

BS EN 54-5:2017



BSI Standards Publication

Fire detection and fire alarm systems

Part 5: Heat detectors — Point heat detectors

National foreword

This British Standard is the UK implementation of EN 54-5:2017. It supersedes BS EN 54-5:2001 which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee FSH/12/2, Fire detectors.

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

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European foreword

This document (EN 54-5:2017) 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of an identical text or by endorsement, at the latest by August 2017, and conflicting national standards shall be withdrawn at the latest by February 2021.

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

This document supersedes EN 54-5:2000.

EN 54-5 has been revised as follows:

Inclusion of new clauses and annexes:

- Clause 6 Assessment and verification of constancy of performance (AVCP)
- Clause 7 Classification and designation
- Clause 8 Marking, labelling and packaging
- Annex E (informative) Data supplied with point heat detectors

The main technical changes are as follows:

- Applying the latest EN 50130-4:2011 EMC for immunity tests.

The editorial changes are as follows:

- Changes from classes to Categories
- Editorial changes in a number of clauses, such as software and General, in order to conform to the regulation.

This document has been prepared under a standardization request given to CEN/CENELEC by the European Commission and the European Free Trade Association, and supports the basic requirements of Regulation (EU) 305/2011.

For relationship with EU Regulation, see informative Annex ZA, which is an integral part of this document.

EN 54, *Fire detection and fire alarm systems*, consists of the following parts:

- Part 1: Introduction
- Part 2: Control and indicating equipment
- Part 3: Fire alarm devices – Sounders
- Part 4: Power supply equipment

- Part 5: Heat detectors – Point heat detectors
- Part 7: Smoke detectors – Point detectors using scattered light, transmitted light or ionization
- Part 10: Flame detector – Point detectors
- Part 11: Manual call points
- Part 12: Smoke detectors – Line detector using an optical light beam
- Part 13: Compatibility assessment of system components
- Part 14: Guidelines for planning, design, installation, commissioning, use and maintenance (CEN/TS)
- Part 16: Voice alarm control and indicating equipment
- Part 17: Short circuit isolators
- Part 18: Input/output devices
- Part 20: Aspirating smoke detectors
- Part 21: Alarm transmission and fault warning routine equipment
- Part 22: Line-type heat detectors
- Part 23: Fire alarm devices – Visual alarms
- Part 24: Components of voice alarm systems – Loudspeakers
- Part 25: Components using radio links and system requirements
- Part 26: Carbon monoxide detectors – Point detectors
- Part 27: Duct smoke detectors
- Part 28: Non-resettable (digital) line type heat detectors
- Part 29: Multi-sensor fire detectors - Point detectors using a combination of smoke and heat sensors
- Part 30: Multi-sensor fire detectors - Point detectors using a combination of carbon monoxide and heat sensors
- Part 31: Multi-sensor detector – Point detectors using a combination of smoke, carbon monoxide and optionally heat sensors
- Part 32: Guidelines for the planning, design, installation, commissioning, use and maintenance of voice alarm systems (CEN/TS)

NOTE This list includes standards that are in preparation and other standards may be added. For current status of published standards refer to www.cen.eu.

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

1 Scope

This European Standard specifies the requirements, test methods and performance criteria for point heat detectors intended for use in fire detection and fire alarm systems installed in and around buildings (see EN 54-1:2011).

This European Standard provides for the assessment of verification of consistency of performance (AVCP) of point heat detectors to this EN.

For other types of heat detector, or for detectors intended for use in other environments, this standard should only be used for guidance.

Heat detectors with special characteristics and developed for specific risks are not covered by this standard.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 54-1:2011, *Fire detection and fire alarm systems - Part 1: Introduction*

EN 50130-4:2011, *Alarm systems - Part 4: Electromagnetic compatibility - Product family standard: Immunity requirements for components of fire, intruder, hold up, CCTV, access control and social alarm systems*

EN 60068-1:1994, *Environmental testing - Part 1: General and guidance (IEC 60068-1:1988)*

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

EN 60068-2-2:2007, *Environmental testing - Part 2-2: Tests - Test B: Dry heat (IEC 60068-2-2:2007)*

EN 60068-2-6:2008, *Environmental testing - Part 2-6: Tests - Test Fc: Vibration (sinusoidal) (IEC 60068-2-6:2008)*

EN 60068-2-27:2009, *Environmental testing - Part 2-27: Tests - Test Ea and guidance: Shock (IEC 60068-2-27:2009)*

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

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

EN 60068-2-78:2013, *Environmental testing - Part 2-78: Tests - Test Cab: Damp heat, steady state (IEC 60068-2-78:2012)*

ISO 209:2007, *Aluminium and aluminium alloys — Chemical composition*

3 Terms, definitions and abbreviations

3.1 Terms and Definitions

For the purposes of this document, the following terms and definitions and those given in EN 54-1:2011 apply.

3.1.1

typical application temperature

temperature that an installed point heat detector can be expected to experience for long periods of time in the absence of a fire condition

Note 1 to entry: This temperature is deemed to be 29 °C below the minimum static response temperature, according to the category marked on the point heat detector, as specified in Table 1.

3.1.2

maximum application temperature

maximum temperature that an installed point heat detector can be expected to experience, even for short periods of time, in the absence of a fire condition

Note 1 to entry: This temperature is deemed to be 4 °C below the minimum static response temperature, according to the category marked on the point heat detector, as specified in Table 1.

3.1.3

static response temperature

temperature at which the point heat detector would produce an alarm signal if subjected to a vanishingly small rate of rise of temperature

Note 1 to entry: Rates of rise of temperature of approximately 0,2 K min⁻¹ are normally found to be suitable for measuring this, however lower rates can be required in some instances (see 5.3).

3.2 Abbreviations

RT Response time

T Temperature

4 Product characteristics

4.1 General

4.1.1 Heat Response Categories

Detectors are categorized by one or more of the following heat response categories: A1, A2, B, C, D, E, F or G according to the requirements of the tests specified in Clause 5 (see Table 1).

Table 1 — Detector categorization temperatures

Detector Category	Typical Application Temperature °C	Maximum Application Temperature °C	Minimum Static Response Temperature °C	Maximum Static Response Temperature °C
A1	25	50	54	65
A2	25	50	54	70
B	40	65	69	85
C	55	80	84	100
D	70	95	99	115
E	85	110	114	130
F	100	125	129	145
G	115	140	144	160

Manufacturers may optionally give additional information concerning the type of response exhibited by the detector, by adding the suffix S or R to the above categories¹⁾. Detectors, which are marked with the letter S or R as a suffix to the category marking, shall be tested in accordance with the applicable test, specified in 5.4.1 or 5.4.2, and shall meet the requirements of that test, in addition to the tests of Clause 5. Addition of a suffix shall be regarded as creating a new category.

4.2 Operational reliability

4.2.1 Position of heat sensitive elements

The heat sensitive element(s) or at least part of it, except elements with auxiliary functions (e.g. characteristic correctors), shall be at a distance ≥ 15 mm from the mounting surface of the point heat detector. To confirm this, the point heat detector shall be tested in accordance with 5.2.1.

4.2.2 Individual alarm indication

4.2.2.1 Category A1, A2, B, C or D point heat detectors shall be provided with an integral red visual indicator, by which the individual point heat detector, which released an alarm, can be identified, until the alarm condition is reset. Where other conditions of the point heat detector can be visually indicated, they shall be clearly distinguishable from the alarm indication, except when the point heat detector is switched into a service mode. For detachable point heat detectors the indicator may be integral with the base or the point heat detector head. The visual indicator shall be visible from a distance of 6 m directly below the point heat detector, in an ambient light intensity up to 500 lx. To confirm this, the point heat detector shall be assessed in accordance with 5.2.2.1

¹⁾Detectors, with a suffix **S** to their category, do not respond below the minimum static response temperature, applicable to their categories (see Table 1), even at high rates of rise of air temperature. Detectors with a suffix **R** to their category, incorporate a *rate-of-rise* characteristic, which meets the response time requirements (see Table 4) for high rates of rise of air temperature even when starting at air temperatures substantially below the typical application temperature.

4.2.2.2 Category E, F or G point heat detectors shall be provided with either an integral red indicator, or with another means for locally indicating the alarm status of the point heat detector. To confirm this, the point heat detector shall be assessed in accordance with 5.2.2.2

NOTE The alarm condition is reset manually at the control and indicating equipment (see EN 54-2).

4.2.3 Connection of ancillary devices

Where the point heat detector provides for connections to ancillary devices (e.g. remote indicators, control relays), open- or short-circuit failures of these connections shall not prevent the correct operation of the point heat detector. To confirm this, the point heat detector shall be assessed in accordance with 5.2.3.

4.2.4 Monitoring of detachable detectors

For detachable point heat 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. To confirm this, the point heat detector shall be assessed in accordance with 5.2.4.

4.2.5 Manufacturer's adjustments

It shall not be possible to change the manufacturer's settings except by special means (e.g. a special code or tool, or by breaking or removing a seal). To confirm this, the point heat detector shall be assessed in accordance with 5.2.5.

4.2.6 On-site adjustment of response behaviour

If there is provision for on-site adjustment of the response behaviour of the point heat detector then:

- for each setting, at which the manufacturer is stating a corresponding category, access to the adjustment means shall only be possible by the use of a code or special tool or by removing the point heat detector from its base or mounting;
- any other setting(s) which the manufacturer is not stating a corresponding category in accordance to this standard, shall only be accessible by the use of a code or special tool, and it shall be clearly marked on the point heat detector or in the associated data.

To confirm this, the point heat detector shall be assessed in accordance with 5.2.6.

NOTE These adjustments can be carried out at the point heat detector or at the control and indicating equipment.

4.2.7 Software controlled detector (when provided)

4.2.7.1 General

For point heat detectors which rely on software control the requirements of 4.2.7.2, 4.2.7.3 and 4.2.7.4 are applicable.

4.2.7.2 Software documentation

4.2.7.2.1 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 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 point heat 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.

4.2.7.2.2 The manufacturer shall have available detailed design documentation. It shall comprise at least the following:

- a) an overview of the whole system configuration, 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).

4.2.7.3 Software design

The software design shall have:

- a) a modular structure;
- b) the interfaces for manually and automatically generated data shall not permit invalid data to cause error in the program operation;
- c) provisions to avoid the occurrence of deadlock of the programme flow.

4.2.7.4 The storage of programs and data

The program 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 point heat detector.

Site-specific data shall be held in memory which will retain data for at least 2 weeks without external power to the point heat detector, unless provision is made for the automatic renewal of such data, following loss of power, within 1 h of power being restored.

To confirm this, the point heat detector shall be assessed in accordance with 5.2.7.

4.3 Nominal activation conditions/sensitivity

4.3.1 Directional dependence

The response time of the point heat detector shall not be unduly dependent on the direction of airflow around the point heat detector. To confirm this, the point heat detector shall be tested in accordance with 5.3.1.

4.3.2 Static response temperature

The point heat detector shall respond correctly to a slow rate of rise of air temperature. To confirm this, the point heat detector shall be tested in accordance with 5.3.2.

4.3.3 Response times from typical application temperature

The point heat detector shall respond correctly over a range of rates of rise of air temperature. To confirm this, the point heat detector shall be tested in accordance with 5.3.3.

4.3.4 Response times from 25 °C

Point heat detectors in a category with a typical application temperature above 25 °C (see Table 1) shall not exhibit an abnormally fast response to normal increases in temperature.

To confirm this, the point heat detector shall be tested in accordance with 5.3.4.

NOTE The requirement for response time from 25 °C for category A1 or A2 point heat detectors is already covered in 4.3.3.

4.3.5 Response times from high ambient temperature

The point heat detector shall function correctly at high ambient temperatures appropriate to the anticipated service temperatures. To confirm this, the point heat detector shall be tested in accordance with 5.3.5.

4.3.6 Reproducibility

The response times of the point heat detectors shall be within the given limits. To confirm this, the point heat detector shall be tested in accordance with 5.3.6.

4.4 Response delay (response time)

4.4.1 Additional tests for suffix S detectors

Suffix S point heat detector shall not respond below the minimum static response temperature applicable to the category of the point heat detector. To confirm this, the point heat detector shall be tested in accordance with 5.4.1.

4.4.2 Additional tests for suffix R detectors

Suffix R point heat detector shall maintain the response requirements of its category for high rates of rise of temperature starting from an initial temperature below the typical application temperature applicable to the category marked on the point heat detector. To confirm this, the point heat detector shall be tested in accordance with 5.4.2.

4.5 Tolerance to supply voltage - Variation in supply parameters

Within the specified range(s) of the supply parameters (e.g. voltage), the response time of the point heat detector shall not be unduly dependent on these parameters. To confirm this, the point heat detector shall be tested in accordance with 5.5.1.

4.6 Durability of Nominal activation conditions/sensitivity

4.6.1 Temperature resistance

4.6.1.1 Cold (operational)

The point heat detector shall function correctly at low ambient temperatures appropriate to the anticipated service temperature. To confirm this, the point heat detector shall be tested in accordance with 5.6.1.1

4.6.1.2 Dry heat (endurance)

The point heat detector shall withstand a high ambient temperature appropriate to its category. To confirm this, the point heat detector shall be tested in accordance with 5.6.1.2.

This requirement is not applicable to category A1, A2 and B point heat detectors.

4.6.2 Humidity resistance

4.6.2.1 Damp heat, cyclic (operational)

The point heat detector shall function correctly at high relative humidities (with condensation), which can occur for short periods in the anticipated service environment. To confirm this, the point heat detector shall be tested in accordance with 5.6.2.1.

4.6.2.2 Damp heat, steady-state (endurance)

The point heat detector shall 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.). To confirm this, the point heat detector shall be tested in accordance with 5.6.2.2.

