FIRE-GAS

BS EN 54-13:2017

BSI Standards Publication

Fire detection and fire alarm systems

Part 13: Compatibility and connectability assessment of system components

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DATE : 10 May 2017

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National foreword

This British Standard is the UK implementation of EN 54-13:2017. It supersedes BS EN 54-13:2005 which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee FSH/12/3, Control and indicating equipment.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

Published by BSI Standards Limited 2017

ISBN 978 0 580 84463 8

ICS 13.220.20

Compliance with a British Standard cannot confer immunity from legal obligations.

This British Standard was published under the authority of the Standards Policy and Strategy Committee on 28 February 2017.

Amendments/Corrigenda issued since publication

Date	Text affected

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 54-13

February 2017

ICS 13.220.20

Supersedes EN 54-13:2005

English Version

Fire detection and fire alarm systems - Part 13: Compatibility and connectability assessment of system components

Systèmes de détection incendie - Partie 13: Évaluation de la compatibilité et de l'aptitude au raccordement des composants d'un système

Brandmeldeanlagen - Teil 13: Bewertung der Kompatibilität und Anschließbarkeit von Systembestandteilen

This European Standard was approved by CEN on 14 November 2016.

EUROPEAN COMMITTEE FOR STANDARDIZATION

COMITÉ EUROPÉEN DE NORMALISATION

EUROPÄISCHES KOMITEE FÜR NORMUNG

Contents

Page

European foreword

This document (EN 54- 13:2017) has been prepared by Technical Committee CEN/TC 72 “Fire detection and fire alarm system”, the secretariat of which is held by BSI.

This document supersedes EN 54-13:2005.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by August 2017, and conflicting national standards shall be withdrawn at the latest by August 2017.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

EN 54-13 has been revised to update the standard by taking into account new techniques of communication and new technologies available on the market.

It includes new clauses and annexes as follows:

— Clause 4.3. Transmission paths

— Annexe A example of levels used in fire detection and alarm system

— Annexe D software design documentation

— Annexe E flowchart for assessment

The main technical modifications are the followings:

— The standard is applicable to electrical wires, optical fibre or radio frequency connection.

— EN 54-1: 2011 is taken into account and leads to delete the flowchart of functions.

— Introduction of levels (field, control and management) and network transmission path to consider new technique of configuration.

— Transfer of product requirements covering partial open and partial short circuits to an optional clause included in EN 54-2.

EN 54 is published in a series of parts. Information on the relationship between this document and other standards of the EN 54 series is given in Annex A of EN 54-1:2011.

EN 54, *Fire detection and fire alarm systems* consists of the following parts:

— *Part 1: Introduction*

— *Part 2: Control and indicating equipment*

— *Part 3: Fire alarm devices – Sounders*

— *Part 4: Power supply equipment*

— *Part 5: Heat detectors – Point detectors*

— *Part 7: Smoke detectors – Point detectors using scattered light, transmitted light or ionization*

— *Part 10: Flame detectors – Point detectors*

— *Part 11: Manual call points*

— *Part 12: Smoke detectors – Line detectors using an optical beam*

— *Part 13: Compatibility assessment of system components*

— *Part 14: Guidelines for planning, design, installation, commissioning, use and maintenance*

— *Part 15: Point detectors using a combination of detected phenomena*

— *Part 16: Voice alarm control and indicating equipment*

— *Part 17: Short-circuit isolators*

— *Part 18: Input/output devices*

— *Part 20: Aspirating smoke detectors*

— *Part 21: Alarm transmission and fault warning routing equipment*

— *Part 22: Resettable line-type heat detectors*

— *Part 23: Fire alarm devices – Visual alarm devices*

— *Part 24: Components of voice alarm systems – Loudspeakers*

— *Part 25: Components using radio links*

— *Part 26: Carbon monoxide detectors – Point detectors*

— *Part 27: Duct smoke detectors*

— *Part 28: Non-resettable line-type heat detectors*

— *Part 29: Multi-sensor fire detectors - Point detectors using a combination of smoke and heat sensors*

— *Part 30: Multi-sensor fire detectors - Point detectors using a combination of carbon monoxide and heat sensors*

— *Part 31: Multi-sensor fire detectors – Point detectors using a combination of smoke, carbon monoxide and optionally heat sensors*

— *Part 32: Guidelines for the planning, design, installation, commissioning, use and maintenance of voice alarm systems*

NOTE This list includes standards that are in preparation and other standards may be added. For current status of published standards refer to www.cen.eu.

