of the hammer head will need to be reduced by drilling the back face sufficiently to obtain this velocity. It is estimated that a head of mass of about 0,79 kg will be required to obtain the specified velocity, but this will have to be determined by trial and error.

Dimensions in millimetres



Key

1	Mounting board	7	270° angle of movement
2	Specimen	8	Ball bearings
3	Striker	9	Counter balance arms
4	Striker shaft	10	Operating weight
5	Boss	11	Counter balance weight
6	Pulley		

Figure E.1 — Apparatus for impact test

Annex ZA
(informative)

Clauses addressing the provisions of the EU Construction Products Directive 89/106/EEC

ZA.1 Scope and relevant clauses

This European Standard has been prepared under the mandate M/109 given to CEN by the European Commission and the European Free Trade Association.

The clauses of this European Standard, shown in this annex, meet the requirements of the mandate given under the EU Construction Products Directive 89/106/EEC.

Compliance with these clauses confers a presumption of fitness (as defined by the Construction Products Directive) of the construction product covered by this European Standard for its intended use according to Clause 1 (Scope) of this standard; reference shall be made to the information accompanying the CE marking.

WARNING — Other requirements and other EU Directives may be applicable to the products falling within the scope of this standard.

NOTE In addition to any specific clauses relating to dangerous substances contained in this standard, there may be other requirements applicable to the products falling within its scope (e.g. transposed European legislation and national laws, regulations and administrative provisions). These requirements need also to be complied with, when and where they apply. An informative database of European and national provisions on dangerous substances is available at the Construction web site on EUROPA (accessed through http://europa.eu.int).

This Annex ZA has the same scope, in relation to the products covered, as Clause 1 of this standard. This annex establishes the conditions for the CE marking of flame detectors - point detectors intended for the use shown below and identifies the relevant clauses applicable.

Construction product: **Flame detectors - Point detectors**

Intended use: **Fire safety**

Table ZA.1 - Relevant clauses

Essential characteristics	Clauses in this European Standard	Mandated level(s)	Notes
Nominal activation conditions / Sensitivity, Response delay (response time) and Performance under fire conditions	4.2, 5.2 to 5.6	None	
Operational reliability	4.3 to 4.9		
Tolerance to supply voltage	5.16		
Durability of operational reliability and response delay; temperature resistance	5.7, 5.8		
Durability of operational reliability; vibration resistance	5.12 to 5.15		
Durability of operational reliability; humidity resistance	5.9, 5.10		
Durability of operational reliability; corrosion resistance	5.11		
Durability of operational reliability; electrical stability	5.17		

ZA.2 Procedures for the attestation of conformity of point smoke detectors covered by this standard

ZA.2.1 System of attestation of conformity

The mandate requires that the attestation of conformity system to be applied shall be that shown in Table ZA.2.

Table ZA.2 - Attestation of conformity system

Product	Intended use	Levels or classes	Attestation of conformity system
Fire detection/Fire alarm: Flame detectors - Point detectors	Fire safety	None	1
System 1: See CPD Annex III.2.(i), without audit-testing of samples by the notified bodies.			

ZA.2.2 Evaluation of conformity

ZA.2.2.1 General

The evaluation of conformity of the product with the requirements of this European Standard shall be demonstrated by:

a) Tasks to be provided by the manufacturer:

— factory production control;

— testing of samples by the manufacturer in accordance with a prescribed test plan;

b) Tasks to be undertaken under the responsibility of a Notified Product Certification Body:

— type testing of the product;

— initial inspection of the factory and factory production control;

— periodic surveillance, assessment and approval of the factory production control.

NOTE The manufacturer is a natural or legal person, who places the product on the market under his own name. Normally, the manufacturer designs and manufactures the product himself. As a first alternative, he may have it designed, manufactured, assembled, packed, processed or labelled by subcontracting. As a second alternative he may assemble, pack, process, or label ready-made products.

The manufacturer shall ensure:

— that the initial type testing in accordance with this European Standard is initiated and carried out under the responsibility of a notified product certification body; and

— that the product continuously complies with the initial type testing samples, for which compliance with the European Standard in question has been verified.