4.6.3 Corrosion resistance: Sulphur dioxide (SO₂) corrosion (endurance)

The point heat detector shall withstand the corrosive effects of sulphur dioxide as an atmospheric pollutant. To confirm this, the point heat detector shall be tested in accordance with 5.6.3.1.

4.6.4 Vibration resistance

4.6.4.1 Shock (operational)

The point heat detector shall withstand mechanical shocks, which are likely to occur, albeit infrequently, in the anticipated service environment. To confirm this, the point heat detector shall be tested in accordance with 5.6.4.1.

4.6.4.2 Impact (operational)

The point heat detector shall withstand mechanical impacts upon its surface, which it may sustain in the normal service environment, and which it can reasonably be expected to withstand. To confirm this, the point heat detector shall be tested in accordance with 5.6.4.2.

4.6.4.3 Vibration, sinusoidal, (operational)

The point heat detector shall withstand vibration at levels considered appropriate to the normal service environment. To confirm this, the point heat detector shall be tested in accordance with 5.6.4.3.

4.6.4.4 Vibration, sinusoidal (endurance)

The point heat detector shall withstand the long term effects of vibration at levels appropriate to the service environment. To confirm this, the point heat detector shall be tested in accordance with 5.6.4.4.

4.6.5 Electrical stability: Electromagnetic Compatibility (EMC), Immunity tests (operational)

The point heat detector shall be immune to Electromagnetic influences. To confirm this, the point heat detector shall be tested in accordance with 5.6.5.1.

5 Testing, assessment and sampling methods

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 EN 60068-1:1994 as follows:

temperature:	(15 to 35) °C;
relative humidity:	(25 to 75) %;
air pressure:	(86 to 106) kPa.

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 point heat detectors to allow a fault signal to be recognized).

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

Unless otherwise stated, the tolerances for the environmental test parameters shall be as given in the basic reference standards for the test (e.g. the relevant parts of EN 60068).

If a requirement or test procedure does not specify a tolerance or deviation limits, then deviation limits of $\pm 5\%$ shall be applied.

5.1.5 Measurement of response time

The specimen, for which the response time is to be measured, shall be mounted in a heat tunnel as described in 5.1.3 and Annex A. It shall be connected to suitable supply and monitoring equipment in accordance with 5.1.2. The orientation of the specimen, relative to the direction of airflow, shall be that which gave the maximum response time in the directional dependence test 5.3.1, unless otherwise specified.

Before the measurement, the temperature of the air stream and the specimen shall be stabilized to the temperature specified in the applicable test procedure. The measurement is then made by increasing the air temperature, in the heat tunnel, linearly with respect to time, at the rate of rise specified in the applicable test procedure until the supply and monitoring equipment indicates an alarm or until the upper limit of response time for the test is exceeded. During the measurement the air flow shall be maintained at a constant mass flow, equivalent to $(0,8 \pm 0,1) \text{ m s}^{-1}$ at $25\text{ }^\circ\text{C}$, and the air temperature shall be controlled to within $\pm 2\text{ K}$ of the nominal temperature required at any time during the test (see Annex A). The response time is the time interval between the start of the temperature increase and the indication of an alarm from the supply and monitoring equipment.

NOTE 1 Linear extrapolation of the stabilized and the increasing temperature against time lines may be used to establish the effective start time of the temperature increase.

NOTE 2 Care should be taken not to subject point heat detectors to a damaging thermal shock when transferring them to and from a stabilization or alarm temperature.

NOTE 3 Details and information concerning the design of the heat tunnel are given in Annexes A and C

5.1.6 Provision for tests

The following shall be provided for testing compliance with this standard:

For resettable point heat detectors:	15 detectors
For non-resettable point heat detectors:	62 detectors
For non-resettable suffix S point heat detectors:	63 detectors
For non-resettable suffix R point heat detectors:	68 detectors;

The data required in Clause 8.

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

5.1.7 Test schedule

Resettable specimens shall be arbitrarily numbered 1 to 15 by the testing organization and tested according to the test schedule in Table 2.

For point heat detectors with provision for on-site adjustment of their category:

- tests in accordance with 5.3.2, 5.3.3, 5.3.4, 5.3.5, 5.3.6, 5.4.1 and 5.4.2 shall be applied for each applicable category;
- the test in accordance with 5.6.1.2 shall be applied for the category with the highest temperature rating;
- all other tests shall be applied for the category with the lowest temperature rating. If suffix R can be selected for the category with the lowest temperature rating, the suffix R shall be applied for all other tests.

Non-resettable specimens shall be arbitrarily numbered 1 to 62, 1 to 63, or 1 to 68 according to category, by the testing organization and tested according to the test schedule in Table 3.

Table 2 — Test schedule for resettable point heat detectors

Test	Clause	Specimen Number(s)							
		Rate of rise of air temperature K min ⁻¹							
		< 0,2	1	3	5	10	20	30	Plunge
Directional dependence	5.3.1					1			
Static response temperature	5.3.2	1, 2							
Response times from typical application temperature	5.3.3		1, 2	1, 2	1, 2	1, 2	1, 2	1, 2	
Response times from 25 °C	5.3.4			1			1		
Response times from high ambient temperature	5.3.5			1			1		
Reproducibility (response times before environmental tests)	5.3.6			3 to 15			3 to 15		
Additional test for suffix S detectors	5.4.1								1
Additional test for suffix R detectors	5.4.2					1, 2	1, 2	1, 2	
Variation in supply parameters	5.5.1			1, 2			1, 2		
Cold (operational)	5.6.1.1			3			3		
Dry heat (endurance)	5.6.1.2			4			4		
Damp heat, cyclic (operational)	5.6.2.1			5			5		
Damp heat, steady-state (endurance)	5.6.2.2			6			6		
Sulphur dioxide (SO ₂) corrosion (endurance)	5.6.3.1			7			7		
Shock (operational)	5.6.4.1			8			8		
Impact (operational)	5.6.4.2			9			9		
Vibration, sinusoidal (operational)	5.6.4.3			10			10		
Vibration, sinusoidal (endurance)	5.6.4.4			10			10		
Electrostatic discharge	5.6.5.1			11 ^a			11 ^a		

Test	Clause	Specimen Number(s)							
		Rate of rise of air temperature K min ⁻¹							
		< 0,2	1	3	5	10	20	30	Plunge
(operational)									
Radiated electromagnetic fields (operational)	5.6.5.1			12 ^a			12 ^a		
Conducted disturbances induced by electromagnetic fields (operational)	5.6.5.1			13 ^a			13 ^a		
Fast transient burst (operational)	5.6.5.1			14 ^a			14 ^a		
Slow high energy voltage surge (operational)	5.6.5.1			15 ^a			15 ^a		

^a In the interests of test economy, it is permitted to use the same specimen for more than one EMC test. In that case, intermediate functional test(s) on the specimen(s) used for more than one test may be deleted, and the functional test conducted at the end of the sequence of tests. However it should be noted that in the event of a failure, it may not be possible to identify which test exposure caused the failure.

Table 3 — Test schedule for non-resettable point heat detectors

Test	Clause	Specimen Number(s)							
		Rate of rise of air temperature K min ⁻¹							
		< 0,2	1	3	5	10	20	30	Plunge
Directional dependence	5.3.1					1 to 8			
Static response temperature	5.3.2	9, 10							
Response times from typical application temperature	5.3.3		11, 12	13, 14	15, 16	17, 18	19, 20	21, 22	
Response times from 25 °C	5.3.4			23			24		
Response times from high ambient temperature	5.3.5			25			26		
Reproducibility (response times before environmental tests)	5.3.6			31, 32			33, 34		
Additional test for	5.4.1								63

Test	Clause	Specimen Number(s)							
		Rate of rise of air temperature K min ⁻¹							
		< 0,2	1	3	5	10	20	30	Plunge
suffix S point heat detectors									
Additional test for suffix R point heat detectors	5.4.2					63, 64	65, 66	67, 68	
Variation in supply parameters	5.5.1			27, 28			29, 30		
Cold (operational)	5.6.1.1			35			36		
Dry heat (endurance)	5.6.1.2			37			38		
Damp heat, cyclic (operational)	5.6.2.1			39			40		
Damp heat, steady-state (endurance)	5.6.2.2			41			42		
Sulphur dioxide (SO ₂) corrosion (endurance)	5.6.3.1			43			44		
Shock (operational)	5.6.4.1			45			46		
Impact (operational)	5.6.4.2			47			48		
Vibration, sinusoidal (operational)	5.6.4.3			49			50		
Vibration, sinusoidal (endurance)	5.6.4.4			51			52		
Electrostatic discharge (operational)	5.6.5.1			53 ^a			54 ^a		
Radiated electromagnetic fields (operational)	5.6.5.1			55 ^a			56 ^a		
Conducted disturbances induced by electromagnetic fields (operational)	5.6.5.1			57 ^a			58 ^a		
Fast transient burst (operational)	5.6.5.1			59 ^a			60 ^a		
Slow high energy voltage surge (operational)	5.6.5.1			61 ^a			62 ^a		

^a In the interests of test economy, it is permitted to use the same specimen for more than one EMC test. In that case, intermediate functional test(s) on the specimen(s) used for more than one test may be deleted, and the functional test conducted at the end of the sequence of tests. However it should be noted that in the event of a failure, it may not be possible to identify which test exposure caused the failure.

5.2 Operational reliability

5.2.1 Position of heat sensitive elements

The position of the heat sensitive element(s) from the mounting surface of the point heat detector, except elements with auxiliary functions (e.g. characteristic correctors), shall be measured to verify that the point heat detector meets the requirements as specified in 4.2.1.

5.2.2 Individual alarm indication

5.2.2.1 The indicator for category A1, A2, B, C, and D shall be visually inspected from a distance of 6 m directly below the point heat detector, in an ambient light intensity up to 500 lx as specified in 4.2.2.1.

5.2.2.2 If the indicator is integral for category E, F or G then it shall be visually inspected from a distance of 6 m directly below the point heat detector, in an ambient light intensity up to 500 lx as specified in 4.2.2.2.

5.2.3 Connection of ancillary devices

Open- and short-circuit shall be applied at the connections for ancillary devices. Check that no faults or alarm is observed. Apply stimulus to check the operation of the detector and confirm the correct operation of the point heat detector.

5.2.4 Monitoring of detachable detectors

Removal of a detector from its base shall be indicated as a fault at a remote monitoring system (e.g. control and indicating equipment).

5.2.5 Manufacturer's adjustments

A visual inspection and a review of the supporting data shall be conducted in conjunction with appropriate operation of the point heat detector to verify that it is not possible to change the manufacturer's settings except by special means (e.g. a special code or tool, or by breaking or removing a seal).

5.2.6 On-site adjustment of response behaviour

A visual inspection and a review of the supporting data shall be conducted in conjunction with appropriate operation of the point heat detector to verify that for each setting, it meets the appropriate heat response requirement and it is not possible to change the manufacturer's settings except by special means (e.g. a special code or tool, or by breaking or removing a seal).

5.2.7 Software controlled detectors (when provided)

For point heat detectors that rely on software for their operation, a visual inspection of samples of documentation provided by the manufacturer shall be conducted to verify that the device complies with the requirements specified in 4.2.7.

5.3 Nominal activation conditions/sensitivity

5.3.1 Directional dependence

5.3.1.1 Object

To confirm that the response time of the point heat detector is not unduly dependent on the direction of airflow around the point heat detector.

5.3.1.2 Test procedure

The specimen(s) shall be tested as described in 5.1.5 at a rate of rise of air temperature of 10 K min⁻¹. Eight such tests shall be made, the specimen being rotated about a vertical axis by 45 ° between successive tests so that tests are made with eight different orientations. Before each test the specimen shall be stabilized to the typical application temperature specified in Table 1 according to the category marked on the specimen. The response time at the eight orientations shall be recorded. The orientations at which the maximum and minimum response times were measured, shall be noted.

5.3.1.3 Requirements

Category A1 point heat detectors shall respond between 1 min 0 s and 4 min 20 s at all eight orientations.

Categories A2, B, C, D, E, F and G point heat detectors shall respond between 2 min 0 s and 5 min 30 s at all eight orientations. (Refer to Table 4)

5.3.2 Static response temperature

5.3.2.1 Object

To confirm the ability of a point heat detector to respond correctly to a slow rate of rise of air temperature.

5.3.2.2 Test procedure

The specimens shall be tested as described in 5.1.5 at a rate of rise of air temperature of 1 K min⁻¹ until the applicable maximum application temperature is reached as specified in Table 1 according to the category marked on the specimen. Thereafter the test shall be continued at a maximum rate of rise of air temperature of 0,2 K min⁻¹. One specimen shall be tested at the orientation which gave the maximum response time, and the other at the orientation which gave the minimum response time in test 5.3.1. Before each test the specimen shall be stabilized to the typical application temperature specified in Table 1 according to the category marked on the specimen. The temperature at which the specimens respond shall be recorded.

5.3.2.3 Requirements

The response temperatures of the point heat detectors tested shall lie between the minimum and maximum static response temperatures, shown in Table 1, according to the category of the point heat detector.

5.3.3 Response times from typical application temperature

5.3.3.1 Object

To confirm the ability of the point heat detector stabilized at its typical application temperature to respond correctly over a range of rates of rise of air temperature.

5.3.3.2 Test Procedure

The specimens shall be tested as described in 5.1.5 at rates of rise of air temperature of (1, 3, 5, 10, 20 and 30) K min⁻¹. One specimen shall be tested at the orientation which gave the maximum response time, and the other at the orientation which gave the minimum response time in test 5.3.1. Before each test the specimen shall be stabilized to the typical application temperature specified in Table 1 according to the category marked on the specimen. The response time for each rate of rise of air temperature shall be recorded for each specimen.