EN 54-1 provides additional information about the components performing the functions of a fire detection and fire alarm system.

EN 54-25 provides additional information and requirements about systems using radio frequency links.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

Introduction

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

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

A fire detection and fire alarm system (including voice alarm system) may combine 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.

A fire detection and fire alarm system may also be linked to remote fault and fire alarm monitoring stations, and to fire protection and/or building management systems. However these systems are not considered as part of the fire detection and fire alarm system.

It is necessary that all the components constituting the fire detection and fire alarm system are compatible or connectable, and that requirements relating to the performance of the overall system are 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 fire alarm systems are unlimited, the assessment is only carried out on the configuration(s) declared by the applicant.

The intended use of this standard is to demonstrate the compatibility and connectability of components

even if they are not defined by an EN 54 standard.

1 Scope

This European Standard specifies the requirements for compatibility and connectability assessment of components of fire detection and fire alarm systems (including voice alarm systems as a subsystem of fire detection and fire alarm system). The components conform to either with the requirements of EN 54 or with a manufacturer's specification where there is no EN 54 standard.

The requirements for the transmission path used for a distributed function are covered by the relevant EN 54 standard and not by this document.

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 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.

This document specifies requirements related to compatibility and connectability assessment methods and tests for the components belonging to FDAS or connecting FDAS.

This document does not cover components or functions which are not included in a FDAS like functions achieved by a building management system.

This document is applicable to systems where the components are interconnected by electrical wires or optical fibre or by radio frequency links or by any combination. For other interconnection technology between components this standard may be used as a guidance.

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

2 Normative references

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

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

EN 50130-5, *Alarm systems - Part 5: Environmental test methods*

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

EN 54-1:2011, *Fire detection and fire alarm systems - Part 1: Introduction*

EN 54-2, *Fire detection and fire alarm systems - Part 2: Control and indicating equipment*

EN 54-4, *Fire detection and fire alarm systems - Part 4: Power supply equipment*

EN 54-16, *Fire detection and fire alarm systems - Part 16: Voice alarm control and indicating equipment*

EN 54-25, *Fire detection and fire alarm systems - Part 25: Components using radio links*

3 Terms, definitions and abbreviations

3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 54-1, those given in each relevant part of EN 54 product standard and the following apply.

3.1.1

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

3.1.2

ability **compatibility** ofacomponent **forcomponent** type1to **ty** operate **1** with other type 1 components of the FDAS:

— within the limits specified for each component given in the documentation;

— within the specified limits given by the relevant parts of EN 54, or given by the applicant; if no EN 54 part applies;

— within specified configurations of systems

3.1.3

device **component** performing **type1** a function A, B, C, D, E, G, J, L, M, for fire detection and fire alarm as defined in EN 54-1 or device performing another function declared as component type 1 by the applicant

Note 1 to entry: For example function N. See Annex B.

3.1.4

device **component** other than **ype 2** type 1 and which is connected to a type 1 component

3.1.5

ability **connectability** ofcomponent **forcomponent** type2tooperate **type2** without jeopardizing the performance of the fire detection and fire alarm system

3.1.6

level **control** where **level** control and indication functions are provided

Note 1 to entry: See drawing in Annex A.

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

3.1.7

level **field** where **levl** detection, activation and fire alarm functions are provided

Note 1 to entry: See drawing in Annex A.

