
**Fire detection and fire alarm systems —
Part 25:
Components using radio transmission
paths**

Systèmes de détection et d'alarme d'incendie —

Partie 25: Composants utilisant des voies de transmission radio
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Published in Switzerland

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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.

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 7240-25 was prepared by Technical Committee ISO/TC 21, *Equipment for fire protection and fire fighting*, Subcommittee SC 3, *Fire detection and alarm systems*.

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 Specification]
- *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]

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- *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*
- *Part 20: Aspirating smoke detectors*
- *Part 21: Routing equipment*
- *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*

A part 23, dealing with visual alarm indicators, is under development.

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Introduction

This part of ISO 7240 is based on European Standard EN 54-25, prepared by the European Committee for Standardization, CEN/TC 72, *Fire detection and fire alarm systems*.

This part of ISO 7240 defines requirements and tests in addition to those in other parts of ISO 7240 that allow components of a fire detection and alarm system using radio transmission paths to operate with an integrity and stability similar to those of wire transmission paths.

This part of ISO 7240 includes both equipment and system requirements because of the integral relationship between equipment that forms the system.

Limitations to the use of radio components, such as capacity, can be specified in national rules or guidelines.

Technical aspects of the assessment of frequencies, bands and channels should be considered.

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Fire detection and fire alarm systems —

Part 25:

Components using radio transmission paths

1 Scope

This part of ISO 7240 specifies requirements, test methods and performance criteria for components used in fire detection and alarm systems, installed in and around buildings, which use radio-frequency (r.f.) transmission paths. It specifies requirements for the assessment of conformance of the components to the requirements of this part of ISO 7240.

Where components work together and this requires knowledge of the system design, this part of ISO 7240 also specifies requirements for the system.

When the fire detection and alarm system uses wired and r.f. transmission paths, the relevant parts of ISO 7240 apply together with this part of ISO 7240. Requirements relevant to wire transmission paths are superseded or modified by those included in this part of ISO 7240.

This part of ISO 7240 does not restrict

- the intended use of radio spectrum, e.g. frequency, power output of devices;
- the allowed maximum number of the components using r.f. transmission paths within the fire detection and alarm system or one wire transmission path and/or r.f. transmission path;
- the allowed maximum number of the components affected by loss of one wire transmission path and/or r.f. transmission path.

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 7240-2, *Fire detection and alarm systems — Part 2: Control and indicating equipment*

ISO 7240-4, *Fire detection and alarm systems — Part 4: Power supply equipment*

ISO 7240-5:2003, *Fire detection and alarm systems — Part 5: Point-type heat detectors*

ISO 7240-11, *Fire detection and alarm systems — Part 11: Manual call points*

ISO 7240-18, *Fire detection and alarm systems — Part 18: Input/output devices*

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*

IEC 61620:1998, *Insulating liquids — Determination of the dielectric dissipation factor by measurement of the conductance and capacitance — Test method*

IEC 61672-1:2002, *Electroacoustics — Sound level meters — Part 1: Specifications*

ITU-T O.153, *Basic parameters for the measurement of error performance at bit rates below the primary rate*

EN 50130-4, *Alarm systems — Part 4: Electromagnetic compatibility — Product family standard: Immunity requirements for components of fire, intruder and social alarm systems*

3 Definitions and abbreviations

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

3.1 Definitions

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3.1.1

adjacent channel selectivity

measure of the capability of the receiver to operate satisfactorily in the presence of an unwanted signal that differs in frequency from the wanted signal by an amount equal to the adjacent channel separation for which the equipment is intended

3.1.2

antenna

element of a radio component of the fire detection and alarm system that allows coupling between the component and the media where r.f. waves are propagated

3.1.3

assigned band

frequency band within which the equipment is authorized to operate

3.1.4

autonomous power source

p.s.e. without any link to the public power supply or an equivalent system not rechargeable during operation and able by itself to power the supplied component

EXAMPLE A primary battery.