5.3.3.3 Requirements

The response times of the point heat detectors shall lie between the lower and upper response time limits specified in Table 4 for the appropriate point heat detector category.

Table 4 — Response time limits

Rate of rise of air temperature	Category A1 point heat detectors				Category A2, B, C, D, E, F and G point heat detectors			
	Lower limit of response time		Upper limit of response time		Lower limit of response time		Upper limit of response time	
	min	s	min	s	min	s	min	s
K min ⁻¹								
1	29	0	40	20	29	0	46	0
3	7	13	13	40	7	13	16	0
5	4	9	8	20	4	9	10	0
10	1	0	4	20	2	0	5	30
20		30	2	20	1	0	3	13
30		20	1	40		40	2	25

NOTE Information concerning the derivation of the limits given in Table 4 is given in Annex C.

5.3.4 Response times from 25 °C

5.3.4.1 Object

To confirm that point heat detectors in a category with a typical application temperature above 25 °C (see Table 1) do not exhibit an abnormally fast response to normal increases in temperature.

NOTE This test is already covered in 5.3.3 for categories A1 and A2 point heat detectors.

5.3.4.2 Test procedure

The specimen(s) shall be tested as described in 5.1.5 at rates of rise of air temperature of 3 K min⁻¹ and 20 K min⁻¹. The specimen shall be tested at the orientation which gave the minimum response time in test 5.3.1. Before each test the specimen shall be stabilized to 25 °C. The response times of the specimen shall be recorded.

5.3.4.3 Requirements

The response time at 3 K min⁻¹ shall exceed 7 min 13 s, and the response time at 20 K min⁻¹ shall exceed 1 min 0 s.

5.3.5 Response times from high ambient temperature

5.3.5.1 Object

To demonstrate the ability of the point heat detector to function correctly at high ambient temperatures appropriate to the anticipated service temperatures.

5.3.5.2 Test procedure

The specimen(s) shall be tested as described in 5.1.5 at rates of rise of air temperature of 3 K min⁻¹ and 20 K min⁻¹. The specimen shall be tested at the orientation which gave the maximum response time in test 5.3.1. Before each test the specimen shall be stabilized for 2 h at the maximum application temperature specified in Table 1 according to the category marked on the specimen. The rate of rise of air temperature up to the stabilization temperature shall be ≤ 1 K min⁻¹. The response times of the specimen shall be recorded.

5.3.5.3 Requirements

No alarm or fault signal shall be given during the period that the temperature is increasing to the stabilization temperature or during the stabilization period.

Point heat detectors shall respond, according to their category, between the lower and upper response time limits specified in Table 5.

Table 5 — Response time limits from maximum application temperature

Point heat detector category	Lower limit of response time at air temperature rise of:				Upper limit of response time at air temperature rise of:			
	3 K min ⁻¹		20 K min ⁻¹		3 K min ⁻¹		20 K min ⁻¹	
	min	s	min	s	min	s	min	s
A1	1	20		12	13	40	2	20
All others	1	20		12	16	0	3	13

5.3.6 Reproducibility

5.3.6.1 Object

To show that the response times of the point heat detectors are within the required limits, and, for resettable point heat detectors, to establish response time base data for comparison with the response times measured after the environmental tests.

5.3.6.2 Test procedure

The response time of the specimens shall be measured as described in 5.1.5 at rates of rise of air temperature of 3 K min⁻¹ and 20 K min⁻¹ in the orientation which gave the maximum response time as determined by test 5.3.1. Before each measurement the specimen shall be stabilized to the typical application temperature specified in Table 1 according to the category marked on the specimen.

5.3.6.3 Requirements

The response times of the point heat detectors shall lie between the lower and upper response time limits specified in Table 4 for the appropriate point heat detector category.

5.4 Response delay (response time)

5.4.1 Additional tests for suffix S detectors

5.4.1.1 Object

To confirm that a suffix S point heat detector does not respond below the minimum static response temperature applicable to the category of the point heat detector. This test is only applicable to suffix S point heat detectors.

5.4.1.2 Test procedure

5.4.1.2.1 Plunge test

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.

The specimen shall be stabilized to the conditioning temperature specified in Table 6 according to the category marked on the specimen. At the end of the conditioning period the specimen shall be transferred, in a period not exceeding 10 s, into an airflow of 0,8 m s⁻¹ (mass equivalent at 25 °C) maintained at the temperature specified in Table 6. The specimen shall be tested in the orientation which gave the minimum response time as determined by the test in 5.3.1. The specimen shall be exposed to the airflow for at least 10 min. Any response from the specimen during this time or during the transfer period shall be noted.

Table 6 — Conditioning and airflow temperatures

Point heat detector category	Conditioning temperature	Airflow temperature
	°C	°C
A1S	5 ± 2	50 ± 2
A2S	5 ± 2	50 ± 2
BS	20 ± 2	65 ± 2
CS	35 ± 2	80 ± 2
DS	50 ± 2	95 ± 2
ES	65 ± 2	110 ± 2
FS	80 ± 2	125 ± 2
GS	95 ± 2	140 ± 2

5.4.1.2.2 Review of response time data

The response times of the specimens tested in tests 5.4 and 5.3.6 shall be reviewed.

5.4.1.3 Requirements

The specimen subjected to the plunge test, in accordance with 5.4.1.2.1, shall not produce an alarm or fault signal during the transfer period or during the 10 min exposure to the airflow, when tested in accordance with 5.4.1.2.2.

The response times of the specimens tested in 5.3.3 and 5.3.6 shall exceed the lower limits of response time for each applicable rate of temperature rise specified in Table 7.

Table 7 — Lower limit of response for category suffix S point heat detectors

Rate of rise of air temperature K min ⁻¹	Lower limit of response time	
	min	s
3	9	40
5	5	48
10	2	54
20	1	27
30		58

NOTE These lower limits of response time correspond to a minimum rise of temperature of 29 K above the stabilization temperature.

5.4.2 Additional test for suffix R detectors

5.4.2.1 Object

To confirm that a suffix R point heat detector maintains the response requirements of its category for high rates of rise of temperature starting from an initial temperature below the typical application temperature applicable to the category marked on the point heat detector. This test is only applicable to suffix R point heat detectors.

5.4.2.2 Test procedure

The specimens shall be tested as described in 5.1.5 at rates of rise of air temperature of 10 K min⁻¹, 20 K min⁻¹, and 30 K min⁻¹. One specimen shall be tested with the orientation which gave the minimum response time and the other at the orientation which gave the maximum response time in the test in 5.3.1. Before each test, the air stream and the specimen shall be stabilized to the temperature specified in Table 8 according to the category marked on the specimen. The response times of the specimens shall be recorded.

Table 8 — Initial conditioning temperature for suffix R point heat detectors

Point heat detector category	Initial conditioning temperature °C
A1R	5 ± 2
A2R	5 ± 2
BR	20 ± 2
CR	35 ± 2
DR	50 ± 2
ER	65 ± 2
FR	80 ± 2
GR	95 ± 2

5.4.2.3 Requirements

The response times of the point heat detectors shall lie between the lower and upper response time limits specified in Table 4 for the appropriate point heat detector category.

5.5 Tolerance to supply voltage

5.5.1 Variation in supply parameters

5.5.1.1 Object

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

5.5.1.2 Test procedure

The specimens shall be tested as described in 5.1.5 at rates of rise of air temperature of 3 K min⁻¹ and 20 K min⁻¹ at the upper and lower limits of the supply parameters (e.g. voltage) range specified by the manufacturer. One specimen shall be tested at the orientation which gave the maximum response time, and the other at the orientation which gave the minimum response time in test 5.3.1. Before each test the specimen shall be stabilized to the typical application temperature specified in Table 1 according to the category marked on the specimen. The response times for both rates of rise of air temperature at each supply parameter limit shall be recorded.

NOTE For conventional point heat detectors the supply parameter is the dc voltage applied to the point heat detector. For other types of point heat detector (e.g. analogue addressable) signal levels and timing may need to be considered. If necessary the manufacturer may be requested to provide suitable supply equipment to allow the supply parameters to be changed as required.

5.5.1.3 Requirements

The response times of the point heat detectors shall lie between the lower and upper response time limits specified in Table 4 for the appropriate point heat detector category.

5.6 Durability of Nominal activation conditions/sensitivity

5.6.1 Temperature resistance

5.6.1.1 Cold (operational)

5.6.1.1.1 Object

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

5.6.1.1.2 Test procedure

5.6.1.1.2.1 Reference

The test apparatus and procedure shall be as described in EN 60068-2-1:2007, Test Ab, and as described below.

5.6.1.1.2.2 State of the specimen(s) during conditioning

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

5.6.1.1.2.3 Conditioning

The following conditioning shall be applied:

Temperature: $(-10 \pm 3) ^\circ\text{C}$

Duration: 16 h

NOTE Test Ab specifies rates of change of temperature of $\leq 1 \text{ K min}^{-1}$ for the transitions to and from the conditioning temperature.

5.6.1.1.2.4 Measurements during conditioning

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

5.6.1.1.2.5 Final measurements

The response time of the specimen(s) shall be measured as described in 5.1.5 at rates of rise of air temperature of 3 K min^{-1} and 20 K min^{-1} in the orientation which gave the maximum response time in test 5.3.1. Before each measurement the specimen shall be stabilized to the typical application temperature specified in Table 1 according to the category marked on the specimen.

5.6.1.1.3 Requirements

No alarm or fault signal shall be given during the transition to the conditioning temperature or during the period at the conditioning temperature.

For resettable point heat detectors the response time at 3 K min^{-1} shall not be less than 7 min 13 s and any change in the response time compared with the time obtained in the equivalent test 5.3.6 shall not exceed 2 min 40 s.

For resettable point heat detectors the response time at 20 K min^{-1} shall not be less than 30 s for category A1 point heat detectors, 1 min 0 s for all other categories, and any change in response time compared with the time obtained in the equivalent test 5.3.6 shall not exceed 30 s.

For non-resettable point heat detectors, the response times shall lie between the lower and upper response time limits specified in Table 4 for the appropriate point heat detector category.

5.6.1.2 Dry heat (endurance)

5.6.1.2.1 Object

To demonstrate the ability of the point heat detector to withstand a high ambient temperature appropriate to its category. This test is not applicable to category A1, A2 and B point heat detectors.

5.6.1.2.2 Test Procedure

5.6.1.2.2.1 Reference

The test apparatus and procedure shall be as described in EN 60068-2-2:2007, Test Ba or Bb, and as indicated below.

5.6.1.2.2.2 State of the specimen(s) during conditioning

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

5.6.1.2.2.3 Conditioning

The applicable conditioning temperature specified in Table 9 shall be applied for 21 days.

Table 9 — Dry heat (endurance) conditioning temperatures

Point heat detector category	Conditioning temperature °C
C	80 ± 2
D	95 ± 2
E	110 ± 2
F	125 ± 2
G	140 ± 2

5.6.1.2.2.4 Final measurements

The response time of the specimen(s) shall be measured as described in 5.1.5 at rates of rise of air temperature of 3 K min⁻¹ and 20 K min⁻¹ in the orientation which gave the maximum response time in test 5.3.1. Before each measurement the specimen shall be stabilized to the typical application temperature specified in Table 1 according to the category marked on the specimen.

5.6.1.2.3 Requirements

No fault signal, attributable to the endurance conditioning, shall be given on reconnection of the specimen.

For resettable point heat detectors the response time at 3 K min⁻¹ shall not be less than 7 min 13 s and any change in the response time compared with the time obtained in the equivalent test 5.3.6 shall not exceed 2 min 40 s.

For resettable point heat detectors the response time at 20 K min⁻¹ shall not be less than 1 min 0 s and any change in response time compared with the time obtained in the equivalent test 5.3.6 shall not exceed 30 s.

For non-resettable point heat detectors, the response times shall lie between the lower and upper response time limits specified in Table 4 for the appropriate point heat detector category.

5.6.2 Humidity resistance**5.6.2.1 Damp heat, cyclic (operational)****5.6.2.1.1 Object**

To demonstrate the ability of the point heat detector to function correctly at high relative humidities (with condensation), which can occur for short periods in the anticipated service environment.

5.6.2.1.2 Test procedure**5.6.2.1.2.1 Reference**

The test apparatus and procedure shall be as described in EN 60068-2-30:2005, using the Variant 2 test cycle and controlled recovery conditions, and as described below.

5.6.2.1.2.2 State of the specimen(s) during conditioning

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

5.6.2.1.2.3 Conditioning

The following severity of conditioning (EN 60068-2-30, Severity 1) shall be applied:

Lower temperature: $(25 \pm 3) ^\circ\text{C}$

Upper temperature: $(40 \pm 2) ^\circ\text{C}$

Relative Humidity:

at lower temperature: $\geq 95 \%$

at upper temperature: $(93 \pm 3) \%$

Number of cycles: 2

5.6.2.1.2.4 Measurements during conditioning

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

5.6.2.1.2.5 Final measurements

After the recovery period the response time of the specimen(s) shall be measured as described in 5.1.5 at rates of rise of air temperature of 3 K min^{-1} and 20 K min^{-1} in the orientation which gave the maximum response time in test 5.3.1. Before each measurement the specimen shall be stabilized to the typical application temperature specified in Table 1 according to the category marked on the specimen.

5.6.2.1.3 Requirements

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

For resettable point heat detectors the response time at 3 K min^{-1} shall not be less than 7 min 13 s and any change in the response time compared with the time obtained in the equivalent test 5.3.6 shall not exceed 2 min 40 s.

For resettable point heat detectors the response time at 20 K min^{-1} shall not be less than 30 s for category A1 point heat detectors, 1 min 0 s for all other categories, and any change in response time compared with the time obtained in the equivalent test 5.3.6 shall not exceed 30 s.