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

3.1.8

level**managem**where**management****level** functions are provided (such as management stations)

Note 1 to entry: See drawing in Annex A

3.1.9

configuration**networkpology**ofnetwork including both the categories of node and interconnection of TP between them

3.1.10

device**ntwork**with**node**aunique network address

3.1.11

Networked**n****CIE**comprise more than one CIE (function B in EN 54 -1) or more than one VACIE, (function M in EN 54-1) or a combination of both function B and M, which are interconnected on a fault tolerant transmission path which forms the network

3.1.12

certification**sngauthority** body or testing laboratory

3.2 Abbreviations

4 Requirements

4.1 Compliance

In order to conform to this standard, compatibility of the components type 1 or connectability of the components type 2 within the FDAS shall meet the requirements listed in Clause 4. This shall be verified by theoretical assessment (5.1) with reference to the required documentation (4.4). When this 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 criteria of acceptance of the tests.

4.2 Basic requirements

The applicant shall provide a list of the devices of the FDAS and those devices not covered by EN 54-1 shall be declared as component type 1 or component type 2. **4.2.1**

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

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

NOTE Representative configurations are defined by agreement between the applicant and the testing authority.

Each type 1 component shall be powered directly or indirectly by a PSE which conforms to the requirements in EN 54-4 except for some radio link components in accordance with EN 54-25 which may be powered by batteries. **4.2.4**

4.2.5 Each type 1 component shall meet the requirements of the relevant part of EN 54.

In the case where the component type 1 is not covered by EN 54 series it shall meet the following:

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) compliance to EN 50130-4 Electromagnetic compatibility;

c) compliance to EN 50130 -5; 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 also shall remain within specification.

Alternatively the component may comply with the environmental clauses included in an appropriate EN 54 part (refer to environmental tests in EN 54-1:2011 Clause 5 to select the appropriate part).

NOTE A component not covered by an EN 54 standard may be covered by a European Assessment Document.

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

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. **4.2.7**

4.3 Transmission path(s)

4.3.1 General

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

Means, specified and provided, to limit 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.

g) a loss of communication to a network node 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.

4.4 Documentation

4.4.1 General

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

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

4.4.2 Documentation for compatibility To allow the assessment of **compatibility** of a FDAS to be completed, the following documents shall be supplied:

a) a list of components type 1 that make up the FDAS, with a unique identification of each component. If the component is approved to the relevant part of EN 54 (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 EN 54 such as environmental class according to EN 50130-5;

c) necessary evidence (for example test reports or certificate of performance) for the compliance of the components to the relevant part of the EN 54;

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 output port of each component shall be provided.

4.4.3 Documentation for connectability To allow the assessment of **connectability** to be completed, the following documents shall be supplied: a) 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 (example: printer, computer, etc.) is connected through an interface its unique identification is not needed but the interface specification is needed.

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

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.

4.4.4 Software documentation

If the component type 1 is covered by an EN 54 standard this software shall be documented in accordance with Annex D.

5 Assessment methods and tests

5.1 General

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

Based on the theoretical analysis of the system, a set of tests shall be selected from those listed below. If requirements defined in Clause 4 are included in the applicable part of EN 54 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 to implement 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.

For components type 1 not covered by EN 54, if no evidence of compliance to electromagnetic compatibility[5.1.2] (see 4.2.5 b)) is provided then the electromagnetic compatibility immunity tests shall be carried out in accordance with 4.2.5 b).

For components type 1 not covered by EN 54, if no evidence of compliance to environmental test[5.1.3] (see 4.2.5 c)) is provided then tests shall be carried out in accordance with 4.2.5.c)

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

NOTE The test programme may be undertaken as part of a programme to assess the performance of a device in accordance with a part of EN 54.

The assessment of the software documentation of component type 1 not covered by EN 54 shall carried[5.1.5] out in accordance to Annex D.

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

5.2 Provision of equipment and supporting information and tools

At least one system configuration shall be provided for testing compliance with this European Standard[5.2.1].

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

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

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

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 submitted for testing.

