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Fire detection and fire alarm systems —

Part 5: Point type heat detectors

Systèmes de détection et d'alarme incendie —

Partie 5: Détecteurs de chaleur ponctuels

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Contents

Page

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 21, *Equipment for fire protection and fire fighting*, Subcommittee SC 3, *Fire detection and alarm systems*.

This third edition cancels and replaces the second edition (ISO 7240-5:2012), which has been technically revised.

A list of all parts in the ISO 7240 series, published under the general title *Fire detection and fire alarm systems*, can be found on the ISO website.

This edition includes the following significant changes with respect to the previous edition:

— in 5.18 (electromagnetic compatibility immunity tests), EN 50130-4 has been replaced by IEC 62599-2;

— marking has been moved to a new Clause 7;

— data and software requirements have been moved to a new Clause 8.

Introduction

A fire detection and alarm system is required to function satisfactorily not only in the event of a fire, but also during and after exposure to conditions likely to be met in practice such as corrosion, vibration, direct impact, indirect shock and electromagnetic interference. Some tests specified are intended to assess the performance of the heat detectors under such conditions.

The performance of heat detectors is assessed from the results obtained in specific tests. This document is not intended to place any other restrictions on the design and construction of such detectors.

Fire detection and fire alarm systems —

Part 5:
Point type heat detectors

1 Scope

This document specifies the requirements, test methods and performance criteria for point type heat detectors for use in fire detection and fire alarm systems for buildings (see ISO 7240-1).

For other types of heat detector, or for detectors intended for use in other environments, this document can be used for guidance only. Heat detectors with special characteristics and developed for specific risks are not covered by this document.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

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

ISO 7240-1, *Fire detection and alarm systems — Part 1: General and definitions*

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

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

IEC 60068-2-2, *Environmental testing — Part 2-2: Tests. Tests B: Dry heat*

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

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

IEC 60068-2-30, *Environmental testing — Part 2-30: Tests. Test Db and guidance: Damp heat, cyclic (12 + 12-hour cycle)*

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

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

IEC 62599-2, *Alarm systems — Part 2: Electromagnetic compatibility — Immunity requirements for components of fire and security alarm systems*

3 Terms and definitions

For the purposes of this document, the terms, definitions and abbreviated terms in ISO 7240-1 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— IEC Electropedia: available at https://www.electropedia.org/

— ISO Online browsing platform: available at https://www.iso.org/obp

3.1
typical application temperature
temperature that an installed detector may 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 class marked on the detector, as specified in Table 1.

3.2
maximum application temperature
maximum temperature that an installed detector may 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 class marked on the detector, as specified in Table 1.

3.3
static response temperature
temperature at which the 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 are normally found to be suitable for measuring this, however lower rates may be required in some instances (see 5.3).

4 General requirements

4.1 Compliance

In order to comply with this document the detector shall meet the requirements of:

a) Clause 4, which shall be verified by visual inspection or engineering assessment, shall be tested as described in Clause 5 and shall meet the requirements of the tests.

b) Clauses 7 and 8, which shall be verified by visual inspection.

4.2 Classification

4.2.1 Detectors shall conform to one or more of the following classes: 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 classification temperatures

Detector class	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

4.2.2 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 classes. Detectors, which are marked with the letter S or R as a suffix to the class marking, shall be tested in accordance with the applicable test, specified in Clause 6, and shall meet the requirements of that test, in addition to the tests of Clause 5.

NOTE Detectors, with a suffix S to their class, do not respond below the minimum static response temperature, applicable to their classification (see Table 1), even at high rates of rise of air temperature. Detectors with a suffix R to their class, 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.

4.3 Position of heat sensitive elements

Each detector shall be constructed such that at least part of its heat sensitive element(s), except elements with auxiliary functions (e.g. characteristic correctors), shall be ≥15 mm from the mounting surface of the detector.

4.4 Individual alarm indication

4.4.1 Class A1, A2, B, C or D detectors shall be provided with an integral red visual indicator, by which the individual detector which released an alarm, may be identified, until the alarm condition is reset. Where other conditions of the detector may be visually indicated, they shall be clearly distinguishable from the alarm indication, except when the detector is switched into a service mode.

4.4.2 For detachable detectors, the indicator may be integral with the base or the detector head. Class E, F or G detectors shall be provided with either an integral red indicator, or with another means for locally indicating the alarm status of the detector.

NOTE The alarm condition is reset manually at the control and indicating equipment (See ISO 7240-2).

4.4.3 The visual indicator shall be visible from a distance of 6 m in an ambient light intensity up to 500 lx at an angle of up to

a) 5° from the axis of the detector in any direction, and

b) 45° from the axis of the detector in at least one direction.

4.5 Connection of ancillary devices

Where the 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 detector.

4.6 Monitoring of detachable detectors

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

4.7 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).

4.8 On-site adjustment of response behaviour

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

a) for each setting, at which the manufacturer claims compliance with this document, he shall declare a corresponding class, and for each such setting the detector shall comply with the requirements of this document for the corresponding class, and access to the adjustment means shall only be possible by the use of a code or special tool or by removing the detector from its base or mounting;

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

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

4.9 Requirements for software controlled detectors

4.9.1 General

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

4.9.2 Software design

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

a) the software shall have a modular structure;

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

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

4.9.3 The storage of programs and data

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

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

5 Tests

5.1 General

5.1.1 Atmospheric conditions for tests

Unless otherwise stated in a test procedure, the testing shall be carried out after the test specimen has been allowed to stabilize in the standard atmospheric conditions for testing as described in IEC 60068-1 as follows:

a) temperature: (15 to 35) °C;

b) relative humidity: (25 to 75) %;

c) air pressure: (86 to 106) kPa.

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

5.1.2 Operating conditions for tests

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

NOTE The details of the supply and monitoring equipment and the alarm criteria used can 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

5.1.4.1 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 part of IEC 60068).

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

5.1.5 Measurement of response time

5.1.5.1 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 5.2, unless otherwise specified.

5.1.5.2 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 ± 0,1) m/s at 25 °C, and the air temperature shall be controlled to within ±2 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 can be used to establish the effective start time of the temperature increase.

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