For non-resettable point heat detectors, the response times shall lie between the lower and upper response time limits specified in Table 4 for the appropriate point heat detector category.

5.6.2.2 Damp heat, steady-state (endurance)

5.6.2.2.1 Object

To demonstrate the ability of the point heat 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.).

5.6.2.2.2 Test procedure

5.6.2.2.2.1 Reference

The test apparatus and procedure shall be as described in EN 60068-2-78:2013, Test Cab as described below.

5.6.2.2.2.2 State of the specimen(s) during conditioning

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

5.6.2.2.2.3 Conditioning

The following conditioning shall be applied :

Temperature:	$(40 \pm 2) ^\circ\text{C}$
Relative Humidity:	$(93 \pm 3) \%$
Duration:	21 days

5.6.2.2.2.4 Final measurements

After a recovery period, of at least 1 h in standard laboratory conditions, the response time of the specimen(s) shall be measured as described in 5.1.5 at rates of rise of air temperature of 3 K min^{-1} and 20 K min^{-1} in the orientation which gave the maximum response time in test 5.3.1. Before each measurement the specimen shall be stabilized to the typical application temperature specified in Table 1 according to the category marked on the specimen.

5.6.2.2.3 Requirements

No fault signal, attributable to the endurance conditioning, shall be given on reconnection of the specimen.

For resettable point heat detectors the response time at 3 K min^{-1} shall not be less than 7 min 13 s and any change in the response time compared with the time obtained in the equivalent test 5.3.6 shall not exceed 2 min 40 s.

For resettable point heat detectors the response time at 20 K min^{-1} shall not be less than 30 s for category A1 point heat detectors, 1 min 0 s for all other categories, and any change in response time compared with the time obtained in the equivalent test 5.3.6 shall not exceed 30 s.

For non-resettable point heat detectors, the response times shall lie between the lower and upper response time limits specified in Table 4 for the appropriate point heat detector category.

5.6.3 Corrosion resistance

5.6.3.1 Sulphur dioxide (SO₂) corrosion (endurance)

5.6.3.1.1 Object

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

5.6.3.1.2 Test procedure

5.6.3.1.2.1 Reference

The test apparatus and procedure shall be as described in EN 60068-2-42:2003, Test Kc, except that the conditioning shall be as described below.

5.6.3.1.2.2 State of the specimen(s) during conditioning

The specimen(s) 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.

5.6.3.1.2.3 Conditioning

The following conditioning shall be applied:

Temperature:	$(25 \pm 2) ^\circ\text{C}$
Relative humidity:	$(93 \pm 3) \%$
SO ₂ concentration:	(25 ± 5) ppm (by volume)
Duration:	21 days

5.6.3.1.2.4 Final measurements

Immediately after the conditioning, the specimen(s) shall be subjected to a drying period of 16 h at $(40 \pm 2)^\circ\text{C}$, ≤ 50 % RH, followed by a recovery period of at least 1 h at the standard laboratory conditions. After this the response time of the specimen(s) shall be measured as described in 5.1.5 at rates of rise of air temperature of 3 K min^{-1} and 20 K min^{-1} in the orientation which gave the maximum response time in test 5.3.1. Before each measurement the specimen shall be stabilized to the typical application temperature specified in Table 1 according to the category marked on the specimen.

5.6.3.1.3 Requirements

No fault signal, attributable to the endurance conditioning, shall be given on reconnection of the specimen.

For resettable point heat detectors the response time at 3 K min^{-1} shall not be less than 7 min 13 s and any change in the response time compared with the time obtained in the equivalent test 5.3.6 shall not exceed 2 min 40 s.

For resettable point heat detectors the response time at 20 K min^{-1} shall not be less than 30 s for category A1 point heat detectors, 1 min 0 s for all other categories, and any change in response time compared with the time obtained in the equivalent test 5.3.6 shall not exceed 30 s.

For non-resettable point heat detectors, the response times shall lie between the lower and upper response time limits specified in Table 4 for the appropriate point heat detector category.

5.6.4 Vibration resistance

5.6.4.1 Shock (operational)

5.6.4.1.1 Object

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

5.6.4.1.2 Test procedure

5.6.4.1.2.1 Reference

The test apparatus and procedure shall be as described in EN 60068-2-27:2009, Test Ea, except that the conditioning shall be as described below.

5.6.4.1.2.2 State of the specimen(s) during conditioning

The specimen(s) 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.

5.6.4.1.2.3 Conditioning

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

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

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

5.6.4.1.2.4 Measurements during conditioning

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

5.6.4.1.2.5 Final measurements

The response time of the specimen(s) shall be measured as described in 5.1.5 at rates of rise of air temperature of 3 K min^{-1} and 20 K min^{-1} in the orientation which gave the maximum response time in test 5.3.1. Before each measurement the specimen shall be stabilized to the typical application temperature specified in Table 1 according to the category marked on the specimen.

5.6.4.1.3 Requirements

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

For resettable point heat detectors the response time at 3 K min^{-1} shall not be less than 7 min 13 s and any change in the response time compared with the time obtained in the equivalent test 5.3.6 shall not exceed 2 min 40 s.

For resettable point heat detectors the response time at 20 K min^{-1} shall not be less than 30 s for category A1 point heat detectors, 1 min 0 s for all other categories, and any change in response time compared with the time obtained in the equivalent test 5.3.6 shall not exceed 30 s.

For non-resettable point heat detectors, the response times shall lie between the lower and upper response time limits specified in Table 4 for the appropriate point heat detector category.

5.6.4.2 Impact (operational)

5.6.4.2.1 Object

To demonstrate the immunity of the point heat 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.

5.6.4.2.2 Test procedure

5.6.4.2.2.1 Apparatus

The test apparatus shall consist of a swinging hammer incorporating a rectangular section aluminium alloy head (Aluminium alloy Al Cu₄ Si Mg complying with ISO 209:2007, 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 $(50 \pm 2,5)$ mm high, $(76 \pm 3,8)$ mm wide and (80 ± 4) mm long at mid height, as shown in Figure D.1. A suitable apparatus is described in Annex D.

5.6.4.2.2.2 State of the specimen(s) during conditioning

The specimen(s) shall be rigidly mounted to the apparatus by its normal mounting means 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(s) shall be connected to its supply and monitoring equipment as described in 5.1.2.

5.6.4.2.2.3 Conditioning

The following conditioning shall be applied:

Impact energy:	$(1,9 \pm 0,1)$ J
Hammer velocity:	$(1,5 \pm 0,13)$ m s ⁻¹
Number of impacts:	1

5.6.4.2.2.4 Measurements during conditioning

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

5.6.4.2.2.5 Final measurements

The response time of the specimen(s) shall be measured as described in 5.1.5 at rates of rise of air temperature of 3 K min^{-1} and 20 K min^{-1} in the orientation which gave the maximum response time in test 5.3.1. Before each measurement the specimen shall be stabilized to the typical application temperature specified in Table 1 according to the category marked on the specimen.

5.6.4.2.3 Requirements

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

For resettable point heat detectors the response time at 3 K min^{-1} shall not be less than 7 min 13 s and any change in the response time compared with the time obtained in the equivalent test 5.3.6 shall not exceed 2 min 40 s.

For resettable point heat detectors the response time at 20 K min^{-1} shall not be less than 30 s for category A1 point heat detectors, 1 min 0 s for all other categories, and any change in response time compared with the time obtained in the equivalent test 5.3.6 shall not exceed 30 s.

For non-resettable point heat detectors, the response times shall lie between the lower and upper response time limits specified in Table 4 for the appropriate point heat detector category.

5.6.4.3 Vibration, sinusoidal, (operational)

5.6.4.3.1 Object

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

5.6.4.3.2 Test procedure

5.6.4.3.2.1 Reference

The test apparatus and procedure shall be as described in EN 60068-2-6:2008, Test Fc, and as described below.

5.6.4.3.2.2 State of the specimen(s) during conditioning

The specimen(s) 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.

5.6.4.3.2.3 Conditioning

The following conditioning shall be applied:

Frequency range:	(10 to 150) Hz
Acceleration amplitude:	5 m s^{-2} ($\approx 0,5 \text{ g}_n$)
Number of axes:	3
Sweep rate:	$1 \text{ octave min}^{-1}$
Number of sweep cycles:	1 per axis

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.

5.6.4.3.2.4 Measurements during conditioning

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

5.6.4.3.2.5 Final measurements

The final measurements specified in 5.6.4.4.2.4 are normally made after the vibration endurance test and only need be made here if the operational test is conducted in isolation.

5.6.4.3.3 Requirements

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

For resettable point heats the response time at 3 K min^{-1} shall not be less than 7 min 13 s and any change in the response time compared with the time obtained in the equivalent test 5.3.6 shall not exceed 2 min 40 s.

For resettable point heats the response time at 20 K min^{-1} shall not be less than 30 s for category A1 point heats, 1 min 0 s for all other categories, and any change in response time compared with the time obtained in the equivalent test 5.3.6 shall not exceed 30 s.

For non-resettable point heats, the response times shall lie between the lower and upper response time limits specified in Table 4 for the appropriate point heat category.

5.6.4.4 Vibration, sinusoidal (endurance)

5.6.4.4.1 Object

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

5.6.4.4.2 Test procedure

5.6.4.4.2.1 Reference

The test apparatus and procedure shall be as described in EN 60068-2-6:2008, Test Fc, and as described below.

5.6.4.4.2.2 State of the specimen(s) during conditioning

The specimen(s) 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.

5.6.4.4.2.3 Conditioning

The following conditioning shall be applied:

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

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.

5.6.4.4.2.4 Final measurements

The response time of the specimen(s) shall be measured as described in 5.1.5 at rates of rise of air temperature of 3 K min⁻¹ and 20 K min⁻¹ in the orientation which gave the maximum response time in test 5.3.1. Before each measurement the specimen shall be stabilized to the typical application temperature specified in Table 1 according to the category marked on the specimen.

5.6.4.4.3 Requirements

No fault signal, attributable to the endurance conditioning, shall be given on reconnection of the specimen.

For resettable point heat detectors the response time at 3 K min⁻¹ shall not be less than 7 min 13 s and any change in the response time compared with the time obtained in the equivalent test 5.3.6 shall not exceed 2 min 40 s.

For resettable point heat detectors the response time at 20 K min⁻¹ shall not be less than 30 s for category A1 point heat detectors, 1 min 0 s for all other categories, and any change in response time compared with the time obtained in the equivalent test 5.3.6 shall not exceed 30 s.

For non-resettable point heat detectors, the response times shall lie between the lower and upper response time limits specified in Table 4 for the appropriate point heat detector category.

5.6.5 Electrical stability

5.6.5.1 EMC, immunity (operational)

5.6.5.1.1 Object of the tests

To demonstrate the immunity of the point heat detector to electromagnetic disturbances appropriate to the service environment.

5.6.5.1.2 Test procedures

5.6.5.1.2.1 Reference

EMC, immunity tests shall be carried out as described in EN 50130-4:2011. The following tests shall be conducted:

- a) Electrostatic discharge;
- b) Radiated electromagnetic fields;
- c) Conducted disturbances induced by electromagnetic fields;
- d) Fast transient burst;
- e) Slow high energy voltage surges.

5.6.5.1.2.2 State of the specimen during conditioning

For tests a) to e) in 5.6.5.1.2.1, the conditioning shall be applied to the specimen only in the quiescent state. The specimen shall be connected to supply and monitoring equipment as described in 5.1.2.

5.6.5.1.2.3 Conditioning

The tests conditions specified in EN 50130-4:2011 for the tests listed in 5.6.5.1.2.1 shall be applied.

5.6.5.1.2.4 Measurements during conditioning

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

5.6.5.1.2.5 Final measurements

The response time of the specimen(s) shall be measured as described in 5.1.5 at rates of rise of air temperature of 3 K min^{-1} and 20 K min^{-1} in the orientation which gave the maximum response time in test 5.3.1. Before each measurement the specimen shall be stabilized to the typical application temperature specified in Table 1 according to the category marked on the specimen.

5.6.5.1.3 Requirements

For these tests the criteria for compliance specified in EN 50130-4:2011 and the following shall apply:

- 1) No alarm or fault signal shall be given during the conditioning.
- 2) The acceptance criteria for the functional test after the conditioning shall be as follows:

For resettable point heat detectors the response time at 3 K min^{-1} shall not be less than 7 min 13 s and any change in the response time compared with the time obtained in the equivalent test 5.3.6 shall not exceed 2 min 40 s;

For resettable point heat detectors the response time at 20 K min^{-1} shall not be less than 30 s for category A1 point heat detectors, 1 min 0 s for all other categories, and any change in response time compared with the time obtained in the equivalent test 5.3.6 shall not exceed 30 s;

For non-resettable point heat detectors, the response times shall lie between the lower and upper response time limits specified in Table 4 for the appropriate point heat detector category.

6 Assessment and verification of constancy of performance (AVCP)

6.1 General

The compliance of the point heat detector with the requirements of this Standard and with the performances declared by the manufacturer in the DoP shall be demonstrated by:

- determination of product type,
- factory production control by the manufacturer, including product assessment.

The manufacturer shall always retain the overall control and shall have the necessary means to take responsibility for the conformity with its declared performance(s).

6.2 Type testing

6.2.1 General

All performances related to characteristics included in this standard shall be determined when the manufacturer intends to declare the respective performances unless the standard gives provisions for declaring them without performing tests. (e.g. use of previously existing data, CWFT and conventionally accepted performance).

Assessment previously performed in accordance with the provisions of this standard, may be taken into account provided that they were made to the same or a more rigorous test method, under the same AVCP system on the same product or products of similar design, construction and functionality, such that the results are applicable to the product in question.