3.1.5

base station

transceiver in the system that communicates with a certain number of components

3.1.6**blocking or desensitization**

measure of the capability of the receiver to receive a wanted modulated signal without exceeding a given degradation due to the presence of an unwanted input signal at any frequencies other than those of the spurious responses or the adjacent channels or bands

3.1.7**collision**

simultaneous transmissions, from two or more transmitters belonging to the same system, of sufficient signal strength to cause, by mutual interaction, corruption or obliteration of the information carried by the r.f. transmission path

3.1.8**compatibility**

capacity of a component of the system to operate with another component of this system

- within the limits specified by each component,
- within the specified limits given by the relevant parts of ISO 7240 if available or given by the manufacturer if not available,
- within specified configurations of the system

3.1.9**fire detection and alarm system**

group of components including a c.i.e. that, when arranged in (a) specified configuration(s), is capable of detecting and indicating a fire, and giving signals for appropriate action

3.1.10**identification code**

part of a message used to identify a transmitting r.f. communication device belonging to the system

3.1.11**intermediate element**

device connected to a transmission path of a fire detection and alarm system, used to receive and/or transmit signals necessary for the operation of the fire detection and alarm system

NOTE An intermediate element meets the requirements of an input/output device in accordance with ISO 7240-18 but it is not restricted to electrical signals.

3.1.12**limited frequency range**

frequency of the local oscillator signal (f_{LO}) applied to the first mixer of the receiver plus or minus the sum of the intermediate frequencies (f_{i1}, \dots, f_{in}) and half of the switching range, r_{sw} , of the receiver, as defined by the expression in Equation (1):

$$f_{LO} - \sum_{j=1}^n f_{ij} - \frac{r_{sw}}{2} \leq f_i \leq f_{LO} + \sum_{j=1}^n f_{ij} - \frac{r_{sw}}{2} \quad (1)$$

3.1.13**manufacturer**

natural or legal person who places the equipment on the market under his own name

NOTE Normally, the manufacturer designs and manufactures the product himself. A manufacturer can also design, manufacture, assemble, pack, process or label the product as subcontractor or he assembles, packs, processes, or labels products as ready-made products.

3.1.14

r.f. transmission path

means of communication between at least two points, using r.f. wave propagation

3.1.15

radio part

component or part of the component incorporating the receiver and/or transmitter

NOTE The radio part can include a power supply, e.g. an autonomous power source.

3.1.16

receiver

device that receives the r.f. energy corresponding to an r.f. transmission path

NOTE The receiver can be incorporated in a component of the fire detection and alarm system.

3.1.17

r.f. interference

r.f. transmission from a source other than a component of the fire detection and alarm system that can cause corruption or obliteration of wanted signals and that does not conform to the definition of collision or message substitution

3.1.18

service life

period of useful life of an autonomous power source under specified conditions

3.1.19

site attenuation

degradation of the r.f. signal due to either transmission path loss or a change in the environment of the fire detection and alarm system after its installation

NOTE Site attenuation can be changed for example by installation or relocation of reflection or absorption materials.

3.1.20

special tool

device not normally carried by the public (e.g. a key), normally provided by the manufacturer and that is used for opening the enclosure of the component to detach the antenna

NOTE It is intended to deter unauthorized access to the antenna, while being available on site either at a defined location or from a "responsible person" familiar with and having knowledge of the system.

3.1.21

spurious response rejection

measure of the capability of the receiver to receive a wanted, modulated signal without exceeding a given degradation due to the presence of an unwanted, modulated signal at any other frequency at which a response is obtained

3.1.22

switching range

r_{sw}
maximum frequency range over which the receiver or the transmitter can be operated within the alignment range without reprogramming or realignment

3.1.23

transmitter

device which generates the r.f. energy necessary for an r.f. transmission path

NOTE The transmitter can be incorporated in a component of the fire detection and alarm system.

3.2 Abbreviated terms

c.i.e.	control and indicating equipment
p.s.e.	power supply equipment
r.f.	radio frequency
RMS	root mean square

4 System requirements

4.1 General

The requirements of this part of ISO 7240 shall be applied, together with requirements of the relevant part of ISO 7240, where the r.f. transmission path component has the same function as the component covered by that part and when not otherwise specified in this part of ISO 7240.

For example, a component with a r.f. transmission path, having the function of a heat detector shall comply with ISO 7240-5 and a component having the function of a manual call point shall comply with ISO 7240-11.

4.2 Radio frequency transmission paths

4.2.1 Immunity to site attenuation

The manufacturer shall provide means either in the component itself or by the system configuration to ensure that a site attenuation, which can be caused by influences for different reasons on site, shall not affect the r.f. transmission path adversely in a way that communication between components is not possible.

The immunity to site attenuation shall be specified as follows:

- a) for r.f. operating frequencies up to 10 MHz: at least 10 dB;
- b) for r.f. operating frequencies higher than 10 MHz: as calculated in Annex B.

