INTERNATIONAL STANDARD

**ISO 7240-17**

Second edition
2020-02

# Fire detection and fire alarm systems —

# Part 17: Transmission path isolators

*Systèmes de détection d'incendie et d'alarme —*

*Partie 17: Isolateurs de court-circuit*



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# Contents

Page

# Foreword

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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*.



The second edition cancels and replaces the first edition (ISO 7240-17:2009), which has been technically revised. The main changes compared to the previous edition are as follows:

— the title of the document has been changed to “Transmission path isolators” which better reflects the functionality of the product;

— the whole document has been updated to the latest ISO standard template;

— IEC 62599-2 has been included and replaces the reference to EN 50130-4;

— a new Clause 6 on test report, Clause 7 on marking and Clause 8 on data have been included.

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.

# Introduction

Short-circuit isolators have been renamed transmission path isolators reflecting that the isolators considered are intended to limit the consequences of low parallel resistance faults between the lines of the transmission path(s) of a fire detection and fire alarm system. This is normally achieved by connecting the transmission path in a loop configuration, separating sections of the loop with transmission path isolators and introducing a means of detecting the presence of a fault if its consequences (e.g. reduction in the line voltage) jeopardises the correct operation of components on the transmission path. The faulty section of the loop can then be switched out, between a pair of transmission path isolators, allowing the rest of the loop to continue to function correctly.

It is recognised that it is not possible for this component standard to specify all of the requirements for the function of a transmission path isolator in a system. The requirements for the functioning of a transmission path isolator are dependent on the system operation, the other components associated with the transmission path (e.g. the control and indicating equipment and detectors) and the transmission path parameters (e.g. line impedance and line loads), and they will have to be verified in a system test.

However, this document includes:

— a requirement that the manufacturer gives all of the specifications, for the transmission path isolator, needed by system designers to use the device correctly, in accordance with the system requirements;

NOTE It is recognized that the system designer needs to ensure that only those transmission path isolators having the necessary performance are chosen to meet the specific requirements of a given system design.

— the tests to verify that the transmission path isolator functions in accordance with these manufacturer's specifications;

— the tests to verify the stability of the transmission path isolator with respect to environmental and electromagnetic compatibility (EMC) conditions.



Due to the many different concepts that can be used for the operation of transmission path isolators, it is not possible to define a precise functional test procedure applicable to all types. Instead, this document requires that a functional test procedure is developed to verify the manufacturer's specification and lists the most important points that have to be verified. To assist in developing such test procedures, some example procedures are given in an informative annex (Annex A).

In view of the above, it is important that, in addition to meeting the requirements of this document, transmission path isolators are shown to operate correctly within the types of systems with which they are intended to be used.

# Fire detection and fire alarm systems —

# Part 17: Transmission path isolators

## 1 Scope

This document specifies the requirements, test methods and performance criteria for transmission path isolators for use in fire detection and fire alarm systems for buildings (for general requirements and definitions, see ISO 7240-1).

Means of isolation or protection incorporated within control and indicating equipment are not covered by this document.

## 2 Normative references

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



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

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



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

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

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

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

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

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

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

## 3 Terms and definitions

For the purposes of this document, the terms 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**
**transmission path isolator**
device, which may be inserted into a transmission path of a fire detection and fire alarm system, to limit the consequences of low parallel resistance faults between the lines of this transmission path

Note 1 to entry: A transmission path isolator may be a physically separate device or it may be incorporated into another device (e.g. integrated into a smoke detector or detector base).

**3.2**
**closed condition**
condition of the transmission path isolator which allows the normal signals and the supply currents to pass through the transmission path isolator

Note 1 to entry: This is the correct condition for the transmission path isolator when there is no short circuit.

**3.3**
**open condition**
condition of the transmission path isolator which prevents the passage of short circuit currents through the transmission path isolator

Note 1 to entry: This is the correct condition for the transmission path isolator when it is protecting part of a circuit from the effects of a short circuit.

**3.4**
**field device**
device, which is located remotely from the CIE and may be subject to a more severe environmental condition



Note 1 to entry: Detectors, MCP, and alarm devices are always considered as field devices whereas PSE, input/output module, and routing equipment may be field devices.



**3.5**
**non-field device**
device which is specified to be located in the same conditions as the CIE

## 4 General requirements

### 4.1 Compliance

In order to comply with this document, the transmission path isolator shall meet the requirements of:

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

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

### 4.2 Integral status indication

If the transmission path isolator incorporates an integral visual indication of its status, then this indication shall not be red.

### 4.3 Connection of ancillary devices

Where the transmission path isolator provides for connections to ancillary devices (e.g. remote indicators), open or short circuit failures of these connections shall not prevent the correct operation of the transmission path isolator.

## 4.4 Monitoring of detachable transmission path isolators

If a transmission path isolator is detachable (i.e. it is attached to a 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.

## 4.5 Manufacturer's adjustments

It shall not be possible to change the manufacturer's settings except by special means (e.g. the use of a special code or tool) or by breaking or removing a seal.

## 4.6 On-site adjustments

If there is provision for on-site adjustment of the transmission path isolator, then for each setting, the transmission path isolator shall comply with the requirements of this document. Access to the means of adjustment shall only be possible using a code or special tool.

## 4.7 Requirements for software-controlled transmission path isolators

### 4.7.1 General

The requirements of 4.7.2 and 4.7.3 shall apply to transmission path isolators that rely on software control in order to fulfil the requirements of this document.



### 4.7.2 Software design

To ensure the reliability of the transmission path isolator, the following requirements for software design shall apply.



