INTERNATIONAL STANDARD

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Fire detection and alarm systems —

Part 5: Point-type heat detectors

Systèmes de détection et d'alarme d'incendie —

Partie 5: Détecteurs de chaleur de type ponctuel

Reference number
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ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

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Foreword

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International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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.

ISO 7240-5 was prepared by Technical Committee ISO/TC 21, *Equipment for fire protection and fire fighting*, Subcommittee SC 3, *Fire detection and alarm systems*.

This second edition cancels and replaces the first edition (ISO 7240-5:2003), which has been technically revised. It also incorporates ISO 7240-5:2003/Cor1:2005.

ISO 7240 consists of the following parts, under the general title *Fire detection and alarm systems*:

- *Part 1: General and definitions*
- *Part 2: Control and indicating equipment*
- *Part 3: Audible alarm devices*

- *Part 4: Power supply equipment*
- *Part 5: Point-type heat detectors*
- *Part 6: Carbon monoxide fire detectors using electro-chemical cells*
- *Part 7: Point-type smoke detectors using scattered light, transmitted light or ionization*
- *Part 8: Carbon monoxide fire detectors using an electro-chemical cell in combination with a heat sensor*
- *Part 9: Test fires for fire detectors* [Technical Report]
- *Part 10: Point-type flame detectors*
- *Part 11: Manual call points*
- *Part 12: Line type smoke detectors using a transmitted optical beam*
- *Part 13: Compatibility assessment of system components*
- *Part 14: Guidelines for drafting codes of practice for design, installation and use of fire detection and fire alarm systems in and around buildings* [Technical Report]
- *Part 15: Point type fire detectors using scattered light, transmitted light or ionization sensors in combination with a heat sensor*
- *Part 16: Sound system control and indicating equipment*
- *Part 17: Short-circuit isolators*
- *Part 18: Input/output devices*

— *Part 19: Design, installation, commissioning and service of sound systems for emergency purposes*

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— *Part 22: Smoke-detection equipment for ducts*

— *Part 24: Sound-system loudspeakers*

— *Part 25: Components using radio transmission paths*

— *Part 27: Point-type fire detectors using a scattered-light, transmitted-light or ionization smoke sensor, an electrochemical-cell carbon-monoxide sensor and a heat sensor*

— *Part 28: Fire protection control equipment*

Introduction

This part of ISO 7240 is based on a draft prepared by European Standards Technical Committee CEN/TC72 "*Fire detection and fire alarm systems*".

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 part of ISO 7240 is not intended to place any other restrictions on the design and construction of such heat detectors.

Fire detection and alarm systems —

Part 5:
Point-type heat detectors

1 Scope

This part of ISO 7240 specifies 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 part of ISO 7240 should only be used for guidance. This part of ISO 7240 is not applicable to heat detectors with special characteristics and developed for specific risks.

2 Normative references

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

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

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

EN 50130-4, *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*

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

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

IEC 60068-2-2, *Environmental testing — Part 2-2: Tests — Test 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: Damp heat, cyclic (12 h + 12 h 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*

3 Terms and definitions

For the purposes of this document, the following definitions and those given in ISO 7240-1 apply:

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 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 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 Rates of rise of temperature of approximately 0,2 K min^{-1} 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 part of ISO 7240, the detector shall meet the requirements of this clause, which shall be verified by visual inspection or engineering assessment, shall be tested as specified in Clause 5, and if applicable Clause 6, and shall meet the requirements of the tests in accordance with its marked class(es).

4.2 Classification

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

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

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.

For detachable detectors, the indicator may be integral with the base or the detector head.

The visual indicator shall be visible from a distance of 6 m at an angle of up to 5° from the axis of the detector in any direction, in ambient light intensity up to 500 lx.

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).

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 part of ISO 7240, he shall declare a corresponding class, and for each such setting, the detector shall comply with the requirements of this part of ISO 740 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 part of ISO 7240 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 this part of ISO 7240.