NOTE 1 Same AVCP system means testing by an independent third party under the responsibility of a notified product certification body.

For the purpose of assessment manufacturer's products may be grouped into families where it is considered that the results for one or more characteristics from any one product within the family are representative for that same characteristics for all products within that same family

NOTE 2 Products may be grouped in different families for different characteristics.

Reference to the assessment method standards should be made to allow the selection of a suitable representative sample.

In addition, the determination of the product type shall be performed for all characteristics included in the standard for which the manufacturer declares the performance:

- at the beginning of the production of a new or modified point heat detector (unless a member of the same product range), or
- at the beginning of a new or modified method of production (where this may affect the stated properties).

They shall be repeated for the appropriate characteristic(s), whenever a change occurs in the point heat detector design, in the raw material or in the supplier of the components, or in the method of production (subject to the definition of a family), which would affect significantly one or more of the characteristics.

Where components are used whose characteristics have already been determined, by the component manufacturer, on the basis of assessment methods of other product standards, these characteristics need not be re-assessed. The specifications of these components shall be documented.

Products bearing regulatory marking in accordance with appropriate harmonized European specifications may be presumed to have the performances declared in the DoP, although this does not replace the responsibility on the manufacturer to ensure that the point heat detector as a whole is correctly manufactured and its component products have the declared performance values.

6.2.2 Test samples, testing and compliance criteria

The number of samples of point heat detector to be tested/assessed shall be in accordance with Table 10.

Table 10 — Number of samples to be tested and compliance criteria

Characteristic	Requirement	Assessment method	No. of samples	Compliance criteria
Operational reliability	4.2	5.2	1	4.2
Nominal activation conditions/sensitivity	4.3	5.3	15	5.3
Response delay (response time)	4.4	5.4	2	5.4
Tolerance to supply voltage	4.5	5.5	2	5.5
Durability of Nominal activation conditions/sensitivity	4.6	5.6	15	5.6
NOTE 1 Samples may be used for more than one test/assessment where tests are judged to be non-destructive or not affecting performance.				
NOTE 2 For non-resettable heat detectors, more samples will be required (refer to table 3)				

6.2.3 Test reports

The results of the determination of the product type shall be documented in test reports. All test reports shall be retained by the manufacturer for at least 10 years after the last date of production of the point heat detector to which they relate.

6.3 Factory production control (FPC)

6.3.1 General

The manufacturer shall establish, document and maintain an FPC system to ensure that the products placed on the market comply with the declared performance of the essential characteristics.

The FPC system shall consist of:

- procedures,
- regular inspections and tests or assessments or both
- the use of the results to control:
 - raw and other incoming materials or components,
 - equipment,
 - the production process and the product.

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 factory production control system documentation shall:

- ensure a common understanding of the evaluation of the constancy of performance,
- enable the achievement of the required product performances,
- enable 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 compliance of the product with the declared performance(s) of the essential characteristics.

6.3.2 Requirements

6.3.2.1 General

The manufacturer is responsible for organizing the effective implementation of the FPC system in line with the content of this product standard. Tasks and responsibilities in the production control organization shall be documented and this documentation shall be kept up-to-date.

The responsibility, authority and the relationship between personnel that manages, performs or verifies work affecting product constancy shall be defined. This applies in particular to personnel that need to initiate actions preventing product non-constancies from occurring, actions in case of non-constancies and to identify and register product constancy problems.

Personnel performing work affecting the constancy of performance of the product shall be competent on the basis of appropriate education, training, skills and experience for which records shall be maintained.

In each factory the manufacturer may delegate the action to a person having the necessary authority to:

- identify procedures to demonstrate constancy of performance of the product at appropriate stages;
- identify and record any instance of non-constancy;
- identify procedures to correct instances of non-constancy.

The manufacturer shall draw up and keep up-to-date documents defining the FPC. The manufacturer's documentation and procedures should be appropriate to the product and manufacturing process and the FPC system should achieve an appropriate level of confidence in the constancy of performance of the product. This involves:

- a) the preparation of documented procedures and instructions relating to factory production control operations, in accordance with the requirements of the technical specification to which reference is made;
- b) the effective implementation of these procedures and instructions;
- c) the recording of these operations and their results;
- d) the use of these results to correct any deviations, repair the effects of such deviations, treat any resulting instances of non-conformity and, if necessary, revise the FPC to rectify the cause of non-constancy of performance.

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.

NOTE Manufacturers having an FPC system, which complies with EN ISO 9001 standard and which addresses the provisions of the present European standard are considered as satisfying the FPC requirements of the Regulation (EU) No 305/2011.

6.3.2.2 Equipment

6.3.2.2.1 Testing

All weighing, measuring and testing equipment shall be calibrated or verified or both and regularly inspected according to documented procedures, frequencies and criteria to ensure consistency with the monitoring and measuring requirements. All calibrated or verified equipment shall have identification in order to determine their status.

6.3.2.2.2 Manufacturing

All equipment used in the manufacturing process shall be regularly inspected and maintained to ensure use, wear or failure does not cause inconsistency in the manufacturing process. Inspections and maintenance shall be carried out and recorded in accordance with the manufacturer's written procedures and the records retained for the period defined in the manufacturer's FPC procedures.

6.3.2.3 Raw materials and components

The specifications of all incoming raw materials and components shall be documented, as shall the inspection scheme for ensuring their compliance. In case supplied kit components are used, the constancy of performance system of the component shall be that given in the appropriate harmonized technical specification for that component.

6.3.2.4 Traceability and marking

Individual products shall be identifiable and traceable with regard to their production origin. The manufacturer shall have written procedures ensuring that processes related to affixing traceability codes and/or markings are inspected regularly.

6.3.2.5 Controls during manufacturing process

The manufacturer shall plan and carry out production under controlled conditions.

6.3.2.6 Product testing and evaluation

The manufacturer shall establish procedures to ensure that the declared performance of the characteristics is maintained. The characteristics, and the means of control, are indicated in Clauses 4 and 5.

6.3.2.7 Non-complying products

The manufacturer shall have written procedures which specify how non complying products shall be dealt with. Any such events shall be recorded as they occur and these records shall be kept for the period defined in the manufacturer's written procedures.

Where the product fails to satisfy the acceptance criteria, the provisions for non-complying products shall apply, the necessary corrective action(s) shall immediately be taken and the products or batches not complying 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 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, throwing away or putting right of product) shall be indicated in the records.

6.3.2.8 Corrective action

The manufacturer shall have documented procedures that instigate action to eliminate the cause of non-conformities in order to prevent recurrence.

6.3.2.9 Handling, storage and packaging

The manufacturer shall have procedures providing methods of product handling and shall provide suitable storage areas preventing damage or deterioration.

6.3.3 Product specific requirements

The FPC system shall:

- address this European Standard, and
- ensure that the products placed on the market comply with the declaration of performance.

The FPC system shall include a product specific test plan, which identifies procedures to demonstrate compliance 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 in the test plan, and/or
- b) the verifications and tests to be carried out on finished products according to a frequency laid down in the test plan

If the manufacturer uses only finished products, the operations under b) shall lead to an equivalent level of conformity of the product as if 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 compliance of the product as if 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.

6.3.4 Initial inspection of factory and FPC

Initial inspection of factory and of FPC shall be carried out when the production process has been finalised and in operation. The factory and FPC documentation shall be assessed to verify that the requirements of 6.3.2 and 6.3.3 are fulfilled.

During the inspection it shall be verified:

a) that all resources necessary for the achievement of the product characteristics included in this European Standard are in place and correctly implemented,

and

b) that the FPC-procedures in accordance with the FPC documentation are followed in practice

and

c) that the product complies with the product type samples, for which compliance of the product performance to the DoP 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 and implemented.

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.

All assessments and their results shall be documented in the initial inspection report.

6.3.5 Continuous surveillance of FPC

Surveillance of the FPC shall be undertaken once a year.

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

Checks shall be made to ensure that the test plans are still correctly implemented and that the production equipment is still correctly maintained and calibrated at appropriate time intervals.

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 the determination of the product type and that the correct actions have been taken for non-compliant products.

6.3.6 Procedure for modifications

If modifications are made to the product, production process or FPC system that could affect any of the product characteristics declared according to this standard, then all characteristics for which the manufacturer declares performance, which may be affected by the modification, shall be subject to the determination of the product type as described in 6.2.1.

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.

6.3.7 One-off products, pre-production products, (e.g. prototypes) and products produced in very low quantities

The point heat detector produced as a one-off, prototypes assessed before full production is established and products produced in very low quantities (less than 50 per year) are assessed as follows:

For type assessment, the provisions of 6.2.1, 3rd paragraph apply, together with the following additional provisions:

- in the case of prototypes, the test samples shall be representative of the intended future production and shall be selected by the manufacturer;
- on request of the manufacturer, the results of the assessment of prototype samples may be included in a certificate or in test reports issued by the involved third party.

The FPC system of one-off products and products produced in very low quantities shall ensure that raw materials and/or components are sufficient for production of the product. The provisions on raw materials and/or components shall apply only where appropriate. The manufacturer shall maintain records allowing traceability of the product.

For prototypes, where the intention is to move to series production, the initial inspection of the factory and FPC shall be carried out before the production is already running and/or before the FPC is already in practice. The FPC-documentation and the factory shall be assessed.

In the initial assessment of the factory and FPC it shall be verified:

- a) that all resources necessary for the achievement of the product characteristics included in this European Standard will be available, and
- b) that the FPC procedures in accordance with the FPC documentation will be implemented and followed in practice, and
- c) that procedures are in place to demonstrate that the factory production processes can produce a component complying with the requirements of this European Standard and that the component will be the same the samples used for the determination of the product type, for which compliance with this European standard has been verified.

Once series production is fully established, the provisions of 6.3 shall apply.

7 Classification

No classification of point heat detectors is specified in the European standard.

8 Marking, labelling and packaging

The point heat detector shall be clearly marked with the following information:

- a) the number of this standard and its date(i.e. EN 54-5:2017);
- b) the name or trademark of the manufacturer or supplier;
- c) the model designation (type or number);
- d) the wiring terminal designations;

- e) some mark(s) or code(s) (e.g. 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 point heat detector.
- f) the category (ies) of the point heat detector (e.g. A1, A1R, A1S, A2, B etc.). If the point heat detector has provision for on-site adjustment of the category (see 4.2.6), then the marking of the category may be replaced by the symbol P;

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

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.

Where regulatory marking provisions require information on some or all items listed in this clause, the requirements of this clause concerning those common items are deemed to be met.

The point heat detector shall either be supplied with sufficient data to enable their correct operation or, if all of these data are not supplied with each point heat detector reference to the appropriate data sheet(s) or technical manual shall be given on, or with each point heat detector.

NOTE Further data also considered beneficial when installing, maintaining and operating the point heat detectors are given in Annex E.

Annex A **(normative)**

Heat tunnel for response time and response temperature measurements

The following specifies those properties of the heat tunnel, which are of primary importance for making repeatable and reproducible measurements of response time and static response temperature of point heat detectors. However, since it is not practical to specify and measure all parameters, which may influence the measurements, the background information in Annex C should be carefully considered and taken into account when a heat tunnel is designed and used to make measurements in accordance with this standard.

The heat tunnel shall meet the following requirements for each category of point heat detector it is used to test.

The heat tunnel shall have a horizontal working section containing a working volume. The working volume is a defined part of the working section, where the air temperature and air flow conditions are within ± 2 K and $\pm 0,1$ m s⁻¹ of the nominal test conditions, respectively. Conformance of this requirement shall be regularly verified under both static and rate-of-rise conditions, by measurements at an adequate number of points distributed within and on the imaginary boundaries of the working volume. The working volume shall be large enough to fully enclose the point heat detector(s) to be tested, the required amount of mounting board and the temperature measuring sensor.

The point heat detector to be tested shall be mounted in its normal operating position on the underside of a flat board aligned with the airflow in the working volume. The board shall be (5 ± 1) mm thick and of such dimensions that the edge(s) of the board are at least 20 mm from any part of the point heat detector. The edge(s) of the board shall have a semi-circular form and the air flow between the board and the tunnel ceiling shall not be unduly obstructed. The material from which the board is made shall have a thermal conductivity not greater than $0,52$ W m⁻¹ K⁻¹.

If two or more point heat detectors are to be mounted in the working volume and tested simultaneously, then previous tests shall have been conducted, which confirm that response time measurements made simultaneously on more than one point heat detector are in close agreement with measurements made by testing point heat detectors individually. In the event of a dispute, the value obtained by individual testing shall be accepted.

Means shall be provided for creating a stream of air through the working volume at the constant temperatures and rates of rise of air temperature specified for the categories of detector to be tested. This air stream shall be essentially laminar and maintained at a constant mass flow, equivalent to $(0,8 \pm 0,1)$ m s⁻¹ at 25 °C.

The temperature sensor shall be positioned at least 50 mm upstream of the point heat detector and at least 25 mm below the lower surface of the mounting board. The air temperature shall be controlled to within ± 2 K of the nominal temperature required at any time during the test.

The air temperature measuring system shall have an overall time constant of not greater than 2 s, when measured in air with a mass flow equivalent to $(0,8 \pm 0,1)$ m s⁻¹ at 25 °C.

Means shall be provided for measuring the response time of the point heat detector under test to an accuracy of ± 1 s.

Annex B (informative)

Information concerning the construction of the heat tunnel

Point heat detectors respond when the signal(s) from one or more sensors fulfil certain criteria. The temperature of the sensor(s) is related to the air temperature surrounding the point heat detector but the relation is usually complex and dependent on several factors, such as orientation, mounting, air velocity, turbulence, rate of rise of air temperature etc. Response times and response temperature and their stability are the main parameters considered when the fire detection performance of point heat detectors is evaluated by testing in accordance with this standard.

