BRITISH STANDARD

BS EN
54-25:2008

# Fire detection and fire alarm systems —

## Part 25: Components using radio links

ICS 13.220.20



BSI
British Standards

# National foreword

This British Standard is the UK implementation of EN 54-25:2008.

The UK participation in its preparation was entrusted by Technical Committee FSH/12, Fire detection and alarm systems, to Subcommittee FSH/12/5, Alarm devices, voice alarm evacuation sub-systems and emergency voice communications.

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.

**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 31 March 2008



**ISBN 978 0 580 54521 4**

**Amendments/corrigenda issued since publication**

| Date | Comments |
|---|---|
| | |
| | |
| | |
| | |

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

# EN 54-25

March 2008

ICS 13.220.20

English Version

# Fire detection and fire alarm systems - Part 25: Components using radio links

Systèmes de détection et d'alarme incendie - Partie 25: Composants utilisant des liaisons radioélectriques

Brandmeldeanlagen - Teil 25: Bestandteile, die Hochfrequenz-Verbindungen nutzen

This European Standard was approved by CEN on 20 January 2008.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN Management Centre or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the CEN Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

**Management Centre: rue de Stassart, 36 B-1050 Brussels**



Ref. No. EN 54-25:2008: E

# Contents

Page

# Foreword

This document (EN 54-25:2008) has been prepared by Technical Committee CEN/TC 72 “Fire detection and fire alarm systems”, the secretariat of which is held by BSI.

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 September 2008, and conflicting national standards shall be withdrawn at the latest by March 2011.

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.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s).

For relationship with EU Directive(s), see informative Annex ZA, which is an integral part of this document.

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 ionisation*

— *Part 10: Flame detectors – Point detectors*

— *Part 11: Manual call points*

— *Part 12: Smoke detectors – Line detectors using an optical light 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 fire 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: Line-type heat detectors*

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

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

— *Part 25: Components using radio links*

— *Part 26: Point fire detectors using carbon monoxide sensors*[1)]

— *Part 27: Duct smoke detectors*[1)]

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, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and the United Kingdom.

1) Under preparation.

# Introduction

The aim of this European Standard is to define additional requirements to other parts of EN 54 and tests that allow radio fire detection systems and components complying with them to be at least efficient and stable as wired fire detection systems and components complying with the current requirements of cable based systems in the EN 54 standards.

System and component aspects are dealt with in this European Standard because it is difficult to describe the components of a radio-linked system separately.

Capacity limitations with respect to the use of radio components may be specified in national technical rules or guidelines.

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

## 1 Scope

This European Standard specifies requirements, test methods and performance criteria for components used in fire alarms systems, installed in and around buildings, which use radio frequency links (RF links) to communicate. It also provides requirements for the evaluation of conformity of the components to the requirements of this European Standard.

Where components work together and this requires knowledge of the system design, this document also specifies requirements on the system.

When the fire detection and fire alarm systems (FDAS) use wired and RF links, the relevant parts of EN 54 apply together with this document. Requirements relevant to wire links are superseded or modified by those included in this European Standard.

This document does not restrict:

— the intended use of radio spectrum, e.g. frequency, power output of devices;

— the allowed maximum number of the components using RF links within the FDAS or one transmission path and/or RF link;

— the allowed maximum number of the components affected by loss of one transmission path and/or RF link.

These requirements relate to national regulations and can vary from member state to member state.

## 2 Normative references

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

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 54-5, *Fire detection and fire alarm systems — Part 5: Heat detectors — Point detectors*

EN 54-11, *Fire detection and fire alarm systems — Part 11: Manual call points*

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

EN 60068-2-1, *Environmental testing — Part 2-1: Tests — Tests A: Cold (IEC 60068-2-1:2007)*

EN 60068-2-2, *Basic environmental testing procedures — Part 2-2: Tests — Tests B: Dry heat (IEC 60068-2-2:1974 + IEC 60068-2-2A:1976)*

EN 60068-2-6, *Environmental testing — Part 2-6: Tests — Tests Fc: Vibration (sinusoidal) (IEC 60068-2-6:1995 + Corrigendum 1995)*

EN 60068-2-27, *Basic environmental testing procedures — Part 2: Tests — Test Ea and guidance: Shock (IEC 60068-2-27:1987)*

EN 60068-2-30, *Environmental testing — Part 2-30: Tests — Test Db: Damp heat, cyclic (12 h + 12 h cycle) (IEC 60068-2-30:2005)*

EN 60068-2-42, *Environmental testing — Part 2-42: Test methods — Test Kc: Sulphur dioxide test for contacts and connections (IEC 60068-2-42:2003)*

EN 60068-2-78, *Environmental testing — Part 2-78: Tests — Test Cab: Damp heat, steady state (IEC 60068-2-78:2001)*

EN 300113-1 V 1.4.1:2002, *Electromagnetic compatibility and Radio spectrum Matters (ERM) — Land mobile service — Radio equipment intended for the transmission of data (and/or speech) using constant or non-constant envelope modulation and having an antenna connector — Part 1: Technical characteristics and methods of measurement*