The manufacturer shall provide the necessary documentation and/or means of evaluation that permits an assessment of the full functionality of the component. If these means are a part of the component, the user shall not be able to interfere with these means (see 8.2.2).

4.2.2 Alarm signal integrity

The components of the system shall use a transmission protocol on the transmission path to ensure that no alarm message is lost (see 8.2.3).

4.2.3 Identification of components

4.2.3.1 Each component using an r.f. transmission path shall be identified by an individual identification code as belonging to one specific fire detection and alarm system.

4.2.3.2 The manufacturer shall provide means to ensure that a component using an r.f. transmission path shall not be accepted by other fire detection and alarm systems (see 8.2.4).

4.2.4 Receiver performance

Unless otherwise specified in mandatory national regulations, the receiver shall meet the requirements given in Table 1.

Table 1 — Minimum receiver performance characteristics

Characteristic	Limit dB	Working frequency offset MHz	Notes
Adjacent channel selectivity	≥ 36	—	For all bandwidths and modulation schemes
Blocking or desensitization	≥ 40	± 1	In direct sequence spread spectrum systems (DSSS) the working frequency is the centre frequency
	≥ 45	± 2	
	≥ 60	± 5	
	≥ 65	± 10	
Spurious response rejection	≥ 40	—	—

The manufacturer of the receiver shall provide a test report by a test laboratory to demonstrate that the requirements of this subclause are fulfilled. If the manufacturer cannot provide this evidence, the tests described in 8.2.5 shall be conducted. The manufacturer shall provide the means to carry out the test, e.g. stop frequency hopping.

4.2.5 Immunity to interference

4.2.5.1 General

4.2.5.1.1 Tests shall be conducted to determine the level of immunity to the following sources:

- radio influences from the fire detection and alarm system;
- radio influences from other users of the spectrum;

4.2.5.1.2 The following influences are not covered:

- random influences as a result of electromagnetic effects;

NOTE 1 These are covered by EMC guidelines (see EN 50130-4).

- deliberate electromagnetic attack on the r.f. transmission path.

NOTE 2 No special sabotage resistance is required for fire detection and alarm systems in ISO 7240.

4.2.5.1.3 Unless otherwise specified in mandatory national regulations, the requirements of 4.2.5 shall apply.

4.2.5.2 Availability of r.f. transmission path in two or more technically similar systems from the same manufacturer

For two or more technically similar systems from the same manufacturer operating within the same radio range the r.f. transmission paths shall not mutually impede one another.

The manufacturer shall specify the means for assessment, which shall be suitable to ensure the availability of all parts of the system in all expected system configurations (see 8.2.6).

4.2.5.3 Availability of the r.f. transmission path in the presence of other band users

Where equipment from other users is operating at the maximum permitted limits (e.g. power, bandwidth and duty cycle) in the same r.f. band or sub-band, r.f. interference shall not prevent signal transmission (see 8.2.7).

NOTE The definition in EN 300220-1 applies for establishing the duty cycle.

4.2.5.4 Integrity of the r.f. transmission path

The application of one of the r.f. interference signals specified in 8.2.7 to one of the fire detection and alarm system receivers shall not cause an alarm condition or a fault warning condition at the c.i.e.

4.2.6 Loss of communication

The loss of the ability of the system to transmit a message of any component with an r.f. transmission path to the c.i.e. within periods specified in ISO 7240-2 shall be recognized in less than 300 s and shall be indicated in less than 100 s (see 8.2.8).

4.2.7 Antenna

The antenna or its cable shall be detachable only by opening the enclosure of the component or by using special tools provided by the manufacturer (see 8.2.9).

5 Components requirements

5.1 Compliance

In order to comply with this part of ISO 7240, the components shall meet the requirements of this Clause 5, which shall be verified by visual inspection or engineering assessment, shall be tested in accordance with Clause 8 and shall meet the requirements of the tests.

5.2 General

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5.2.1 All components shall meet the requirements of the relevant part of ISO 7240 and the additional specific requirements in 5.3 and 5.4, including the transmission paths.

5.2.2 The component shall be designed such that the removal from its base and/or point of installation are detected and indicated as a fault.

5.2.3 Components that rely on software control in order to fulfil the requirements of this part of ISO 7240 shall comply with the relevant part of ISO 7240.

5.3 Power supply equipment

5.3.1 The components shall be powered by

- a) an autonomous power source, e.g. a primary battery; or
- b) a p.s.e. in accordance with ISO 7240-4.

