
**Fire detection and alarm systems —
Part 13:
Compatibility assessment of system
components**

Systèmes de détection et d'alarme d'incendie —

Partie 13: Estimation de la compatibilité des composants d'un système

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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.

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 of 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 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 second edition cancels and replaces the first edition (ISO 7240-13:2005), which has been technically revised.

The main changes compared to the previous edition are as follows:

- This edition takes into account new techniques in communication and the availability of new technologies and concepts.
- This edition is applicable to electrical wires, optical fibre or radio frequency connections. The previous edition was only applicable to electrical wires.
- Clarification introduced that it is possible to use this document to establish compatibility with fire protection equipment such as sprinkler flow switches and electrically activated sprinkler heads.
- Levels (field, control and management) and a network transmission path for the basis of system configuration introduced.
- References to EN standards have been replaced with the appropriate IEC standard references.
- Introduction of [Annex A](#), Example of levels used in FDAS.
- Introduction of [Annex B](#), Classification of functions of the FDAS.
- Introduction of [Annex C](#), Example methodology for theoretical analysis.
- Introduction of [Annex D](#), Software design documentation.
- Introduction of [Annex E](#), Flowchart for assessment of compatibility/connectability.
- Introduction of [Annex F](#), previously [Annex A](#), upgraded to the latest fire detection and alarm system functions diagram from ISO 7240-1.

A list of all parts in the ISO 7240 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

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Introduction

The purpose of fire detection is to detect a fire at the earliest practicable moment and to give signals and indications so that appropriate action can be taken.

The purpose of a fire alarm is, at a minimum, to give audible and/or visible signals to the occupants of a building who may be at risk from fire.

A fire detection and alarm system including voice alarm systems combines the functions of detection and alarm in a single system and typically consists of a number of inter-linked components including automatic fire detectors, manual call points and alarm devices. These components are connected to control and indicating equipment by means of one or more transmission paths. All system components, including the control and indicating equipment, are also directly or indirectly connected to a power supply.

A separate voice alarm system can be assessed for compatibility and connectability independently of the fire detection and alarm system.

ISO 7240-1 provides additional information about the components performing these functions, listed in [Annex F](#) of this document.

A fire protection system and/or building management system, or remote fault and fire alarm monitoring stations that are linked to a fire detection and alarm system, are not considered part of the fire detection and alarm system.

It is necessary for all of the components constituting the fire detection and alarm system to be compatible or connectable and it is necessary that requirements relating to the performance of the overall system be fulfilled.

Differentiation is made between components classified as components type 1 and other components, classified as components type 2.

As the possible configurations of fire detection and alarm systems are unlimited, the assessment is only carried out on the configuration(s) declared by the applicant.

This document recognizes that it is not practical to assess the compatibility or connectability of components in all possible configurations. Methods of assessment are specified to reach an acceptable degree of confidence within pre-determined operational and environmental conditions.

National application guidelines (also known as codes of practice) also contain system requirements.

System requirements are also included for fire detection and alarm systems which are linked to fire protection systems and/or other systems (for example: fire suppression and building management systems).

The intended use of this document is to demonstrate the compatibility and connectability of components, even if they are not defined by an ISO standard.

Fire detection and alarm systems —

Part 13:

Compatibility assessment of system components

1 Scope

This document specifies the requirements for compatibility and connectability assessment of the components of fire detection and alarm systems, fire protection systems and voice alarm systems.

This document only includes system requirements when these are necessary for compatibility assessment.

This document also specifies requirements for the integrity of the fire detection and fire alarm system when connected to other systems.

This document does not specify the manner in which the system is designed, installed and used in any particular application.

This document does not cover components or functions which are not included in the fire detection and alarm systems (FDAS), such as functions performed by a building management system.

Methods of assessment are specified to permit an acceptable degree of confidence within predetermined operational and environmental conditions to be achieved.

The requirements for the transmission path used for a distributed function are covered by a relevant ISO standard and not by this document.

This document is applicable to systems where the components are connected to control-and-indicating equipment (CIE) and where the components are interconnected by electrical wires or optical fibre or by radio frequency links or by any combination of these.

ISO 7240-25 provides additional information and requirements about systems using radio frequency links.

NOTE Other International Standards are expected to cover the requirements of other systems to which the fire detection and fire alarm system is connected.

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

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

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

ISO 7240-16, *Fire detection and alarm systems — Part 16: Sound system control and indicating equipment*

ISO 7240-25, *Fire detection and fire alarm systems — Part 25: Components using radio transmission paths*

IEC 62599-1, *Alarm systems — Part 1: Environmental test methods*

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

3 Terms, definitions and abbreviated terms

3.1 Definitions

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

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

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <http://www.electropedia.org/>

3.1.1

compatibility of the component type 1

ability of a *component type 1* (3.1.2) to operate with control-and-indicating equipment

- within the limits specified for each component,
- within the specified limits given by the relevant parts of the ISO 7240 series or the ISO 6182 series if available and if not available, given by either a National fire equipment standard or by the applicant,
- within specified configurations of systems

3.1.2

component type 1

device performing a function for the protection of life and/or property, which is required by national guidelines or regulations

3.1.3

component type 2

device other than a type 1 device which is connected to a *component type 1* (3.1.2) performing a function for the protection of life and/or property, which is not required by national guidelines or regulations

EXAMPLE A printer used for listing fire events.