He shall always retain the overall control and shall have the necessary competence to take the responsibility for the product. The manufacturer shall be fully responsible for the conformity of the product to all relevant regulatory requirements.

ZA.2.2.2 Type testing

ZA.2.2.2.1 Type testing shall be performed to demonstrate conformity with this European Standard.

Type testing of the product shall be carried out in accordance with the clauses shown in Table ZA.1, except as described in ZA.2.2.2.2 and ZA.2.2.2.3.

ZA.2.2.2.2 Tests previously performed, such as type tests for product certification, may be taken into account providing that they were made to the same or a more rigorous test method under the same system of attestation of conformity as required by this standard on the same product or products of similar design, construction and functionality, such that the results are applicable to the product in question.

NOTE Same system of attestation of conformity means testing by an independent third party under the responsibility of a product certification body which is now a notified product certification body.

ZA.2.2.2.3 Where one or more characteristics are the same for products with similar design, construction and functionality then the results of tests for these characteristics on one product may be applied to the other similar product or products.

ZA.2.2.2.4 Test samples shall be representative of the normal production. If the test samples are prototypes, they shall be representative of the intended future production and shall be selected by the manufacturer.

NOTE In the case of prototypes and third party certification, this means that it is the manufacturer not the product certification body who is responsible for selecting the samples. During the initial inspection of the factory and of the factory production control (see ZA.2.2.3.4), it is verified that the type tested samples are representative of the product being produced.

ZA.2.2.2.5 All type testing and its results shall be documented in a test report. All test reports shall be retained by the manufacturer for at least ten years after the last date of production of the product to which they relate.

ZA.2.2.3 Factory production control

ZA.2.2.3.1 General

Factory production control is the permanent internal control of production exercised by the manufacturer.

All the elements, requirements and provisions adopted by the manufacturer shall be documented in a systematic manner in the form of written policies and procedures. This production control system documentation shall ensure a common understanding of conformity evaluation and enable the achievement of the required product characteristics and the effective operation of the production control system to be checked.

Factory production control therefore brings together operational techniques and all measures allowing maintenance and control of the conformity of the product with its technical specifications. Its implementation may be achieved by controls and tests on measuring equipment, raw materials and constituents, processes, machines and manufacturing equipment and finished products, including material properties in components, and by making use of the results thus obtained.

NOTE The FPC system may be part of a Quality Management system, e.g. in accordance with EN ISO 9001:2000.

ZA.2.2.3.2 General requirements

The manufacturer shall establish, document and maintain a FPC system to ensure that the products placed on the market conform to the stated performance characteristics and the samples subjected to type testing.

Where subcontracting takes place, the manufacturer shall retain the overall control of the product and ensure that he receives all the information that is necessary to fulfil his responsibilities according to this European Standard. If the manufacturer has part of the product designed, manufactured, assembled, packed, processed and/or labelled by subcontracting, the FPC of the subcontractor may be taken into account, where appropriate, for the product in question. The manufacturer who subcontracts all of his activities may in no circumstances pass these responsibilities on to a subcontractor.

The FPC system shall fulfil the requirements as described in the following clauses of EN ISO 9001:2000, where applicable:

— 4.2 except 4.2.1a);

— 5.1 e), 5.5.1, 5.5.2;

— Clause 6;

— 7.1 except 7.1 a), 7.2.3 c), 7.4, 7.5, 7.6;

— 8.2.3, 8.2.4, 8.3, 8.5.2.

The FPC system may be part of an existing quality management system, (e.g. in accordance with EN ISO 9001:2000), the scope of which covers the manufacture of the product.

Where a quality management system is certified in accordance with EN ISO 9001:2000 by a certification body which is now a notified certification body, then the assessment reports of this quality management system may be taken into account with respect to these clauses.

ZA.2.2.3.3 Product-specific requirements

The FPC system shall:

— address this European Standard; and

— ensure that the products placed on the market conform to the stated performance characteristics.