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

4.9 Marking

Each detector shall be clearly marked with the following information:

a) reference to this part of ISO 7240, i.e. ISO 7240-5:2012;

b) class(es) of the detector (e.g. A1, A1R, A1S, A2, B etc.). If the detector has provision for on-site adjustment of the class (see 4.8), then the marking of the class may be replaced by the symbol P;

c) name or trademark of the manufacturer or supplier;

d) model designation (type or number);

e) wiring terminal designations;

f) 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 detector.

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

Where any marking on the device uses symbols or abbreviations not in common use, these should 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.

4.10 Data

Detectors shall either be supplied with sufficient technical, installation and maintenance data to enable their correct installation and operation or, if all of this data is not supplied with each detector, reference to the appropriate data sheet(s) shall be given on, or with each detector.

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

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

NOTE Additional information may be required by organizations certifying that detectors conform to the requirements of this part of ISO 7240.

4.11 Requirements for software controlled detectors

4.11.1 General

For detectors which rely on software control in order to fulfil the requirements of this part of ISO 7240, the requirements of 4.11.2, 4.11.3 and 4.11.4 shall be met.

4.11.2 Software documentation

4.11.2.1 The manufacturer shall submit documentation which gives an overview of the software design. This documentation shall be in sufficient detail for the design to be inspected for compliance with this part of ISO 7240 and shall include at least the following:

a) functional description of the main program flow (e.g. as a flow diagram or structogram) including a brief description of:

   1) the modules and the functions that they perform;

   2) the way in which the modules interact;

   3) the overall hierarchy of the program;

   4) the way in which the software interacts with the hardware of the detector;

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

b) description of those areas of memory used for each purpose (e.g. the program, site-specific data and running data);

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

4.11.2.2 The manufacturer shall prepare and maintain detailed design documentation. This shall be available for inspection in a manner that respects the manufacturers' rights for confidentiality. 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 (CASE-tools, compilers etc).

NOTE This detailed design documentation can be reviewed at the manufacturers' premises.

4.11.3 Software design

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

a) The software shall have a modular structure;

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

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

4.11.4 Storage of programs and data

The program necessary to comply with this part of ISO 7240 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 be possible only by the use of some special tool or code and shall not be possible during normal operation of the detector.

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

5 Tests

5.1 General

5.1.1 Atmospheric conditions for tests

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

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

The specimen for which the response time is to be measured shall be mounted in a heat tunnel, as specified 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 of 5.2, 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 ± 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.

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.

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

NOTE Details and information concerning the design of the heat tunnel are given in Annexes A and B.

5.1.6 Provision for tests

The following shall be provided for testing compliance with this part of ISO 7240:

— For resettable detectors: 15 detectors;

— For non-resettable detectors: 62 detectors;

— For non-resettable suffix S detectors: 63 detectors;

— For non.resettable suffix R detectors: 68 detectors;

— The data required in 4.10.

The specimens submitted shall be deemed 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 detectors with provision for on-site adjustment of their class:

a) tests in accordance with 5.3, 5.4, 5.5, 5.6, 5.8, 6.1 and 6.2 shall be applied for each applicable class;

b) the test in accordance with 5.10 shall be applied for the class with the highest temperature rating;

c) all other tests shall be applied for at least one class.

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

Table 2 — Test schedule for resettable detectors

Test	Sub clause	Specimen number(s)							
		Rate of rise of air temperature (K min^{-1})							
		≤ 0,2	1	3	5	10	20	30	Plunge
Directional dependence	5.2					1			
Static response temperature	5.3	1, 2							
Response times from typical application temperature	5.4		1, 2	1, 2	1, 2	1, 2	1, 2	1, 2	
Response times from 25 °C	5.5			1			1		
Response times from high ambient temperature	5.6			1			1		
Variation in supply parameters	5.7			1, 2			1, 2		
Reproducibility (response times before environmental tests)	5.8			3 to 15			3 to 15		