3.1.4

configuration

topological arrangement of components connected through transmission paths to a control and indicating equipment

3.1.5

connectability of component type 2

ability of a *component type 2* (3.1.3) to operate without jeopardizing the performance of the fire detection and fire alarm system

3.1.6

control level

level where control and indication functions are provided

Note 1 to entry: See [Figure A.1](#).

Note 2 to entry: CIE and VACIE belong to this level.

3.1.7

field level

level where detection, activation and fire alarm functions are provided

Note 1 to entry: See [Figure A.1](#).

Note 2 to entry: Detectors, input/output devices and visual/audible alarm devices belong to this level.

3.1.8

fire protection system

group of devices, which in combination are capable of automatically actuating measures to limit the effect of fire

EXAMPLE Compartmentalization systems, smoke control systems, fixed fire-fighting systems.

3.1.9

hierarchical system

networked system in which one item of control-and-indicating equipment is designated as the main control-and-indicating equipment, and in which the main control-and-indicating equipment is able to

- receive signals from and/or transmit signals to the control-and-indicating equipment of a subsystem, and
- indicate the status of the control-and-indicating equipment of a subsystem

3.1.10

management level

level where management functions are provided

Note 1 to entry: The FDAS shall not depend on these functions for its operation.

3.1.11

networked CIE

fire-detection and fire-alarm system in which more than one CIE or VACIE or a combination are interconnected on a fault tolerant transmission path and are able to exchange information

3.1.12

applicant

organization or other such body requiring an assessment of the compatibility and connectability of system components

3.2 Abbreviated terms

CIE	control-and-indicating equipment
FDAS	fire detection and fire alarm system
PSE	power supply equipment
TP	transmission path
VACIE	voice alarm control and indicating equipment
VAS	voice alarm system

4 Requirements

4.1 Conformance

The components shall conform to the requirements of the ISO 7240 series or the ISO 6182 series or with a national equipment standard or with a manufacturer's specification where a standard is not available.

National application guidelines (also known as codes of practice) also contain system requirements. Suppliers of components shall ensure that they

- meet the requirements of this document;

- meet the requirements of the application guidelines of the countries where the components are intended to be placed on the market.

In order to conform to this document, compatibility of the components type 1 or connectability of the components type 2 within the FDAS shall meet the requirements listed in [Clause 4](#) of this document. This shall be verified by theoretical assessment ([5.1](#)) with reference to the required documentation ([Clause 8](#)). When it is an outcome of the theoretical assessment, configuration(s) according to [5.3](#) shall be tested as described using the relevant selection of functional tests defined in [5.5](#) and [5.6](#) and shall meet the acceptance criteria of the tests.

4.2 General system requirements

4.2.1 The applicant shall provide a list of the FDAS devices and those devices not covered by the ISO 7240 series shall be declared as component type 1 or component type 2.

4.2.2 The different FDAS configurations intended to be used shall be described within the applicant's documentation.

4.2.3 Each of the configurations declared by the applicant shall be considered and representative configurations shall be assessed to meet the requirements of this document.

4.2.4 Each component type 1 shall be powered directly or indirectly by a PSE which conforms to the requirements in ISO 7240-4, except for some radio link components in accordance with ISO 7240-25 which may be powered by batteries.

4.2.5 Each component type 1 shall meet the requirements of the relevant part of the ISO 7240 series or the ISO 6182 series.

Where the component type 1 is not covered by a relevant part of ISO 7240 series or the ISO 6182 series, it shall meet the following criteria:

- a) conformity of the functionality (indication, control, activation) as declared by the component manufacturer: this functionality shall be consistent with the purpose of a FDAS. The applicant shall provide the means to check the functionality;
- b) conformance to IEC 62599-2;
- c) conformance to IEC 62599-1; the applicant shall declare the environmental class. The measurements or inspections are made before, during (if necessary) and after testing. There shall be no change in the functioning of the equipment and no significant change in any measurements, which shall also remain within specification.

Alternatively, the component may comply with the environmental clauses included in the relevant part of the ISO 7240 series (refer to ISO 7240-1 to classify the components and select the appropriate part).

NOTE It is possible for a component to be covered by a National Assessment Document where there is not an ISO 7240 standard.