Many different heat tunnel designs are suitable for the tests specified in this standard but the following points should be considered when designing and characterizing a heat tunnel.

There are two basic types of heat tunnel; recirculating and non-recirculating. All else being equal, a non-recirculating tunnel requires a higher power heater than a recirculating tunnel, particularly for the higher rates of rise of air temperature. More care is generally needed to ensure that the high power heater and control system of a non-recirculating tunnel are sufficiently responsive to the changes in heat demand necessary to attain the required temperature versus time conditions in the working section. On the other hand, maintaining a constant mass flow with increasing temperature is generally more difficult in a recirculating tunnel.

The temperature control system shall be able to maintain the temperature within ± 2 K of the "ideal ramp" for all of the specified rates of rise of air temperature. Such performance can be achieved in different ways e.g.:

- by proportional heating control, where more heating elements are used when generating higher rates of rise. Improved temperature control may be achieved by powering some of the heating elements continuously, while controlling others. With this control system the distance between the tunnel heater and the point heat detector under test should not be so large that the intrinsic delay in the temperature control feedback loop becomes excessive at an air flow of $0,8 \text{ m s}^{-1}$.
- by rate controlled feed forward heating control, assisted by proportional/integral (PI) feedback. This control system will permit greater distance between the tunnel heater and the point heat detector under test.

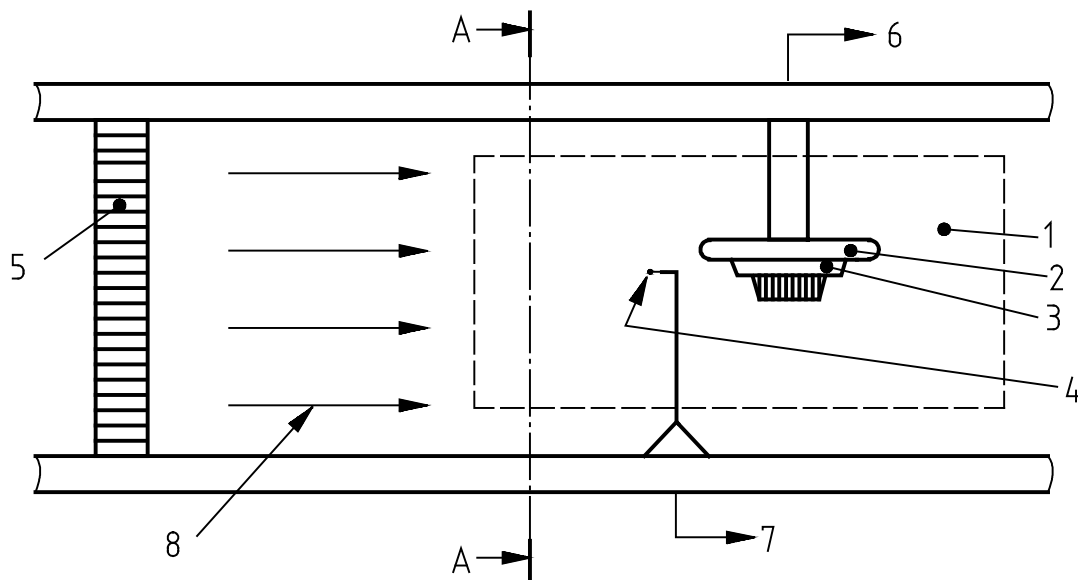
The important thing is that the specified temperature profiles are obtained with the required accuracy within the working section.

For a non-recirculating tunnel, the anemometer used for air flow control and monitoring may be placed in a section of the tunnel upstream of the heater where it will be subject to a substantially constant temperature, thereby eliminating any need to temperature compensate its output. A constant velocity, indicated by an anemometer so positioned, should correlate with a constant mass flow through the working volume. However, to maintain a constant mass flow at normal atmospheric pressure in a recirculating tunnel, it is necessary to increase the air velocity as the air temperature is increased. Careful consideration should therefore be given to ensuring that an appropriate correction is used for the temperature coefficient of the anemometer monitoring the air flow. It should not be assumed that an automatically temperature compensated anemometer will compensate sufficiently quickly at high rates of rise of air temperature.

The airflow created by a fan in the tunnel will be turbulent, and needs to pass through an air straightener to create a nearly laminar and uniform air flow in the working volume (see Figures B.1 and B.2). This can be facilitated by using a filter, honeycomb or both, in line with, and upstream of the working section of the tunnel. Care should be taken to ensure that the airflow from the heater is mixed to a uniform temperature, before entering the flow straightener.

It is not possible to design a tunnel where uniform temperature and flow conditions prevail in all parts of the working section. Deviations will exist, especially close to the walls of the tunnel, where a boundary layer of slower and cooler air will normally be observed. The depth of this boundary layer and the temperature gradient across it can be reduced by constructing or lining the walls of the tunnel with a low thermal conductivity material.

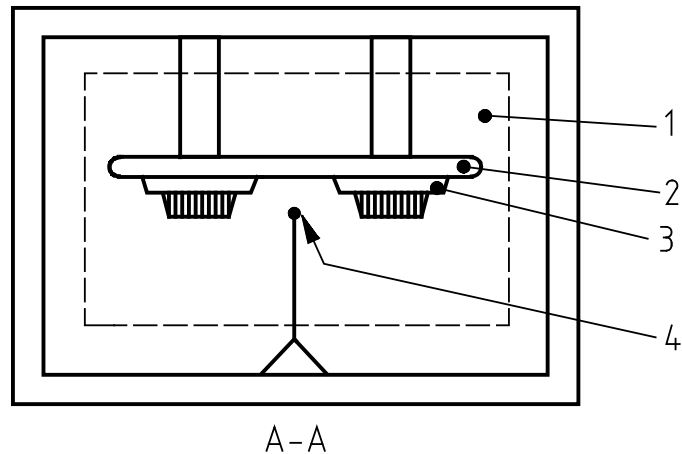
Special attention should be given to the temperature measuring system in the tunnel. The required overall time constant of not greater than 2 s in air, means that the temperature sensor should have a very small thermal mass. In practice only the fastest thermocouples and similar small sensors will be adequate for the measuring system. The effect of heat loss from the sensor via its leads can normally be minimized by exposing several centimetres of the lead to the air flow.



Key

- | | |
|-------------------------------------|--------------------------------------|
| 1 working volume | 5 flow straightener |
| 2 mounting board | 6 to supply and monitoring equipment |
| 3 point heat detector(s) under test | 7 to control and measuring equipment |
| 4 temperature sensor | 8 air flow |

Figure B.1 — Example of working section of heat tunnel



Key

- 1 working volume
- 2 mounting board
- 3 point heat detector(s) under test
- 4 temperature sensor

Figure B.2 — Example of mounting arrangement for simultaneously testing two point heat detectors (section A - A, see Figure B.1)

Annex C (informative)

Derivation of upper and lower limits of response times

The upper and lower limits of response times specified in this standard were derived using the same equations that were used to derive the limits specified in EN 54-5:1976 and EN 54-8:1982. However, in the light of experience, the value of some of the thermal constants used in the equations deviate slightly from their original value. For reference purposes the thermal constants and equations used for the derivation of the limits in this standard are set-out below.

NOTE It is noted for information, that these equations were originally used to derive the limits specified in BS 3116-1:1970. Appendix G to BS 3116-1:1970 detailed the equations, the original thermal constants used and the minimum size of fires that can be detected by point heat detectors with performances equivalent to the then specified upper response time limits, when mounted at a distance of 4.6 m (15 feet) horizontally from the fire on ceilings of various heights.

Upper limits

Upper limits of response times are derived from the theoretical response times of idealised point heat detectors containing only a static element (fixed temperature point heat detector). Assuming no heat losses from the sensing element, the response time of such a point heat detector under constant conditions of air mass flow and rate of rise in air temperature depends on two design properties. The first is the 'time constant' T of the sensing element as expressed by the equation:

$$T = \frac{C}{HA} \quad (\text{C.1})$$

where:

- C is the thermal capacity of the heat sensitive element;
- H is the coefficient of convective heat transfer to the element;
- A is the surface area of the element.

The second property is the temperature at which the point heat detector will give an alarm when subjected to an infinitely slow rate of rise of air temperature, its fixed temperature setting, which is normally set by an adjustment of a gap between contacts, electrical resistance, etc.

A decrease in either of these properties will result in a decrease in the response time of the point heat detector at any given rate of rise of air temperature. Hence a point heat detector having a high response time (low sensitivity) will have a high temperature setting or a long time constant or both, while a point heat detector having a low response time (high sensitivity) will have lower values of either or both.

Assuming no heat losses, the temperature rise θ of the heat sensitive element at any time t , when subject to a constant mass flow with linearly increasing temperature α , is given by the equation:

$$T \frac{d\theta}{dt} + \theta = \alpha t \quad (\text{C.2})$$

The solution of this equation is:

$$\theta = \alpha(t - T(1 - e^{-\frac{t}{T}})) \quad (C.3)$$

If θ_0 is the operating temperature rise of the sensitive element (the difference between the alarm and the stabilization temperatures) then the response time is given by the root of the above equation with θ set to θ_0 . The two sets of upper response time limits given in Table 4 were calculated using the values shown in Table C.1.

Table C.1 — Thermal constants used to derive upper limits in Table 4

Point heat detector category	Thermal constants for upper limits	
	θ_0	T
A1	40 K	20 s
All others	45 K	60 s

The time constants shown in Table C.1 are referenced to an airflow of $0,8 \text{ m s}^{-1}$ and should not be confused with the “response time index” (RTI in $\text{m}^{1/2} \text{ s}^{1/2}$) commonly used in other heat detector standards. RTI referenced to 1 m s^{-1} is related to the time constant T_u at an airflow u by the following equation:

$$RTI = T_u \sqrt{u} \quad (C.4)$$

A time constant referenced to 1 m s^{-1} has the same numerical value as the RTI referenced to 1 m s^{-1} .

Lower limits

The purpose of imposing lower limits on the response times of point heat detectors is to minimize the incidence of false alarms due to changes in air temperature which occur under non-fire conditions.

An analysis of the performance of rate of rise point heat detectors made by many manufacturers has shown that, with the exception of point heat detectors that have a performance equivalent to category A1, they alarm at substantially the same temperature at rates of rise of between 1 K min^{-1} and 30 K min^{-1} . In the light of this finding and the wide range of application conditions in which these point heat detectors may be installed, the minimum increase in temperature necessary to cause an alarm for point heat detectors other than Category A1 has been set at 20 K for rates of rise of 10 K min^{-1} and above, starting from an initial temperature at or below the typical application temperature. For category A1 point heat detectors the minimum rise in temperature to cause an alarm has been set at 10 K for rates of rise of 10 K min^{-1} and above because it is envisaged that category A1 point heat detectors will be installed in environments that are not subject to large, rapid changes in temperature.

The lower limits of response times specified in Table 4 for rates of rise up to 5 K min^{-1} for category A1 and up to 30 K min^{-1} for other categories were derived from the calculated performance of a rate of rise point heat detector consisting of two heat sensitive elements, one with a zero time constant and the other with a time constant of 34 min , and having a $19,51 \text{ K}$ initial temperature 'setting' between the elements. These values were selected because they produce a smooth curve yielding an operating temperature rise of 29 K for 1 K min^{-1} and 20 K for 10 K min^{-1} and above. For this point heat detector, assuming no heat losses, the response time t is given by the following equation:

$$t = T \ln\left(1 - \frac{\theta}{\alpha T}\right) \quad (\text{C.5})$$

where:

- T is the time constant of the second element;
- θ is the temperature setting between the elements;
- α is the rate of rise of air temperature.

Change after environmental tests

For a single measurement, the response time of a point heat detector can be measured to a high degree of accuracy, but the response temperature is usually subject to a proportionately greater uncertainty because the temperature is changing with time, and may deviate from the required temperature at any instant by 2 K. For this reason response time measurements have been specified in this standard for tests in which the point heat detector is subject to rates of rise of 1 K min⁻¹ and above.

Some point heat detectors, particularly fixed temperature detectors with a very short thermal time constant, can produce a spread of response times from repeated measurements which reflect the temperature control limitations of the test apparatus rather than changes in the detector. This is because the response time of the point heat detector can be more closely related to the temperature of the airflow than to the time it is subjected to a rate of rise of temperature. Conversely the response time of other point heat detectors can be more dependant on the initial stabilization temperature than the instantaneous temperature at the moment of response. These possibilities were considered in determining the maximum change in response time between measurements made before and after the environmental tests.

The maximum allowable change at 3 K min⁻¹ of 2 min 40 s equates to an 8 K change in response temperature, 4 K attributable the measuring apparatus and 4 K to the point heat detector. Similarly the maximum allowable change of 30 s at 20 K min⁻¹ also equates to 8 K plus a further 2 K attributable to twice the rounded up, allowable uncertainty of 1 s in the measurement of response time.

Annex D (informative)

Apparatus for impact test

The apparatus (see Figure D.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 high and 94 mm long (overall dimensions) and is manufactured from aluminium alloy (Al Cu₄ Si Mg ISO 209:2007), solution treated and precipitation treated condition. It has a plane impact face chamfered at $(60 \pm 1)^\circ$ to the long axis of the head. The tubular steel shaft has an outside diameter of $(25 \pm 0,1)$ mm with walls $(1,6 \pm 0,1)$ 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 D.1. On the end of the central boss is mounted a 12 mm wide x 150 mm 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 upper half of the impact face of the hammer will strike the specimen when the hammer is moving horizontally, as shown in Figure D.1.