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

In case 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 will 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.

5Each**.3.3** network**Configurati****topology****na control**shallbe **level**configured**fornetwork**asper the**assessment**applicant's

At least three CIEs and the necessary components for the functional testing described in this standard shall be configured in accordance with EN 54-2.

At least three VACIEs and the necessary components for the functional testing described in this standard shall be configured in accordance with EN 54-16.

It is also possible to combine CIE and VACIE (at least three in total): each of them loaded as mentioned above.

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 EN 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 est

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 EN 54 standards under each defined tests.

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 may 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.

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 system, the aim of this test is not to evaluate the compliance with part EN 54–25 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.
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 short circuit will not cause a fault warning condition and therefore this combination of cores shall be excluded from the test;
— simultaneous short circuit of 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.

5The**.5.3**following**.3.2.2Crite****criteria****ofacceptance**ofacceptance 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.

5The**.5.3**following**.3.3.2Crite**criteria**ofacceptance**ofacceptance 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 reestablishment 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 EN 54-4.

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

All the type 1 components are to 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 EN 54–2 or in EN 54–16 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.

5.6.2.1 A schedule shall be drawn up in order to check that the components type 1 remain in compliance 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:

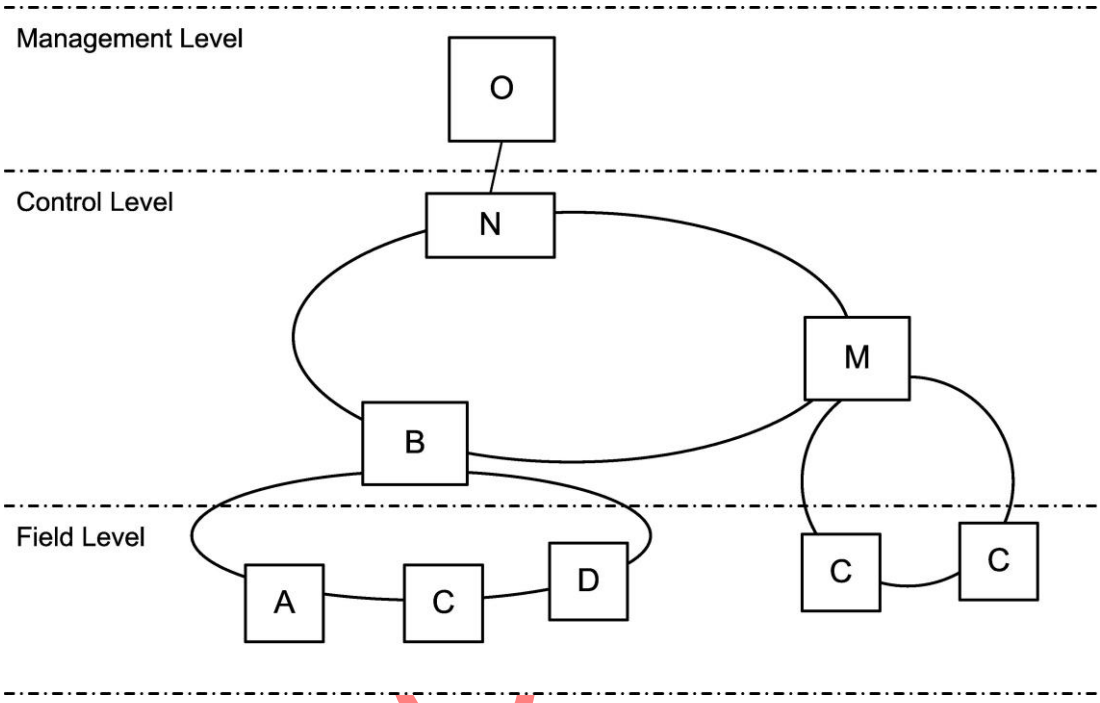
— the activation (or the failure) of the component type 2 shall not prevent the correct functioning of the components type 1 of the system;

— 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 may cause the fault warning condition of the FDAS or VAS.