4.2.6 The operation of type 1 and type 2 components shall not jeopardize the operation of the system.

4.2.7 Each component within the FDAS shall operate correctly when submitted to supply voltage variation as specified by the manufacturer. For each configuration, voltage shall be within the specified voltage supply range of each component in the FDAS.

4.3 Transmission path(s) (TP)

4.3.1 General

Each TP between components shall be realized as one of or a combination of the following: electrical cables, radio frequency links or fibre optic cables.

Means, specified and provided, of limiting the consequences of faults on a transmission path shall ensure that the function of remaining operational devices is re-established within 300 s following the occurrence of the fault.

Application guidelines may require that the consequences of a fault (for example a short circuit or an interruption) on a transmission path are limited: for example, not losing more than one function or limiting the maximum area affected by the fault.

4.3.2 TP using wires

The applicant shall define in the installation documentation the arrangement of the TP and if the TPs may be combined in one cable.

A single short or open or earth fault in any TP between components of the FDAS shall not affect the correct functioning of any other TP.

A short, open or earth fault on a TP to any other system shall not affect the correct functioning of the FDAS.

4.3.3 TP using radio frequency links

The applicant shall define in the installation documentation the arrangement of the TP using radio frequency links. The component type 1 using radio frequency links shall comply with the requirements of ISO 7240-25.

4.3.4 TP using optical fibres

The applicant shall define in the installation documentation the arrangement of the TP and whether or not the TPs may be combined in one cable.

A single fibre break or loss of transmission within a cable shall not affect more than one TP.

A fibre break or loss of transmission on a transmission path to any other system shall not affect the correct functioning of the FDAS.

4.3.5 Network TP

The network technology of networked CIE could be either a wired link, fibre optics or radio.

The following requirements shall apply:

- a) the connection to the network and any single short, open or earth fault in the network shall not jeopardize the correct operation of the FDAS (in the specified configuration);
- b) any traffic on the network shall stay within the limits defined by the applicant and shall not jeopardize the correct operation of the FDAS;
- c) the access to the CIE through the network shall comply with the requirement of the access levels defined in the relevant part of the ISO 7240 series;
- d) if the configuration is designed to transmit a functional condition (such as fire, fault, disablement, etc.) from one CIE to any other CIE through the network, then the transmission time shall be determined by the applicable product standard forming part of the ISO 7240 series. However, where this is not the case, the transmission time shall be within 20 s;

- e) if the configuration is designed to transmit an activation message(s) from one CIE to any other CIE through the network, then the transmission time shall be within 20 s and the relevant output shall be activated at the other CIE as specified in ISO 7240-2 or ISO 7240-16;
- f) if the configuration is designed to transmit a fire alarm, fault warning or disablement condition from one CIE to any other CIE through the network, it shall be possible to identify at least the CIE from which the information originated;
- g) a loss of communication to a network CIE shall cause at least one CIE to enter the fault warning condition within 100 s. In the case of a hierarchical system, the main CIE shall enter the fault warning condition within 20 s of the original fault warning condition;
- h) if it is possible to remotely control one CIE from another CIE via the network, the result shall be identical to that achieved by the operation of these controls on the controlled CIE.

5 Assessment methods and tests

5.1 General

5.1.1 To assess the compatibility or connectability, a theoretical analysis shall be undertaken for each component and its type of transmission path.

Based on the theoretical analysis of the system, a set of tests shall be selected from those listed in [Clause 5](#).

If requirements defined in [Clause 4](#) are included in the applicable part of the ISO 7240 series, no further testing is required.

NOTE 1 An example of the methodology for the theoretical analysis is given in [Annex C](#).

NOTE 2 A flow chart to illustrate the process for implementing the compatibility assessment is given in [Annex E](#).

The compatibility or connectability of each component for each system configuration(s) as specified by the applicant shall be assessed.

5.1.2 For components type 1 not covered by the ISO 7240 series, if no evidence of conformance to electromagnetic compatibility [see [4.2.5 b\)](#)] is provided, then the electromagnetic compatibility immunity tests shall be carried out in accordance with [4.2.5 b\)](#).

5.1.3 For components type 1 not covered by the ISO 7240 series, if no evidence of conformance to environmental tests [see [4.2.5 c\)](#)] is provided, then tests shall be carried out in accordance with [4.2.5 c\)](#).

5.1.4 The test programme shall be undertaken after the theoretical analysis and be dependent upon the results of this analysis.

The test programme may be undertaken as part of a programme to assess the performance of a device in accordance with the relevant part of the ISO 7240 series.

5.1.5 The assessment of the software documentation of components type 1 not covered by the ISO 7240 series shall be carried out in accordance with [Annex D](#).

5.1.6 The assessment shall be based on the assumption of the initial condition of the system being in the quiescent state.

5.2 Provision of equipment and supporting information and tools

5.2.1 At least one system configuration shall be provided for testing conformance with this document.

5.2.2 Each configuration of a component shall be representative of the maximum capacity of equipment declared in the manufacturer's documentation. This may be achieved by the submission of equipment with a full complement of interfaces to transmission paths, zones and outputs.