To operate the apparatus the position of the specimen and the mounting board is first adjusted as shown in Figure D.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 $3\pi/2$ radians to strike the specimen. The mass of the operating weight to produce the required impact energy of 1,9 J equals:

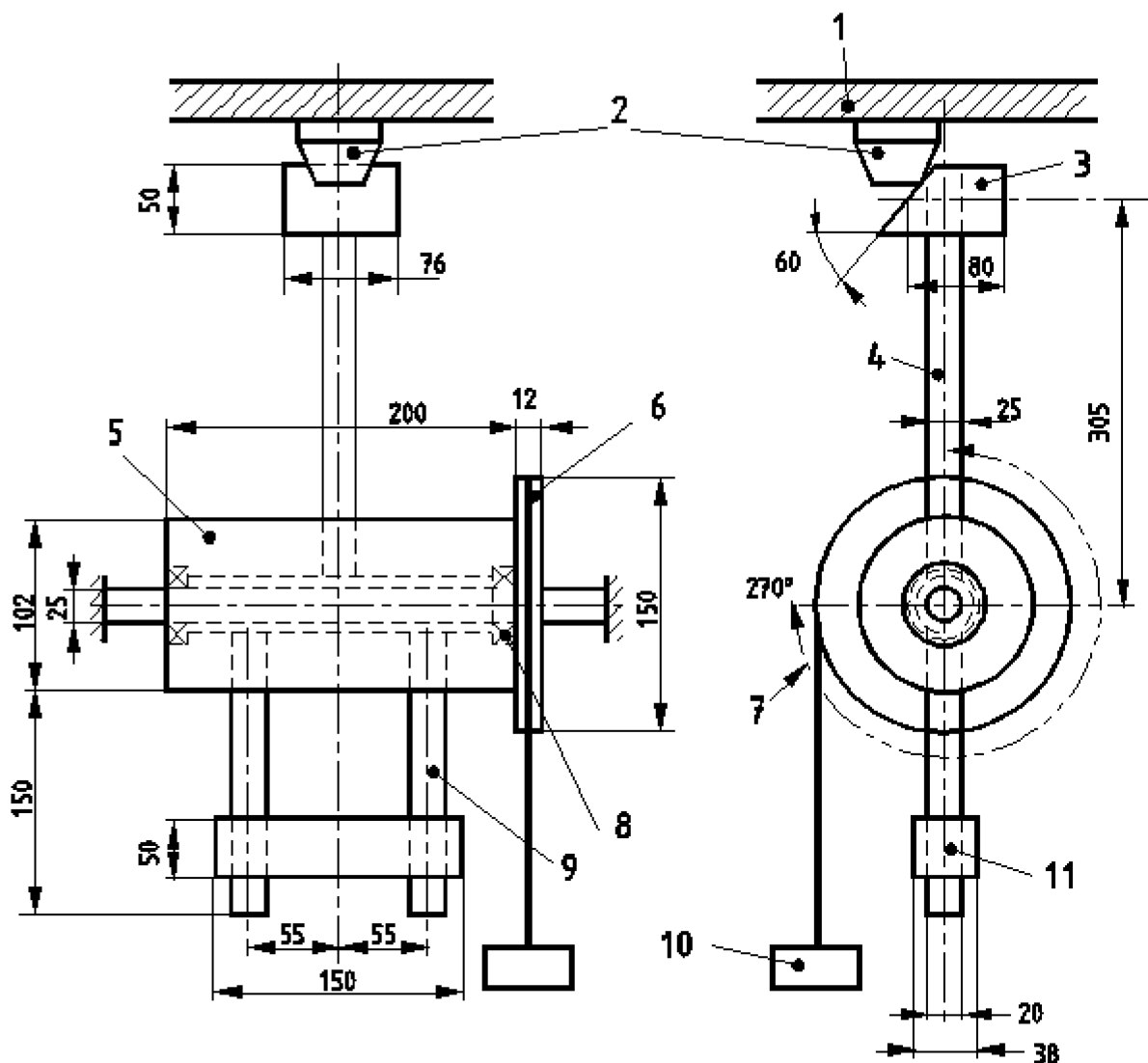
$$\frac{0,388}{3\pi r} \text{ kg} \tag{D.1}$$

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 $(1,5 \pm 0,13)$ m 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 point heat detector | 8 ball bearings |
| 3 striker | 9 counter balance arms |
| 4 striker shaft | 10 operating weight |
| 5 boss | 11 counter balance weight |

NOTE The dimensions shown are for guidance, apart from those relating to the hammer head.

Figure D.1 — Impact apparatus

Annex E (informative)

Data supplied with point heat detectors

To ensure correct operation of point heat detector, manufacturers should make available, in addition to the marking information listed in Clause 8, the following data:

Point heat detectors shall either be supplied with sufficient technical, installation and maintenance data to enable their correct installation and operation²⁾ or, if all of these data are not supplied with each point heat detector, reference to the appropriate data sheet(s) shall be given on, or with each point heat detector.

For point heat detectors with provision for on-site adjustment of their category, these data shall identify the applicable categories and shall describe the method of programming (e.g. by selecting a switch position on the point heat detector or a setting from a menu in the control and indicating equipment).

²⁾ To enable correct operation of the detectors, these data should describe the requirements for the correct processing of the signals from the detector. This can 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.

Annex ZA (informative)

Clauses of this European Standard addressing the provisions of the EU Construction Products Regulation

ZA.1 Scope and relevant characteristics

This European Standard has been prepared under the mandate M/109 for fire alarm/detection, fixed firefighting, fire and smoke control and explosion suppression products given to CEN by the European Commission and the European Free Trade Association.

If this European standard is cited in the Official Journal of the European Union (OJEU), the clauses of this standard, shown in this annex, are considered to meet the provisions of the relevant mandate, under the Regulation (EU) No. 305/2011.

This annex deals with the CE marking of the point heat detector intended for the uses indicated in Table ZA.1.1 to ZA.1.n and shows the relevant clauses applicable.

This annex has the same scope as in Clause 1 of this standard related to the aspects covered by the mandate and is defined by Table ZA.1.

Table ZA.1 — Relevant clauses for point heat detectors and intended use in fire detection and fire alarm systems installed in and around buildings

Product: Point heat detectors			
Intended use: Point detectors for use in fire detection and fire alarm systems installed in and around buildings			
Essential characteristics	Clauses in this and other European Standard(s) related to essential characteristics	Regulatory classes	Notes
Operational reliability:		None	
Position of heat sensitive element	4.2.1		threshold
Individual alarm indication	4.2.2		threshold
Connection of ancillary devices	4.2.3		description
Monitoring of detachable point heat detectors	4.2.4		description

Manufacturing adjustments	4.2.5	description
On site adjustment of response behaviour	4.2.6	description
Software controlled detector (when provided)	4.2.7	description
Nominal activation conditions/Sensitivity:		
Directional dependence	4.3.1	threshold+ description
Static response temperature	4.3.2	threshold+ description
Response times from typical application temperature	4.3.3	threshold+ description
Response times from 25 °C	4.3.4	threshold+ description
Response times from high ambient temperature	4.3.5	threshold+ description
Reproducibility	4.3.6	threshold+ description
Response delay (response time):		
Additional test for suffix S point heat detectors	4.4.1	threshold+ description
Additional test for suffix R point heat detectors	4.4.2	threshold+ description
Tolerance to supply voltage:	4.5.1	threshold+ description
Variation in supply parameters		
Durability of Nominal activation conditions/Sensitivity:		
Temperature resistance:		threshold+ description
Cold (operational)	4.6.1.1	threshold+ description
Dry heat (endurance)	4.6.1.2	
Humidity resistance:		threshold+ description
Damp heat, cyclic (operational)	4.6.2.1	threshold+ description
Damp heat, steady-state (endurance)	4.6.2.2	
Corrosion resistance:		
Sulphur dioxide (SO ₂) corrosion (endurance)	4.6.3	threshold+ description

Vibration Resistance:			
Shock (operational)	4.6.4.1		threshold+ description
Impact (operational)	4.6.4.2		threshold+ description
Vibration, sinusoidal (operational)	4.6.4.3		threshold+ description
Vibration, sinusoidal (endurance)	4.6.4.4		threshold+ description
Electrical stability:			
EMC, immunity (operational)	4.6.5		threshold+ description

The declaration of the product performance related to certain essential characteristics is not required in those Member States (MS) where there are no regulatory requirements on these essential characteristics for the intended use of the product.

In this case, manufacturers placing their products on the market of these MS are not obliged to determine nor declare the performance of their products with regard to these essential characteristics and the option “No performance determined” (NPD) in the information accompanying the CE marking and in the declaration of performance (see ZA.3) may be used for those essential characteristics.

ZA.2 Procedure for assessment and verification of constancy of performance (AVCP) of point heat detector

ZA.2.1 System of AVCP

The AVCP system(s) of point heat detector indicated in Table ZA.1 established by EC Decision 1996/577/EC (OJEU L254 of 1996-10-08), as amended by EC Decision 2002/592/EC (OJEU L192 of 2002-07-20) is shown in Table ZA.2 for the indicated intended use(s) and relevant level(s) or class(es) of performance.

Table ZA.2 — System of AVCP

Product	Intended use	Levels classes	or	AVCP system
Fire detection and fire alarm systems – point heat detectors	Fire safety	-		1
System 1: See Regulation (EU) No 305/2011 (CPR) Annex V.1.2 as amended by EC Delegated Regulation (EU) 568/2014				

The AVCP of the point heat detector in Table ZA.1 shall be according to the AVCP procedures indicated in Table(s) ZA.3 resulting from application of the clauses of this or other European Standard indicated therein. The content of tasks of the notified body shall be limited to those essential characteristics as provided for, if any, in Annex III of the relevant mandate and to those that the manufacturer intends to declare.

Table ZA.3 — Assignment of evaluation of conformity tasks for point heat detectors under system 1

Tasks		Content of the task	AVCP clauses to apply
Tasks for the manufacturer	Factory production control (FPC)	Parameters related to essential characteristics of Table ZA.1 relevant for the intended use which are declared	6.3
	Further testing of samples taken at factory according to the prescribed test plan	Essential characteristics of Table ZA.1 relevant for the intended use which are declared	6.3.2.6
Tasks for the product notified certification body	Determination of the product type on the basis of type testing (including sampling), type calculation, tabulated values or descriptive documentation of the product	Essential characteristic of Table ZA.1 relevant for the intended use	6.2
	Initial inspection of the manufacturing plant and of FPC	Parameters related to essential characteristics of Table ZA.1, relevant for the intended use, which are declared, Documentation of FPC	6.3.4
	Continuous surveillance, assessment and evaluation of FPC	Parameters related to essential characteristics of Table ZA.1, relevant for the intended use, which are declared, Documentation of FPC	6.3.5

ZA.2.2 Declaration of performance (DoP)

ZA.2.2.1 General

The manufacturer shall draw up the DoP and affixes the CE marking on the basis of AVCP system set out in Annex V of the Regulation (EU) No 305/2011:

- the factory production control and further testing of samples taken at the factory according to the prescribed test plan, carried out by the manufacturer; and
- the certificate of constancy of performance issued by the notified product certification body on the basis of determination of the product type on the basis of type testing (including sampling), type calculation, tabulated values or descriptive documentation of the product; initial inspection of the manufacturing plant and of factory production control and continuous surveillance, assessment and evaluation of factory production control.

ZA.2.2.2 Content

The model of the DoP is provided in Annex III of the Regulation (EU) No 305/2011 as amended by EC Delegated Regulation (EU) 574/2014. According to this Regulation, the DoP shall contain, in particular, the following information:

- the reference of the product-type for which the declaration of performance has been drawn up;
- the AVCP system or systems of the construction product, as set out in Annex V of the CPR as amended by EC Delegated Regulation (EU) 568/2014;
- the reference number and date of issue of the harmonized standard which has been used for the assessment of each essential characteristic;
- where applicable, the reference number of the Specific Technical Documentation used and the requirements with which the manufacturer claims the product complies.

The DoP shall in addition contain:

- a) the intended use or uses for the construction product, in accordance with the applicable harmonized technical specification;
- b) the list of essential characteristics, as determined in the harmonized technical specification for the declared intended use or uses;
- c) the performance of at least one of the essential characteristics of the construction product, relevant for the declared intended use or uses;
- d) where applicable, the performance of the construction product, by levels or classes, or in a description, if necessary based on a calculation in relation to its essential characteristics determined in accordance with the Commission determination regarding those essential characteristics for which the manufacturer shall declare the performance of the product when it is placed on the market or the Commission determination regarding threshold levels for the performance in relation to the essential characteristics to be declared.
- e) the performance of those essential characteristics of the construction product which are related to the intended use or uses, taking into consideration the provisions in relation to the intended use or uses where the manufacturer intends the product to be made available on the market
- f) for the listed essential characteristics for which no performance is declared, the letters “NPD” (No Performance Determined).

Regarding the supply of the DoP, article 7 of the Regulation (EU) No 305/2011 as amended by Delegated Regulation (EU)157/2014 applies. The information referred to in Article 31 or, as the case may be, in Article 33 of Regulation (EC) No 1907/2006, (REACH) shall be provided together with the DoP.

ZA.2.2.3 Example of DoP

The following gives an example of a filled-in DoP for point heat detector:

DECLARATION OF PERFORMANCE

[insert here the number of the DoP given by the manufacturer]

1. Unique identification code of the product-type:

[insert here the unique manufacturer's identification code of the product to which the DoP applies]

2. Type, batch or serial number or any other element allowing identification of the construction product as required under Article 11(4):
[insert here the code given by the manufacturer for the construction product in accordance with the provisions included in its FPC].