The FPC system shall include a product specific FPC or quality plan, which identifies procedures to demonstrate conformity of the product at appropriate stages, i.e.

a) the controls and tests to be carried out prior to and/or during manufacture according to a frequency laid down; and/or

b) the verifications and tests to be carried out on finished products according to a frequency laid down.

If the manufacturer uses only finished products, the operations under b) shall lead to an equivalent level of conformity of the product as if normal FPC had been carried out during the production.

If the manufacturer carries out parts of the production himself, the operations under b) may be reduced and partly replaced by operations under a). Generally, the more parts of the production that are carried out by the manufacturer, the more operations under b) may be replaced by operations under a). In any case the operation shall lead to an equivalent level of conformity of the product as if normal FPC had been carried out during the production.

NOTE Depending on the specific case, it can be necessary to carry out the operations referred to under a) and b), only the operations under a) or only those under b).

The operations under a) centre as much on the intermediate states of the product as on manufacturing machines and their adjustment, and measuring equipment etc. These controls and tests and their frequency shall be chosen based on product type and composition, the manufacturing process and its complexity, the sensitivity of product features to variations in manufacturing parameters etc.

The manufacturer shall establish and maintain records that provide evidence that the production has been sampled and tested. These records shall show clearly whether the production has satisfied the defined acceptance criteria and shall be available for at least three years. These records shall be available for inspection.

Where the product fails to satisfy the acceptance measures, the provisions for non-conforming products shall apply, the necessary corrective action shall immediately be taken and the products or batches not conforming shall be isolated and properly identified. Once the fault has been corrected, the test or verification in question shall be repeated.

The results of controls and tests shall be properly recorded. The product description, date of manufacture, test method adopted, test results and acceptance criteria shall be entered in the records under the signature of the person responsible for the control/test. With regard to any control result not meeting the requirements of this European Standard, the corrective measures taken to rectify the situation (e.g. a further test carried out, modification of manufacturing process, discarding or putting right of product) shall be indicated in the records.

Individual products or batches of products and the related manufacturing documentation shall be completely identifiable and retraceable.

ZA.2.2.3.4 Initial inspection of factory and FPC

Initial inspection of FPC shall be carried out when the production process has been finalised and preferably in operation. The factory and FPC documentation shall be assessed to verify that the requirements of ZA.2.2.3.1 and ZA.2.2.3.2 are fulfilled.

In the assessment it shall be verified that:

a) all resources necessary for the achievement of the product characteristics required by this European Standard are or will be available; and

b) the FPC procedures in accordance with the FPC documentation are or will be implemented and followed in practice; and

c) the product complies or will comply with the initial type testing samples, for which compliance with this European Standard has been verified.

All locations where final assembly or at least final testing of the relevant product is performed, shall be assessed to verify that the above conditions a) to c) are in place.

If the FPC system covers more than one product, production line or production process, and it is verified that the general requirements are fulfilled when assessing one product, production line or production process, then the assessment of the general requirements does not need to be repeated when assessing the FPC for another product, production line or production process.

Provided that the production process is similar, assessments previously performed in accordance with the provisions of this standard may be taken into account providing that they were made to the same system of attestation of conformity on the same product or products of similar design, construction and functionality, such that the results may be considered applicable to the product in question.

NOTE Same system of attestation of conformity means inspection of FPC by an independent third party under the responsibility of a product certification body which is now a notified product certification body.

All assessments and their results shall be documented in a report.

ZA.2.2.3.5 Periodic surveillance of FPC

Surveillance of the FPC shall be undertaken at least once a year.

The surveillance of the FPC shall include a review of the quality plan(s) and production processes(s) for each product to determine if any changes have been made since the last assessment or surveillance and the significance of any changes shall be assessed.

Checks shall be made to ensure that the quality plans are still correctly implemented and that the production equipment is still correctly maintained and calibrated.

The records of tests and measurement made during the production process and to finished products shall be reviewed to ensure that the values obtained still correspond with those values for the samples submitted to type testing and that the correct actions have been taken for non-compliant devices.