5.2.3 The components for connection to transmission paths may be substituted by simulated devices, provided that these have equivalent functional and electrical characteristics. In any case, at least one component of each type shall be provided.

Each type may cover variants of the same component.

5.2.4 Information and tools shall be provided to exercise the different configurations of the system.

5.3 Configuration

5.3.1 General

There may be three levels (field level, control level, management level, see [Annex A](#)).

Separate configuration may be possible at each of these levels.

This document does not consider configurations at management level and therefore no method of assessment is provided in the document.

When determining the equipment configuration for testing, both field and control configurations shall be considered.

5.3.2 Configuration at field level for assessment

From the assessment of documentation, the relevant configuration(s) shall be provided for testing.

All different types of components type 1 and components type 2 connected to CIE or VACIE used in the configuration shall be considered (see [Annex B](#)).

If there are several TP of the same type, at least one TP shall be used for testing.

The input and output connections shall be made in accordance with the manufacturer's instructions.

The different TP characteristics provided by the applicant shall be considered and testing shall be carried out with the TP characteristic that is considered to be the worst case. Simulated characteristics on TP may be used, provided that these have equivalent characteristics.

The components under consideration are connected through the transmission path which is loaded as mentioned in the applicant documentation. This shall include:

- a) in the case of wired transmission paths, the maximum electrical loading. Different detection circuits and transmission paths may be used;
- b) in the case of transmission paths that connect addressable components, the maximum number of components. Different detection circuits and transmission paths may be used;
- c) in the case of transmission paths that connect radio linked components, the maximum number of components;
- d) in the case of transmission paths that connect components through fibre optic cable, the maximum attenuation;

- e) the minimum loading. In the absence of this specification it shall be assumed to be a single transmission path loaded with a single component and no load on other transmission paths unless a component is functionally necessary.

5.3.3 Configuration at control level for network assessment

Each network topology shall be configured as per the applicant's declared worst case(s): for example, the limitation of the network system, in terms of number of nodes, cabling and architecture, etc.

At least three CIEs and the necessary components for the functional testing described in this document shall be configured in accordance with ISO 7240-2. At least three VACIEs and the necessary components for the functional testing described in this standard shall be configured in accordance with ISO 7240-16.

It is also possible to combine CIE and VACIE (at least three in total), with each of them loaded as specified in [5.3.2](#).

NOTE Where the network is limited to two CIE, it is sufficient to evaluate only two CIE.

5.4 Standard atmospheric conditions for testing

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 °C to 35 °C;
- b) relative humidity — 25 % to 75 %;
- c) air pressure — 86 kPa to 106 kPa.

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

5.5 Functional test for compatibility assessment on field level

5.5.1 The objective of the test

The objective of the test is to check the functionality of each component type 1 together with all other components of the system as specified by the applicant in accordance with manufacturer's instructions and the applicable ISO 7240 series standards under each defined test.

5.5.2 Test schedule

5.5.2.1 A schedule of tests shall be drawn up that is appropriate to the system design assessment and the technology employed.

NOTE The design assessments can include both inspections of the components and of the documentation.

5.5.2.2 During testing, implemented functions of the FDAS shall be activated in sequence (except when it is specified differently) starting from the quiescent conditions.

5.5.2.3 Each functional test shall be carried out at:

- the minimum supply voltage with the maximum electrical load and maximum number of components on all configured transmission paths;
- the maximum supply voltage with the minimum electrical load on all transmission paths.

During each of the conditions described in 5.5.3, the power and data parameters on the transmission path shall be within the manufacturer's specifications for the connected components.

5.5.3 Functional tests for compatibility in the different conditions

5.5.3.1 Fire alarm condition

5.5.3.1.1 Procedure

Start from the quiescent condition.

Activate one or more of the components (detector, manual call point or input element) that can be connected to the transmission path.

Check the criteria for each component and reset the CIE to quiescent condition.

5.5.3.1.2 Criteria of acceptance

The following criteria of acceptance shall be met for the functional test of the fire alarm condition:

- the activation of one component or two components simultaneously (if it is technically possible for two components to simultaneously enter the fire alarm condition) with subsequent activation of further components shall lead to the fire alarm condition of the system;
- resetting shall return the system to the quiescent condition.

5.5.3.2 Voice alarm condition

5.5.3.2.1 Procedure

Start from the quiescent condition.

Activate one or more of the components that can be connected to the transmission path.

Check the criteria for each component and reset the VACIE to quiescent condition.

5.5.3.2.2 Criteria of acceptance

The following criteria of acceptance shall be met for the functional test of the voice alarm condition:

- the activation of one component shall lead to the voice alarm condition;
- resetting shall return the system to the quiescent condition.