3. Intended use or uses of the construction product, in accordance with the applicable harmonized technical specification, as foreseen by the manufacturer:

Point heat detectors for use in fire detection and fire alarm systems installed in and around buildings

4. Name, registered trade name or registered trade mark and contact address of the manufacturer as required under Article 11(5), e.g.:

AnyCo Ltd,

PO Box 210

EC1-0XX - United Kingdom

Tel. +44207123456

Fax: +44207123457

Email: sales@anyco.co.uk

5. Where applicable, name and contact address of the authorized representative whose mandate covers the tasks specified in Article 12(2), e.g.:

Anyone SA

PO Box 01

B-1050 Brussels, Belgium

Tel. +32987654321

Fax: +32123456789

E-mail: anyone@provider.be

6. System or systems of assessment and verification of constancy of performance of the construction product as set out in CPR, Annex V:

System 1

7. In case of the declaration of performance concerning a construction product covered by a harmonized standard:

The certificate of constancy of performance issued by the notified product certification body 1234 on the basis of determination of the product type on the basis of type testing (including sampling), type calculation, tabulated values or descriptive documentation of the product; initial inspection of the manufacturing plant and of factory production control and continuous surveillance, assessment and evaluation of factory production control.

8. Declared performance;

Essential characteristics	Performance	Harmonized technical specification
<p>Operational reliability:</p> <ul style="list-style-type: none"> Position of heat sensitive element Individual alarm indication Connection of ancillary devices Monitoring of detachable point heat detectors Manufacturing adjustments On site adjustment of response behaviour Software controlled point heat detector (when provided) 	<p>≥ 15 mm</p> <p>Integral red indicator provided for declared category(ies) or means for indicating alarm for certain categories at distance of 6m.</p> <p>No false operations</p> <p>Fault signal given</p> <p>Special means required</p> <p>Special means required, settings clearly marked</p> <p>Documentation available, modular structure, invalid data not permitted, program deadlock avoided. site specific data in non-volatile memory with two-week retention</p>	
<p>Nominal activation conditions/Sensitivity:</p> <ul style="list-style-type: none"> Directional dependence Static response temperature Response times from typical application temperature Response times from 25 °C Response times from high ambient temperature Reproducibility 	<p>Response time (1 min 0s to 4 min 20s) at eight angles for category A1 and 2 min 0s to 5 min 30s at eight angles for other categories</p> <p>Min and max temp for the specified category</p> <p>Lower and Upper response time limits for each rate of rise for the specified category</p> <p>Response time < 7 min 13s at 3K/min and > 1 min 0s at 20K/min</p> <p>No false operation, Lower and Upper response time at 3K/min and 20K/min for each of the specified category</p> <p>Lower and Upper response time at 3K/min and 20K/min for each of the specified category</p>	
<p>Response delay (response time):</p> <ul style="list-style-type: none"> Additional test for suffix S point heat detectors Additional test for suffix R point heat detectors 	<p>No false operation, > Lower response time for each rate of rise</p> <p>Lower and Upper response time at 3K/min, 10K/min and 20K/min for each of the specified category</p>	EN 54-5:2017

<p>Tolerance to supply voltage: Variation in supply parameters</p>	<p>Lower and Upper response time at 3K/min and 20K/min for each of the specified category</p>
<p>Durability of Nominal activation conditions/Sensitivity: Temperature resistance: Cold (operational) Dry heat (endurance) Humidity resistance: Damp heat, cyclic (operational) Damp heat, steady-state (endurance) Corrosion resistance: Sulphur dioxide (SO₂) corrosion (endurance) Vibration Resistance: Shock (operational) Impact (operational) Vibration, sinusoidal (operational) Vibration, sinusoidal (endurance) Electrical stability: EMC, immunity (operational)</p>	<p>Non-resettable, No false operation, Lower and Upper response time at 3K/min and 20K/min for each of the specified category</p> <p>Resettable, No false operation, at 3K/min; response time > 7 min: 13 s and Δresponse time < 2 min:40s. At 20K/min; response time > 30s for A1 and > 1 min for other categories and Δtime < 30s.</p> <p>Non-resettable, No false operation, Lower and Upper response time at 3K/min and 20K/min for each of the specified category</p> <p>Resettable, No false operation, at 3K/min; response time > 7 min: 13 s and Δresponse time < 2 min:40s. At 20K/min; response time > 30s for A1 and > 1 min for other categories and Δtime < 30s.</p> <p>Non-resettable, No false operation, Lower and Upper response time at 3K/min and 20K/min for each of the specified category</p> <p>Resettable, No false operation, at 3K/min; response time > 7 min: 13 s and Δresponse time < 2 min:40s. At 20K/min; response time > 30s for A1 and > 1 min for other categories and Δtime < 30s.</p> <p>Non-resettable, No false operation, Lower and Upper response time at 3K/min and 20K/min for each of the specified category</p> <p>Resettable, No false operation, at 3K/min; response time > 7 min: 13 s and Δresponse time < 2 min:40s. At 20K/min; response time > 30s for A1 and > 1 min for other categories and Δtime < 30s.</p>

Non-resettable, No false operation, Lower and Upper response time at 3K/min and 20K/min for each of the specified category

Resettable, No false operation, at 3K/min; response time > 7 min: 13 s and Δ response time < 2 min:40s. At 20K/min; response time > 30s for A1 and > 1 min for other categories and Δ time < 30s.

Non-resettable, No false operation, Lower and Upper response time at 3K/min and 20K/min for each of the specified category

Resettable, No false operation, at 3K/min; response time > 7 min: 13 s and Δ response time < 2 min:40s. At 20K/min; response time > 30s for A1 and > 1 min for other categories and Δ time < 30s.

Non-resettable, No false operation, Lower and Upper response time at 3K/min and 20K/min for each of the specified category

Resettable, No false operation, at 3K/min; response time > 7 min: 13 s and Δ response time < 2 min:40s. At 20K/min; response time > 30s for A1 and > 1 min for other categories and Δ time < 30s.

Non-resettable, No false operation, Lower and Upper response time at 3K/min and 20K/min for each of the specified category

Resettable, No false operation, at 3K/min; response time > 7 min: 13 s and Δ response time < 2 min:40s. At 20K/min; response time > 30s for A1 and > 1 min for other categories and Δ time < 30s.

Non-resettable, No false operation, Lower and Upper response time at 3K/min and 20K/min for each of the specified category

Resettable, No false operation, at 3K/min; response time > 7 min: 13 s and Δ response time < 2 min:40s. At 20K/min; response time > 30s for A1 and > 1 min for other categories and Δ time < 30s.

Non-resettable, No false operation, Lower and Upper response time at 3K/min and 20K/min for each of the specified category

Resettable, No false operation, at 3K/min; response time > 7 min: 13 s and Δ response time < 2 min:40s. At 20K/min; response time > 30s for A1 and > 1 min for other categories and Δ time < 30s.

NOTE Please note that 'Category' was previously known as 'Class'.

9 The performance of the product identified in points 1 and 2 is in conformity with the declared performance in point 8. This declaration of performance is issued under the sole responsibility of the manufacturer identified in point 4.

Signed for and on behalf of the manufacturer by:

.....

(name and function)

.....

(place, date of issue)

(signature)

ZA.3 CE marking and labelling

The CE marking symbol shall be in accordance with the general principles set out in Article 30 of Regulation (EC) No 765/2008 and shall be affixed visibly, legibly and indelibly together with the identification number of the notified certification body and the number of the DoP to the point heat detector.

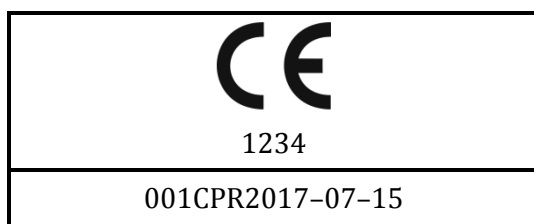
The CE marking symbol shall also be placed on the packaging or in the documents accompanying the point heat detector and it shall be followed by:

- a) the last two digits of the year in which it was first affixed;
- b) the name and the registered address of the manufacturer, or the identifying mark allowing identification of the name and address of the manufacturer easily and without any ambiguity;
- c) the unique identification code of the product- type;
- d) the reference number of the declaration of performance ;
- e) the level or class of the performance declared;
- f) the dated reference to the harmonized technical specification applied, EN 54-5:2017
- g) the identification number of the notified body;
- h) the intended use as laid down in the harmonized technical specification applied.

The CE marking shall be affixed before the construction product is placed on the market. It may be followed by a pictogram or any other mark notably indicating a special risk or use.

Figure ZA.1 gives an example of the information to be placed on the point heat detector subject to AVPC under system 1.

Figure ZA.2 gives an example of the information related to be placed on the packaging or in the documents accompanying the point heat detector.



CE marking, consisting of the "CE"-symbol given in Directive 93/68/EEC.

Identification number of the product certification body

Reference number of the DoP

Figure ZA.1 — Example of CE marking information to be affixed on the point heat detector



1234

AnyCo Ltd, PO Box 210, EC1-0XX - UK

17

001CPR2017-07-15

EN 54-5:2017

Type X Conventional category A1 fixed temperature point heat detector:
T-X-CFT-A1

Point heat detectors for use in fire detection and fire alarm systems
installed in and around buildings

Operational reliability:

- Position of heat sensitive element: > 15mm
- Individual alarm indication: red integral indicator at 6m, Category A1
- Connection of ancillary devices: No false operation
- Monitoring of detachable point heat detectors: fault signal given
- Manufacturing adjustments: special means required
- On site adjustment of response behaviour: no site adjustment of behaviour provided
- Software controlled point heat detector: documentation available, modular structure, invalid data not permitted, program deadlock avoided, site specific data in non-volatile memory with two 2 weeks retention

*CE marking, consisting of the
"CE"-symbol given in Directive
93/68/EEC*

*Identification number of the
product certification body*

*Name or identifying mark and
registered address of the
producer or identifying mark*

*Last two digits of the year in
which the marking was first
affixed*

Reference number of the DoP

*No. of European Standard as
referenced in the OJEU*

*Unique identification code of
the product-type as given by
the manufacturer*

*Intended use as laid down in
the European standard
applied*

*Level or class of the
performance declared*

Nominal activation conditions/Sensitivity:

-Directional dependence: RTL (1 min 0s- 4 min 20s) at eight angles; category A1

-Static response temperature: category A1:T(54 °C and 65°C)

-Response times from typical application temperature:Category A1:
RTL at 1K/min (29min - 40min: 20s); 3K/min (7min: 13s - 13min:
40s); 5K/min (4min: 9s-8min: 20s); 10K/min (1min-4min: 20s);
20K/min (30s-2min: 20s); 30K/min (20s-1min: 40s);

-Response times from 25 °C: No test for category A1

Response times from high ambient temperature: no false operation,
RTL at 3K/min (1min: 20s – 13min: 40s); 20K/min (12s –
2min:20s)

-Reproducibility: category A1: RTL at 3K/min (7min: 13s - 13min:
40s); 20K/min (30s-2min: 20s)

Response delay (response time):

-Additional test for suffix S point heat detectors: not declared

-Additional test for suffix R point heat detectors: not declared

Tolerance to supply voltage:

-Variation in supply parameters: category A1: RTL at 3K/min (7min:
13s - 13min: 40s); 20K/min (30s- 2min: 20s)

Durability of Nominal activation conditions/Sensitivity:

Temperature resistance:

-Cold (operational): Resettable; category A1: No false operation,, at
3K/min; RT > 7 min: 13 s and $\Delta RT < 2 \text{ min:}40\text{s}$; at 20K/min; RT > 30s
and $\Delta \text{time} < 30\text{s}$.

-Dry heat (endurance): Resettable; category A1: No false operation,, at
3K/min; RT > 7 min: 13 s and $\Delta RT < 2 \text{ min:}40\text{s}$; at 20K/min; RT > 30s
and $\Delta \text{time} < 30\text{s}$.

Humidity resistance:

-Damp heat, cyclic (operational): Resettable; category A1: No false
operation,, at 3K/min; RT > 7 min: 13 s and $\Delta RT < 2 \text{ min:}40\text{s}$; at
20K/min; RT > 30s and $\Delta \text{time} < 30\text{s}$.

-Damp heat, steady-state (endurance): Resettable; category A1: No
false operation,, at 3K/min; RT > 7 min: 13 s and $\Delta RT < 2 \text{ min:}40\text{s}$; at
20K/min; RT > 30s and $\Delta \text{time} < 30\text{s}$.

Corrosion resistance:

-Sulphur dioxide (SO₂) corrosion (endurance): Resettable; category A1: No false operation,, at 3K/min; RT > 7 min: 13 s and $\Delta RT < 2$ min:40s; at 20K/min; RT > 30s and $\Delta time < 30s$.

Vibration Resistance:

-Shock (operational): Resettable; category A1: No false operation,, at 3K/min; RT > 7 min: 13 s and $\Delta RT < 2$ min:40s; at 20K/min; RT > 30s and $\Delta time < 30s$.

-Impact (operational): Resettable; category A1: No false operation,, at 3K/min; RT > 7 min: 13 s and $\Delta RT < 2$ min:40s; at 20K/min; RT > 30s and $\Delta time < 30s$.

-Vibration, sinusoidal (operational): Resettable; category A1: No false operation,, at 3K/min; RT > 7 min: 13 s and $\Delta RT < 2$ min:40s; at 20K/min; RT > 30s and $\Delta time < 30s$.

-Vibration, sinusoidal (endurance): Resettable; category A1: No false operation,, at 3K/min; RT > 7 min: 13 s and $\Delta RT < 2$ min:40s; at 20K/min; RT > 30s and $\Delta time < 30s$.

Electrical stability:

-EMC, immunity (operational): Resettable; category A1: No false operation,, at 3K/min; RT > 7 min: 13 s and $\Delta RT < 2$ min:40s; at 20K/min; RT > 30s and $\Delta time < 30s$.

Figure ZA.2 — Example of CE marking information to be placed on the packaging or in the documents accompanying the point heat detector

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