5.3.2 All components powered by an autonomous power source shall be within the enclosure of the component.

The manufacturer shall declare the type of the autonomous power source and its service life for the component in normal operation. The service life shall be demonstrated by a statement of calculation. This calculation shall take into account the mean consumption and voltage under quiescent and at standard atmospheric conditions. The product of the specified discharge time and the mean discharge current shall not be greater than 85 % of the rated capacity of the power source.

NOTE The remaining 15 % of the rated capacity takes into account self-discharge of the power source.

The mean consumption shall be calculated based on the electronic element of the circuit.

Where calculation is not practical, the mean consumption shall be measured at nominal voltage for at least 1 h under quiescent operation after the stabilization period specified by the manufacturer. The verification of this calculation shall be made as defined in 8.3.3. Annex C gives an example for the calculation of the service life of the autonomous power source.

5.3.3 All components powered by an autonomous power source shall be able to transmit a fault signal (low power) before the power source fails. The following conditions shall be taken into account (see 8.3.4).

- a) The component shall be capable of generating and transmitting a fault signal within 60 min after replacing a good or new autonomous power source by a preconditioned power source representing a discharged power source at the end of its service life.
- b) The component shall be capable of operating as intended when it is activated using the preconditioned power source representing a discharged power source at the end of its service life.
- c) The component shall keep the fire alarm condition and/or another activated condition for at least 30 min (where alarm condition is not applicable).

5.3.4 The loss of the power source shall be indicated as a fault signal from point in accordance with ISO 7240-2. Where several power sources are used for different functions within one component, the fault signal shall be given for each power source (see 5.3.3).

5.3.5 Either the component shall be designed to make polarity reversal impossible or, if not, the polarity of the connections for the power source shall be identifiable and the polarity reversal shall not damage the component (see 8.3.5).

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5.4 Environmental

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5.4.1 General

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Components shall be tested to the environmental tests defined in the relevant part of ISO 7240. The functional tests of the radio part of the component before and after the environmental treatment shall be conducted in accordance with 8.3.

The type and severity of the environmental tests are separately specified for the following main categories of equipment containing a transmitter/receiver:

- c.i.e.;
- other components (e.g. detectors, manual call points, input/output devices).

5.4.2 General test procedure

Unless otherwise stated, the components of the fire detection and alarm system containing the transmitter and the receiver, respectively, shall be mounted in the radio-frequency-shielded test equipment in accordance with Annex A.

The component transmitting the alarm signal shall be tested together with a typical component receiving the alarm signal and *vice versa*.

The measurements of the attenuation values, *A*, shall be conducted with the component mounted in the test equipment and with the fixtures closed correctly. However, during some of the environmental exposures the fixtures shall be opened or the equipment under test shall be taken out of the fixture.

5.4.3 Provision for testing

The manufacturer shall provide a sufficient number of specimens for testing. The required number of specimens in Table 2 is dependent on the type of component being tested.

Table 2 — Provisions for testing

Components	Number of specimens
C.i.e.	At least 1 (in accordance with ISO 7240-2)
Other components (e.g. detectors, manual call points, input/output devices)	At least 16 (in accordance with the relevant part of ISO 7240)

The specimens submitted shall be deemed representative of the manufacturer's normal production with regard to their construction and calibration. Where specimens are comprised of at least two parts — a base (socket) and a head (body) — and the radio part and the power supply are located only in one of these parts, only this part shall be tested in accordance with this part of ISO 7240. The other part is used to trigger the radio part.

6 Marking

6.1 The marking shall be in accordance with the marking requirements of the relevant part of ISO 7240.

6.2 The element containing the radio part shall be additionally clearly marked with

a) the number of this part of ISO 7240 (i.e. ISO 7240-25);

b) the marking required by national regulations.

6.3 The element containing an autonomous power source shall be additionally clearly marked with

a) the type and the reference of the power source(s) recommended by the manufacturer, which indications shall be visible during its replacement;

b) the service life of the autonomous power source.

7 Data

7.1 General

The manufacturer shall prepare the documentation to evaluate the compatibility in the configuration(s) specified by the manufacturer. This documentation shall include at least the following:

a) list of the relevant components of the fire detection and alarm system, which shall define for each component the functions (a part of this definition shall include a description of the software and of the hardware) and the technical information for each component to facilitate proof of the compatibility of each sub-system within the global network system;

b) test reports relative to the conformity of the components, with indication of the relevant part of ISO 7240;

c) characteristics of the r.f. transmission path between each component and the c.i.e.;

d) how the requirements of 4.2.3 are satisfied;