5.5.3.3 Fault warning condition: interruption or short circuit on a transmission path

5.5.3.3.1 Interruption on a transmission path

5.5.3.3.1.1 Procedure

Start from the quiescent condition.

Influence the transmission path to cause a full physical interruption or total loss of communication for wireless TP.

This shall be carried out:

- core by core for a wire transmission path in one cable. Some configurations include a redundancy or multiple cores with the same function. In this case, loss of one core may not cause interruption or

fault warning condition and therefore all cores with the same function shall be interrupted to cause the required fault warning condition;

- fibre by fibre for a fibre optic transmission path in one cable;
- simultaneous interruption for wire or fibre optic in one cable;
- interruption of the radio transmission for a wireless transmission path.

NOTE For wireless systems, the aim of this test is not to evaluate the conformance with ISO 7240-25, but to check that a fault occurring within the wireless TP is indicated as a fault warning at the CIE.

Remove all interruptions and reset the transmission path function to the quiescent condition.

Check the criteria for each fault identified above.

5.5.3.3.1.2 Criteria of acceptance

The following criteria of acceptance shall be met for the functional test of the fault warning condition:

- an interruption shall cause the fault warning condition and indicate the intended fault(s);
- means, specified and provided, to limit the consequences of faults shall operate as intended;
- the reestablishment of the transmission path shall cause the system to become fully operational.

5.5.3.3.2 Short circuit on a transmission path using wires

5.5.3.3.2.1 Procedure

Start from the quiescent condition.

Influence the transmission path by causing a single full physical short circuit.

This shall be carried out:

- at any combination of two cores within a wire transmission path in one cable. Some configurations include a redundancy or multiple cores with the same function. In this case, a short circuit will not cause a fault warning condition and therefore this combination of cores shall be excluded from the test.

Simultaneously short circuit all cores within a wire transmission path in one cable.

Remove all short circuits, replace any damaged fuse or other protective device and re-establish the transmission path function to the quiescent condition.

Check the criteria for each fault identified above.

5.5.3.3.2.2 Criteria of acceptance

The following criteria of acceptance shall be met for the functional test of a short circuit on a transmission path:

- a short circuit fault shall cause the fault warning condition and indicate the intended fault(s);
- means, specified and provided, to limit the consequences of faults shall operate as intended;
- reestablishment of the transmission path shall cause the system to become fully operational.

5.5.3.3.3 Earth fault on a transmission path using wires

5.5.3.3.3.1 Procedure

Start from the quiescent condition.

Influence the transmission path by causing an earth fault.

This shall be carried out at each core within a wire transmission path in one cable.

Remove the earth fault and re-establish the transmission path function to the quiescent condition.

Check the criteria for each earth fault.

5.5.3.3.3.2 Criteria of acceptance

The following criteria of acceptance shall be met for the functional test of an earth fault on a transmission path:

- an earth fault shall cause the fault warning condition and indicate the intended fault(s). If no fault is indicated, check that the system is fully operational;
- the removal of the earth fault of the transmission path and reestablishment to the quiescent condition shall cause the system to become fully operational.

5.5.3.4 Removal of detachable components

5.5.3.4.1 Procedure

Start from the quiescent condition.

Remove a detachable component from the transmission path.

Check the criteria for each component.

Reinsert the removed component and reset the transmission path function to the quiescent condition.

5.5.3.4.2 Criteria of acceptance

The following criteria of acceptance shall be met for the functional test of the fault warning condition:

- the removal of a detachable component from the transmission path shall cause the fault warning condition and indicate the intended fault(s);
- means, specified and provided, to limit the consequences of faults shall operate as intended;
- the re-establishment of the transmission path by reinserting and, if necessary, resetting the CIE and the removed component shall cause the component and system to become fully operational.

5.5.3.5 Reduction of power supply voltage

5.5.3.5.1 Procedure

Start from the quiescent condition.

Disconnect the mains voltage and reduce the battery voltage by discharge or by simulation:

- until activation of a deep discharge protection device, followed by;
- reconnection to the mains line supply; or

- until the voltage reaches a level below which the system does not operate, followed by reconnection to the mains line supply.

The simulation of a reduction of the battery voltage shall not be at a rate greater than 0,4 V/min.

Check the criteria for each power supply fault identified above.

5.5.3.5.2 Criteria of acceptance

The power supply fault shall be indicated as specified in ISO 7240-4.

NOTE 1 Additional fault can be indicated on different equipment of the system.

All the type 1 components shall be supplied within the power supply voltage range defined by the manufacturer.

The FDAS shall not enter the fire alarm condition and the VAS shall not enter the voice alarm condition.

After reconnection to the mains supply and, if necessary, the resetting of a deep discharge protection device, the system shall return to the intended functional condition.

NOTE 2 The intended functional condition is one of those mentioned in ISO 7240-2 or in ISO 7240-16 and is specified in the manufacturer's documentation.