Annex A (informative)

Example of levels used in FDAS



Key

Figure A.1 — Example of network levels

(informative) **AnnexB**

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 being able to perform 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 is 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 system, compartment system, release of access control system, 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

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.

(informative) **Annex C**

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

Check **C.2.2.1 Mechanical connections**

that 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

Check **C.2.2.2.1 Voltage range**

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.

.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.

Check that the component is able to function correctly with the supplied power.
frequency, modulation, distortion and phase angle.

Check **.2.2.2.4 Power supply voltage range**

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

CIf **2**a **.2**short **.2.5** circuit **Fault**fault **perf**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
.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 clause should be analysed.

.2.2.3.2.2 Voltage range

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.

Check.2.2.3that.2.3 theCurrentsignal 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.2.2.3.4 Timing
Check that the time related characteristics of the transmitted signals are within the limits of those required by the receiving components.

C.2.2.3.5 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.2.2.3.6 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.

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.

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

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.

(normative) **AnnexD**

Software design documentation

Dsoftware**.1** The applicant shall submit to the testing authority documentation that gives an overview of the design. This documentation shall be in sufficient detail for the design to be inspected for compliance with this European Standard, and shall comprise at least the following.

a) a functional description of the program, including:

1) the overall structure of the program;

2) a brief description of each part of the program and the functions that they perform;

3) a description of the main program flow and the way in which tasks are called, including any interrupt processing;

b) a description of the areas of memory used to store the program, site specific data and running data; Where dynamic memory management is employed, a separation shall be implemented between the program, site specific data and running data and this shall be described in connection with the method of memory allocation.

c) a description of how the software interacts with the electronic hardware of the component type 1 under test.

Dthe**.2** The applicant shall submit to the testing authority a description, and the details of the supplier of following:

a) software supplied by generic providers (for example . operating systems, task scheduler, display driver, memory handler). In which case, the applicant may not have access to full design information, including software source code;

b) software-controlled modules that are supplied by generic providers, for example information display, memory. In which case, the applicant may not have access to full design information, including that for the embedded software;

c) software-configured electronic components, for example: programmable logic devices.

Ddeveloped**.3** For software, which may have been developed and tested by the applicant, or may have been and tested specifically for the equipment by generic providers under the control of the applicant, the applicant shall prepare and maintain detailed software design documentation. This need not be submitted to the testing authority, but shall be accessible for inspection in a manner that respects the applicant's rights of confidentiality. This documentation shall comprise at least the following:

a) a description of each sub-division of the program designed in a methodical manner and the source code which shall be divided into recognizable major functions, or routines, which correspond to the main functions and tasks performed, which includes at least the following:

1) the name or other identification;

2) a date or version reference;

3) a description of functions and tasks performed;

4) a description of the interfaces, including the types of data transfer, the valid data range, and the checking for valid data.

This description shall either be in the form of source code header comments, or in other design documentation. Where an automated control procedure is used to document software, details of this procedure and of any related software package shall be available.

b) the source code listing, including all global and local variables, constants and labels used, and sufficient comment for the program flow to be recognized;

c) details of software tools used in the preparation of the program, for example. high-level design tools, compilers, assemblers, etc., including the supplier and version reference.

For software supplied to the manufacturer by generic providers and software-controlled modules that **D.4** are supplied to the manufacturer by generic providers detailed specifications, including any version state, shall be maintained, together with a description of how the program interfaces with these.

For software-configured electronic components; for example: programmable logic devices, the manufacturer **D.5** shall prepare and maintain detailed design documentation. This documentation shall comprise a least the following:

a) a description of functions and tasks performed;

b) the version reference;

c) details of software tools used in the design or configuration of the component, including the

supplier and version reference.

