
**Fire detection and alarm systems —
Part 18:
Input/output devices**

Systèmes de détection et d'alarme d'incendie—

Partie 18: Dispositifs d'entrée/sortie

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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 7240-18 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 heat sensor*
- *Part 28: Fire protection control equipment*

A part 23 dealing with visual alarm devices is under preparation

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Introduction

This part of ISO 7240 is based on a European standard, EN 54-18, prepared by the European Committee for standardization CEN/TC 72 “*Fire detection and fire alarm systems*”.

The term input/output devices, used in this part of ISO 7240, covers a wide range of different types of devices that are intended for different applications and can, therefore, have different functions. This part of ISO 7240 does not, therefore, include detailed functional requirements for the input/output devices but requires that their function is sufficiently specified by the manufacturer and that they function correctly in accordance with the manufacturer’s specification.

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Fire detection and alarm systems —

Part 18: Input/output devices

1 Scope

This part of ISO 7240 specifies requirements, test methods and performance criteria for input/output devices connected to a transmission path of a fire detection and alarm system used to receive and/or transmit signals to or from the transmission path, necessary for the operation of the fire detection and fire alarm system and/or fire protection system.

An input/output device can be a physically separate device or its function can be integrated into another device, in which case this part of ISO 7240 can be used to assess this function.

An input/output device can include signal amplifiers and signal transfer in separate enclosures, in which case the requirements of this part of ISO 7240 shall apply.

Control and indicating equipment and ancillary control and indicating equipment (e.g. repeater panels and fire brigade panels) are not covered by this part of ISO 7240.

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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 7240-1, *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 — 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 60068-2-75:1997, *Environmental testing — Part 2-75: Tests — Test Eh: Hammer tests*

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

EN 50130-4:1995, *Alarm systems — Part 4: Electromagnetic compatibility — Product family standard: Immunity requirements for components of fire, intruder and social alarm systems (including amendments EN 50130-4:1995/A1:1998 and EN 50130-4:1995/A2:2003)*

3 Terms and definitions

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

3.1 Terms

3.1.1 conditioning

exposure of a specimen to environmental conditions in order to determine the effect of such conditions on the specimen

3.1.2 input/output device

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

3.1.3 recovery

treatment of a specimen, after conditioning, so that the properties of the specimen may be stabilized before measurement

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3.2 Abbreviated terms

c.i.e. control and indicating equipment

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EMC electromagnetic compatibility

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4 Requirements

4.1 Compliance

In order to comply with this part of ISO 7240, the input/output devices shall meet the requirements of Clause 4, which shall be verified by inspection and engineering assessment, and shall be tested as described in Clause 5 and shall meet the requirements of the tests.

For input/output devices integrated into another device that is already covered by an existing part of ISO 7240, the environmental conditioning shall be performed in accordance with that part of ISO 7240, with the addition of the functional tests before, during and/or after conditioning, as required in this part of ISO 7240. In some detector standards, the dry heat (operational) test is conducted in special test equipment (e.g. in the heat tunnel for heat detectors). The required functional testing of the integrated input/output device before, during and after the dry heat conditioning may be done with this equipment, if this is possible without disrupting the detector measurements. Otherwise, a separate dry heat test, with the same conditioning, shall be conducted. For heat detectors, the test temperature is the maximum application temperature.

4.2 Monitoring of detachable devices

If an input/output device is detachable (i.e. it is attached to a detachable mounting base), then a means shall be provided for a remote monitoring system (e.g. the control and indicating equipment) to detect the removal of the device from the base, in order to give a fault signal.

4.3 Marking and data

4.3.1 Marking

Each input/output device shall be clearly marked with the following information:

- a) the number of this part of ISO 7240 (i.e. ISO 7240-18),
- 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. a serial number or batch code), by which the manufacturer can identify, at least, the date or batch and place of manufacture, and the version number(s) of any software, contained within the device.

For detachable devices, the head shall be marked with a), b), c) and e), 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 and shall be accessible during maintenance.

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

4.3.2 Data

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Input/output devices shall be supplied with sufficient technical, installation and maintenance data to ensure their correct installation and operation. These data shall include the parameters necessary to define the input and/or output functions, e.g. output voltage and current ratings, alarm and fault trip levels, logic levels. If all of these data are not supplied with each device, then reference to the appropriate data sheet(s) shall be given on, or with, each device. To enable correct operation of the input/output device, these data shall describe the requirements for the correct processing of the signals from the device. 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 c.i.e., etc.

4.4 Documentation

The manufacturer shall prepare and provide design documentation (e.g. drawings, parts lists, block diagrams, circuit diagrams). Where appropriate, this shall include documentation of the signal processing principle.

4.5 Requirements for software controlled devices

4.5.1 General

For input/output devices that rely on software control in order to fulfil the requirements of this part of ISO 7240, the requirements of 4.5.2, 4.5.3 and 4.5.4 shall be met.

4.5.2 Software documentation

4.5.2.1 The manufacturer shall prepare documentation that gives an overview of the software design. This shall be submitted to the testing authority together with the input/output devices. This documentation shall be in sufficient detail so that the design can 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
 - 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 device,
 - 5) the way in which the modules are called, including any interrupt processing;
- b) description of which areas of memory are used for the various purposes, e.g. the program, site specific data and running data;
- c) designation by which the software and its version can be uniquely identified.

4.5.2.2 The manufacturer shall prepare and maintain detailed design documentation. This shall be available for inspection in a manner that respects the manufacturer's rights for confidentiality. It shall comprise at least the following:

- a) overview of the whole system configuration, including all software and hardware components;
- b) 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 to recognize the program flow;
- d) details of any software tools used in the design and implementation phase, e.g. CASE-Tools, Compilers etc.

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

4.5.3 Software design

In order to ensure the reliability of the device, the following requirements for software design shall apply.

- a) The software shall have a modular structure.
- b) The design of the interfaces for manually and automatically generated data shall not permit invalid data to cause error in the program operation.
- c) The software shall be designed to avoid the occurrence of deadlock of the program flow.

4.5.4 The 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 device.

Site-specific data shall be held in memory that can retain data for at least two weeks without external power to the device, 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, carry out the testing 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.

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The temperature and humidity shall be substantially constant for each environmental test where the standard atmospheric conditions are applied.

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5.1.2 Operating conditions for tests

If a test method requires that a specimen 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.

The details of the supply and monitoring equipment used shall be given in the test report; see Clause 6.

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 IEC 60068-2.

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