5.5.3.6 Disablement condition

5.5.3.6.1 Procedure

Start from the quiescent condition. Disable and re-enable functions, components or system parts such as detection zones, voice alarm zones or transmission path.

Check the criteria for each disablement.

5.5.3.6.2 Criteria of acceptance

The following criteria of acceptance shall be met for the functional test of the disablement condition:

- disablement shall cause the intended disablement condition;
- disabled functions, components or system parts shall no longer have a functional effect on the system;
- after re-enablement, the function, component or system part shall become fully functional.

5.5.3.7 Test condition

5.5.3.7.1 Procedure

Start from the quiescent condition. Activate the test function for various system parts or components provided for this purpose (e.g. detectors, detection zones, voice alarm zones).

Check the criteria for each test function.

5.5.3.7.2 Criteria of acceptance

The following criteria of acceptance shall be met for the functional test of the test condition:

- activation shall cause the intended test condition of the system;
- system parts or components, for which the test state is activated, shall function as intended under this state. After de-activation of the test function, the appropriate part of the system or component shall again become fully functional.

5.6 Functional tests for connectability assessment on field level

5.6.1 The objective of the test

The objective of the test is to check that the component type 2 used in conjunction with the FDAS or the VAS in a defined configuration covered by the specifications given by the manufacturer of the component type 2 does not jeopardize the FDAS or VAS.

5.6.2 Test schedule

5.6.2.1 A test schedule shall be drawn up in order to check that the components type 1 remain in conformance with their requirements when the component type 2 is used.

During testing, implemented functions of the FDAS or of the VAS shall be activated in sequence (except when it is specified differently).

5.6.2.2 Each functional test shall be carried out at:

- the minimum supply voltage with the maximum load on all transmission paths;
- the maximum supply voltage with the minimum load on all transmission paths.

The minimum and the maximum load on each TP shall be defined by the applicant.

5.6.3 Functional test for connectability

5.6.3.1 Procedure

Start from the quiescent condition or fire alarm condition. Activate and reset one or more of the functions included in the component type 2 that can be connected to the transmission path, in accordance with the manufacturer's instructions.

Check the criteria for each component type 2.

5.6.3.2 Criteria of acceptance

The following criteria of acceptance shall be met for the test for connectability:

- the activation (or the failure) of the component type 2 shall not prevent the correct functioning of the components type 1 of the system;
- information concerning conditions of the FDAS delivered by the components type 2 shall not be in conflict with that given by components type 1.

NOTE The failure of component type 2 can cause a fault warning condition on the FDAS.

6 Test report

The test report shall contain at least the following information:

- a) identification of the components tested;
- b) reference to this document (i.e., ISO 7240-13:2020);
- c) the test method used;
- d) results of the assessment testing;

- e) details of any deviation from this document or from the International Standards to which reference is made, and details of any operations regarded as optional;
- f) any unusual features observed;
- g) the date of the test.

7 Marking

Components shall be marked in accordance with the requirements of the applicable equipment standard.

8 Data

8.1 General

The system documentation shall include data for compatibility and, if necessary, for connectability.

The documentation shall be prepared by the applicant to allow the assessment of compatibility and connectability for the configuration(s) defined by the applicant.

8.2 Documentation for compatibility

To allow the assessment of compatibility of a FDAS to be completed, the following documents shall be supplied by the applicant:

- a) a list of components type 1 that make up the FDAS, with a unique identification of each component. If the component conforms to the relevant part of the ISO 7240 series (for example: Aspirating Smoke Detector, Optical Beam Smoke Detector, VACIE, etc.) and is connected through a simple interface such as a relay, etc., its unique identification is not needed, but the interface specification is needed;
- b) technical information facilitating the justification of compatibility; technical information for component not covered by the ISO 7240 series such as environmental class according to IEC 62599-1;
- c) necessary evidence (for example test reports or certificate of performance) for the conformance of the components to the relevant part of the ISO 7240 series;
- d) characteristics of the transmission path(s) between each component and the CIE (type of cable, core size, maximum length, impedance, mode for fibre optic cable, maximum range for radio link, etc.);
- e) the limits of use of the system (configuration, number of components, functional limits, minimum and maximum load etc.). Limitation of use of each input and output port of each component shall be provided.

8.3 Documentation for connectability

To allow the assessment of connectability to be completed, the following documents shall be supplied:

- a) list of the components type 2 intended to be used in conjunction with the FDAS with a unique identification of each component and its functions;

If the component (for example: printer, computer, etc.) is connected through an interface, its unique identification is not needed, but the interface specification is required.

- b) technical information facilitating the justification of the connectability of component type 2;
- c) characteristics of the transmission path(s) between each component and the CIE (type of cable, core size, maximum length, impedance, mode for fibre optic cable, maximum range for radio link, etc.);

- d) the limits of use of the system (configuration, number of components, functional limits, etc.).
Limitation of use of each input and output port of each component shall be provided.