— The software shall have a modular structure.

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

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

### 4.7.3 Storage of programs and data

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

Site-specific data shall be held in memory that will retain data for at least two weeks without external power to the transmission path isolator, 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 described in IEC 60068-1 as follows:

a) temperature: (15 to 35) °C;

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

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

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

### 5.1.2 Operating conditions for tests

If a test method requires a specimen to be operational, then connect the specimen to suitable supply and monitoring equipment with characteristics as required by the manufacturer's data. Unless otherwise specified in the test method, apply the supply parameters to the specimen within the manufacturer's specified range(s) so that it remains substantially constant throughout the tests. For each parameter, choose the value that is normally the nominal value, or the mean of the specified range. If a test procedure requires a specimen to be monitored to detect any alarm or fault signals, then connect it to any necessary ancillary devices.



EXAMPLE To an end-of-line device for conventional detectors to allow a fault signal to be recognised.

### 5.1.3 Mounting arrangements

Mount the specimen by its normal means of attachment in accordance with the manufacturer's instructions. If these instructions describe more than one method of mounting, then choose the method considered to be most unfavourable for each test.

### 5.1.4 Tolerances

Unless otherwise stated, use the tolerances for the environmental test parameters as given in the basic reference standards for the test (e.g. the relevant part of IEC 60068).

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

### 5.1.5 Functional test

#### 5.1.5.1 Object

The object is to confirm the correct operation of the transmission path isolator, in accordance with the manufacturer's specification, and to verify their stability after and, where required, during the environmental and EMC tests.

#### 5.1.5.2 Test procedure

The functional test is intended to verify that the isolator operates within the manufacturer's specification, including the parameters that characterise the transmission path isolator. The functional test verifies at least the following parameters:

a) each stimulus, which the manufacturer claims will cause the isolator to change from the closed to the open condition;

EXAMPLE Stimulus such as current, voltage, and protocol.

b) each stimulus, which the manufacturer claims will cause the isolator to change from the open to the closed condition;

c) the response to a direct short circuit applied to the isolator.

NOTE Some examples of functional tests are given in Annex A but these are not exhaustive.

### 5.1.6 Provision for tests

Provide the following for testing compliance with this document:

a) 14 specimens required to conduct the tests as indicated in the test schedule (see 5.1.7) and number these specimens 1 to 14 arbitrarily;

b) the technical data required in Clause 8.



NOTE The specimens submitted are expected to be representative of the manufacturer's normal production regarding their construction and calibration.

### 5.1.7 Test schedule



Test the specimen according to the following test schedule (see Table 1):

**Table 1 — Test schedule**

| Test | Subclause of this document | Stand-alone isolator<br><br>Specimen number(s) | Combined with other functions<br><br>Specimen number(s) | Remarks |
|---|---|---|---|---|
| Reproducibility | 5.2 | all specimens | all specimens | |
| Variation in supply voltage | 5.3 | 1 | 1 | |
| Dry heat (operational) | 5.4 | 2 | 2[a,b,d] | |
| Dry heat (endurance) | N/A | N/A | 5[c] | refer to other applicable part(s) |
| Cold (operational) | 5.5 | 3 | 3[a] | |
| Damp heat, cyclic (operational) | 5.6 | 4 | 4[a,b] | |
| Damp heat, steady state (endurance) | 5.7 | 5 | 5[a,b] | |
| Damp heat, steady state (operational) | N/A | N/A | 5[c] | refer to other applicable part(s) |
| Sulfur dioxide, $SO_2$, corrosion (endurance) | 5.8 | 6 | 6[a,d] | |
| Shock (operational) | 5.9 | 7 | 7[a,d] | |
| Impact (operational) | 5.10 | 8 | 8 | |
| Vibration, sinusoidal (operational) | 5.11 | 9 | 9[c] | |
| Vibration, sinusoidal (endurance) | 5.12 | 9 | 9[c] | |
| Enclosure protection (IP test) | N/A | N/A | 7 | |
| Electrostatic discharge (operational) | 5.13 | 10[e] | | |
| Radiated electromagnetic fields (operational) | 5.13 | 11[e] | | |
| Conducted disturbances induced by electromagnetic fields (operational) | 5.13 | 12[e] | | |
| Fast-transient bursts (operational) | 5.13 | 13[e] | | |
| Slow, high-energy voltage surge (operational) | 5.13 | 14[e] | | |

[a] If the other parts of ISO 7240 do not call up this test, then the test in this document shall be applied.

[b] If the other function reacts to its normal operation due to the conditioning, then this is acceptable (e.g. [1] heat detector class A1 may alarm at a temperature of 55 ± 2 °C, [2] smoke detector may go into alarm or fault due to condensation).

[c] If the other parts of ISO 7240 call up these tests, then it shall be applied, and the functional test of the isolator shall be applied before, after, and during where applicable.

[d] If the other function is exclusively installed as a non-field device as specified in the manufacturer's data sheet, then this test will not be applicable (e.g. if a routing equipment is installed as a field device on a loop, the test will apply but if it is installed in the same condition as CIE then the test will not apply).

[e] In the interests of test economy, it is permitted to use the same specimen for more than one EMC test. In this case, intermediate functional test(s) on the specimen(s) used for more than one test may be deleted, and the functional test may conducted at the end of the sequence of tests. However, it should be noted that in the event of a failure, it might not be possible to identify which test exposure caused the failure; see IEC 62599-2.



## 5.2 Reproducibility

### 5.2.1 Object

The object is to show that each specimen meets the manufacturer's specification.