The surveillance of the FPC may be carried out as part of a surveillance or reassessment of a Quality Management system (e.g. in accordance with EN ISO 9001:2000).

ZA.2.2.4 Procedure for modifications

If modifications are made to the product, production process or FPC system that could affect any of the product characteristics required by this standard, then all characteristics covered by the clauses shown in Table ZA.1, which may be changed by the modification, shall be subject to type testing or engineering evaluation, except as described in ZA.2.2.2.2 and ZA.2.2.2.3. Where relevant, a re-assessment of the factory and of the FPC system shall be performed for those aspects which may be affected by the modification.

All assessments and their results shall be documented in a report.

ZA.3 CE Marking and labelling and accompanying documentation

The manufacturer or his authorised representative established within the EEA is responsible for the affixing of the CE marking. The CE marking symbol (in accordance with Directive 93/68/EEC) shall be placed on the product and be accompanied by the number of the EC certificate of conformity and the Notified Body number. If the Notified Body number is included as part of the number of the EC certificate of conformity, then the number of the EC certificate of conformity is sufficient.

The CE marking symbol shall in addition be shown on the accompanying commercial documentation supplemented by:

a) the identification number of the Notified Product Certification Body;

b) the name or identifying mark and registered address of the manufacturer;

c) the last two digits of the year in which the marking was affixed;

d) the number of the EC certificate of conformity;

e) reference to this European Standard (EN 54-10);

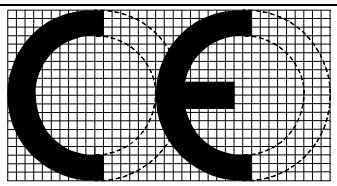
f) the description of the construction product (flame detectors – point detectors);

g) the type/model designation of the product;

h) other information required by 4.8 and/or 4.9, or a reference to a document, which shall be uniquely identifiable and available from the manufacturer, containing this information.

Where the product exceeds the minimum performance levels stated in this standard, and where the manufacturer so desires, the CE marking may be accompanied by an indication of the parameter(s) concerned and the actual test result(s).

Figure ZA.1 shows an example of the information to be given on the accompanying commercial documentation.



0123

AnyCo Ltd, P.O. Box 21, B1050

06

0123 – CPD – 001

EN 54-10

Flame detectors – Point detectors

ABC 123

Technical data: see Doc.123/2006 held by the manufacturer.

Figure ZA.1 — Example of CE marking information on the accompanying commercial documentation

ZA.4 EC certificate and declaration of conformity

The manufacturer, or his authorised representative established in the EEA, shall prepare and retain a declaration of conformity, which authorises the affixing of the CE marking. This declaration shall include:

— the name and address of the manufacturer, or his authorised representative established in the EEA, and the place of production;

NOTE 1 The manufacturer may also be the person responsible for placing the product onto the EEA market, if he takes responsibility for CE marking.

— the description of the construction product (i.e. flame detectors – point detectors);

NOTE 2 Where some of the information required for the Declaration is already given in the CE marking information, it does not need to be repeated.

— type/model designation of the product;

— provisions to which the product conforms (i.e. Annex ZA of this EN);

— any particular conditions applicable to the use of the product (if necessary);

— name and address (or identification number) of the Notified Product Certification Body;

— name of and position held by the person empowered to sign the declaration on behalf of the manufacturer or of his authorized representative.

The declaration shall contain a certificate of conformity with the following information:

— name and address of the Notified Product Certification Body;

— certificate number;

— name and address of the manufacturer, or his authorised representative established in the EEA;

— description of the construction product (i.e. flame detectors – point detectors);

— type/model designation of the product,

— provisions to which the product conforms (i.e. Annex ZA of this EN);

— particular conditions applicable to the use of the product (if necessary);

— conditions of validity of the certificate, where applicable;

— name of and position held by the person empowered to sign the certificate.

The above mentioned declaration and certificate shall be presented (if requested) in the language or languages accepted in the Member State in which the product is to be used.

Bibliography

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

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