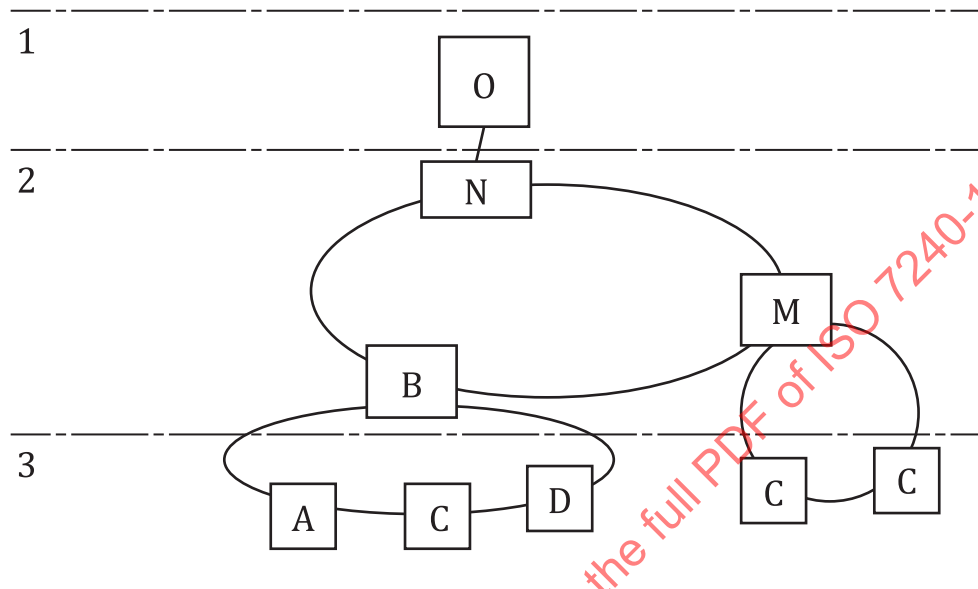
8.4 Software documentation

If the component type 1 is not covered by an ISO 7240 series, standard this software shall be documented in accordance with [Annex D](#).

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Annex A (informative)

Example of levels used in FDAS



Key

- A automatic fire detection function
- B control and indication function
- C fire alarm function
- D manual initiating function
- M control and indication function for alarm annunciation
- N ancillary input or output function
- O ancillary management function
- 1 management level
- 2 control level
- 3 field level

Figure A.1 — Example of network levels

Annex B (informative)

Classification of functions of the FDAS

B.1 General

The purpose of this annex is to assist in the classification of the components type 1 and type 2.

Local or national regulations may impact the classification of a component.

B.2 Fire detection function

All detectors, such as heat, smoke, flame, gas, point or line-type, and manual call points should be considered as being essential and therefore be classified as component type 1. All forms of components that allow the detectors to operate, such as short-circuit-isolators, the interface to connect spur-wired detectors to a loop, etc. should also be classified as type 1.

B.3 Fire alarm to occupants in the premises

All components capable of performing an alarm to alert people are classified as component type 1.

EXAMPLE Sounders, voice sounders, voice alarm components, etc.

When the alarm is passed through to mobile phones or pagers, an output device is needed which is classified as component type 1. All connected elements, such as computers, telephone switch boards, recorders for the messages, are not considered as part of the FDAS.

B.4 Fire alarm to summon external assistance (usually the fire brigade)

Components making a connection to the fire brigade are classified as component type 1.

B.5 Activation of fire protection function

B.5.1 Equipment directly triggered by the FDAS

The output function (terminals of the CIE or output device) used for the control of door holding magnets, closing dampers, smoke ventilation, ventilation control, etc. should be regarded as essential. Each component used for triggering such equipment should be classified as component type 1.

B.5.2 Systems driven by the information coming from the FDAS

The output device driving fire extinguishing systems, smoke control systems, compartment systems, release of access control systems, etc. should be regarded as essential. Each component used for sending information to such a system should be classified as component type 1.

B.6 Remote indication 1 (remote panels, fire brigade panels, etc.)

The classification of component type 1 or type 2 may depend on local regulations.

Fire brigade panels should be classified as component type 1 if the fire brigades require a fire brigade panel as a mandatory component.

Remote panels should be classified as component type 1 if the CIE is in a separate location somewhere in the building and the remote panel is part of the fire alarm procedures.

Remote panels should be classified as component type 2 when they are used to provide redundant information, such as a panel located in the office of the building manager.

B.7 Remote indication 2 (printers, interface to building management system, etc.)

These components should be classified as component type 2, and include devices used to transmit information to the building management system or to all other non-security applications.

B.8 Input function

The devices that are used to receive fire alarm information from other kinds of detection such as a sprinkler system should be classified as component type 1.

The devices that are used to receive control signals from, for example, a building management system should be classified as component type 1.