(informative) Annex E
Flowchart for assessment of compatibility / connectability

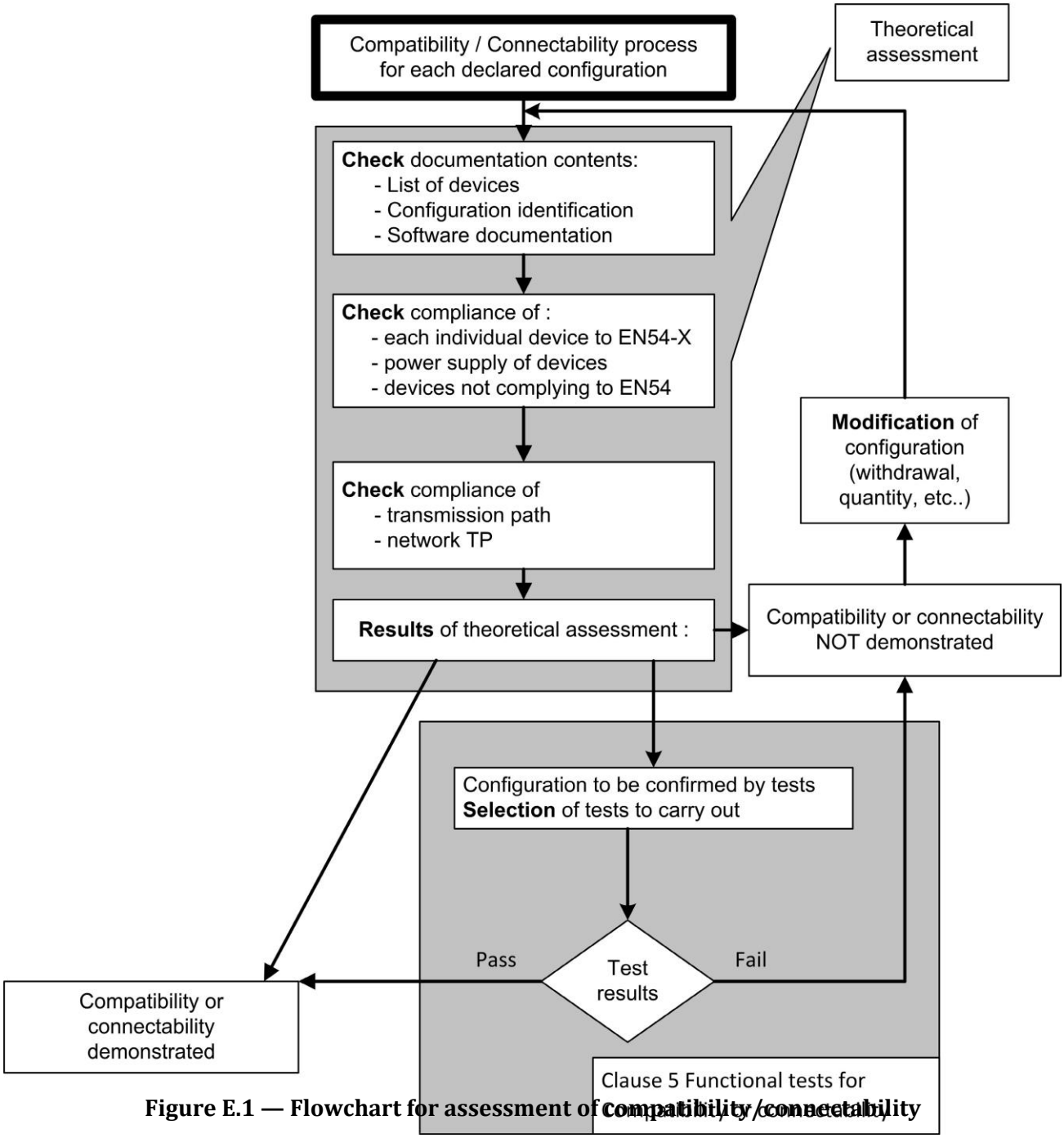


Figure E.1 — Flowchart for assessment of compatibility / connectability

Adjustment : Ali Mohammad Akhavan

DATE: 10 May 2017

FIRE-GAS

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