B.9 Output function

Except for outputs defined in [B.5](#), any devices that perform an output function may be classified as component type 2.

B.10 Devices used to connect transmission paths (gateway, data switch, etc.)

Such devices should be classified as component type 1.

Junction boxes should not be considered as component type 1 or type 2.

Annex C

(informative)

Example methodology for theoretical analysis

C.1 Introduction

The components forming a FDAS are designed to provide a system with a particular aspect of its overall functionality. Only when all the components are connected together is the system likely to perform in the desired manner and then only if the components intercommunicate effectively.

For the purposes of this document, the CIE is the focal point of the system and all other components are required to communicate effectively with the CIE. Communication requires the consideration of communication protocols along with other aspects such as power supply requirements and data transmission characteristics.

A separate voice alarm system can be assessed for compatibility and connectability independently of the fire detection and alarm system.

C.2 Method of test

C.2.1 General

The theoretical analysis should commence with a review of the system configuration documentation. The objective of the review is to understand the most onerous configurations and analyse their performance. A structured approach should then be followed which analyses at least the following characteristics:

- mechanical connections;
- power supply;
- data exchange;
- functionality.

As far as possible, the analysis should be undertaken in the order stated. However, environmental compatibility should be considered throughout the analysis process and additional analysis may be considered necessary.

C.2.2 List of characteristics

C.2.2.1 Mechanical connections

Check that the mechanical arrangements for the termination of the transmission path and its connection to the component are compatible with the cable and any accessories specified for the transmission path.

C.2.2.2 Power supply and distribution analysis

C.2.2.2.1 Voltage range

Check that the maximum voltage of the power supply under all load conditions is less than or equal to the maximum specified voltage of the powered components.

Check that the minimum voltage provided by the power supply under all load conditions is greater than or equal to the minimum voltage of the powered component, taking into account the effects of voltage drops within transmission paths.

C.2.2.2.2 Current

Check that the current available from the power supply circuit is adequate to meet the maximum demands. Ensure that appropriate measures are taken to limit the current that can flow throughout the circuit to a safe level.

C.2.2.2.3 Supply characteristics

Check that the component is able to function correctly with the supplied power.

EXAMPLE Check that the component operates with the power supply's worst-case characteristics of output frequency, modulation, distortion and phase angle.

C.2.2.2.4 Power supply voltage range

Check that the components operate satisfactorily when they are subjected to the limits of the power supply voltage range specification.

C.2.2.2.5 Fault performance

If a short circuit fault occurs on a transmission path used for power distribution, check that this will be handled in an acceptable manner.

EXAMPLE Ensure that appropriate current limiting components are provided to prevent unacceptable losses of power during conditions of current overload.

C.2.2.3 Data exchange analysis

C.2.2.3.1 General

All active components connected to transmission paths rely on data being received or transmitted to perform their functions. The data may be exchanged on the same transmission path as the power supply or may be exchanged via a separate transmission path. The analysis, however, should follow the same method in both cases.

C.2.2.3.2 Transmission characteristics

C.2.2.3.2.1 General

Check that the electrical characteristics of the transmission signals are compatible with the requirements for the successful reception of the data by other components on the transmission path. At least the following characteristics given in this subclause should be analysed.

C.2.2.3.2.2 Voltage range

Check that the maximum transmitted signal voltage under all normal load conditions is less than or equal to the maximum specified voltage of the receiving components.

Check that the minimum transmitted signal voltage under normal load conditions is greater than or equal to that specified for the receiving components when taking into account the effects of voltage drops within transmission paths.

C.2.2.3.2.3 Current

Check that the signal current flowing as a result of the operation of the transmitting component is adequate to meet the demands of the receiving components.

Check that adequate signal-current-limiting facilities are provided to protect components against over current conditions.

C.2.2.3.2.4 Timing

Check that the time related characteristics of the transmitted signals are within the limits of those required by the receiving components.

C.2.2.3.2.5 Tolerances

Ensure that the receiving components will be able to successfully receive the data even under worst case tolerances of the transmitted data and transmission path characteristics.

C.2.2.3.2.6 Fault performance

If a fault, either open or short circuit, occurs on a transmission path, ensure that it will be handled as required in this document.

C.2.2.3.3 Transmission protocol(s)

Check that the data being exchanged between components on the transmission path is in a format that permits all components to effectively transmit and/or receive relevant data.

Check that there is a protocol for each transmission path that will permit all the components on the transmission path to exchange data and function as specified.

C.2.2.4 Functionality**C.2.2.4.1 General**

All components connected on a transmission path should have a defined functionality that is specified in supporting documentation.

C.2.2.4.2 Received data

Check that the data received by the component is sufficient to permit it to perform as specified in the supporting documentation.

C.2.2.4.3 Transmitted data

Check that the data transmitted by the component is sufficient to permit other components on the same transmission path to perform as specified in the supporting documentation.