EN 300220-1 V 1.3.1:2000, *Electromagnetic compatibility and Radio spectrum Matters (ERM) — Short range devices — Radio equipment to be used in the 25 MHz to 1000 MHz frequency range with power levels ranging up to 500 mW — Part 1: Technical characteristics and test methods*

EN ISO 9001, *Quality management systems — Requirements (ISO 9001:2000)*

# 3 Terms, definitions and abbreviations

## 3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in the relevant part of EN 54 and the following apply.

**3.1.1**
**antenna**
element of a radio component of the fire detection and fire alarm system (FDAS) that allows coupling between the component and the media where radio frequency (RF) waves are propagated

**3.1.2**
**assigned band**
frequency band within which the equipment is authorised to operate

**3.1.3**
**site attenuation**
degradation of the RF signal due to either path loss or a change in the environment of the FDAS after its installation

NOTE Site attenuation can be changed by e.g. installation or relocation of reflection or absorption materials.

**3.1.4**
**autonomous power source**
independent power supply equipment (i.e. without any link with the public power supply or an equivalent system) not rechargeable during operation and able by itself to allow the supplied component to run

NOTE An autonomous power source is e.g. a primary battery.

**3.1.5**
**base station**
transceiver in the system which communicates with a certain number of components

**3.1.6**
**collision**
simultaneous transmissions, from two or more transmitters belonging to the same system, of sufficient signal strength to cause, by mutual interaction, corruption or obliteration of the information carried by the RF signals

**3.1.7**
**compatibility**
capacity of a component of the system to operate with another component of this system, in the limits specified by the manufacturer and by the applicable product standard if this standard exists and in specified configurations of the system

**3.1.8**
**fire detection and fire alarm system**
**FDAS**
group of components including a CIE which, when arranged in (a) specified configuration(s), is capable of detecting and indicating a fire, and giving signals for appropriate action

[EN 54-13:2005, definition 3.1.7]

**3.1.9**
**identification code**
part of a message used to identify a transmitting RF communication device belonging to the system

**3.1.10**
**intermediate element**
device connected to a transmission path of a fire detection and fire alarm system, used to receive and/or transmit signals necessary for the operation of the fire detection and fire alarm system

NOTE An intermediate element meets the requirements of an input/output device in accordance with EN 54-18 but it is not restricted to electrical signals.

**3.1.11**
**manufacturer**
natural or legal person, who places the product on the market under his own name

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

**3.1.12**
**radio frequency link**
**RF link**
means of communication between at least two points, using RF wave propagation

NOTE The RF link is the equivalent to the transmission path as defined in other parts of EN 54.

**3.1.13**
**radio part**
component or part of the component incorporating the receiver and/or transmitter

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

**3.1.14**
**receiver**
device which receives the RF energy corresponding to a RF link

NOTE The receiver can be incorporated in a component of the FDAS.

**3.1.15**
**RF interference**
RF transmission from any other source other than any component of the FDAS that may cause corruption or obliteration of wanted signals and not conforming to the definition of collision or message substitution

**3.1.16**
**service life**
period of useful life of an autonomous power source under specified conditions

**3.1.17**
**special tool**
device not normally carried by the public (e.g. a key), normally provided by the manufacturer and which is used for opening the enclosure of the component to detach the antenna

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

**3.1.18**
**transmitter**
device which generates the RF energy necessary for a RF link

NOTE The transmitter can be incorporated in a component of the FDAS.

## 3.2 Abbreviations

For the purposes of this document, the following abbreviations apply.

CIE Control and indicating equipment

FDAS Fire detection and fire alarm systems

PSE Power supply equipment

RF Radio frequency

# 4 System requirements

## 4.1 General

The requirements of this document shall be applied, together with requirements of the relevant part of EN 54, where the radio-linked component has the same function as the component covered by that part and when not otherwise specified in this European Standard.

For example, an RF linked component having the function of a heat detector shall comply with EN 54-5 and a component having the function of a manual call point shall comply with EN 54-11.

## 4.2 Radio frequency links

### 4.2.1 Immunity to site attenuation

The manufacturer shall provide means either in the component itself or by the system configuration to ensure that a site attenuation, which may be caused by influences for different reasons on site, may not affect the RF link adversely in a way that communication between components is not possible. This reserve of site attenuation shall be specified as follows:

a) at least 10 dB up to frequencies of 10 MHz;

b) for frequencies of > 10 MHz as calculated in Annex B.

The manufacturer shall provide the necessary documentation and/or means for the assessment which permits the full functionality of the component to be assessed. If these means are a part of the component, the user shall not be able to interfere with these means.

The test includes verification by an assessment and shall be carried out in accordance with 8.2.2.

### 4.2.2 Alarm signal integrity

The components of the system shall use a transmission protocol on the transmission path and/or the RF link to ensure that no alarm message is lost.

The test shall be carried out in accordance with 8.2.3.

### 4.2.3 Identification of the RF linked component

**4.2.3.1** Each RF linked component shall be identified by an individual identification code as belonging to one specific FDAS.

**4.2.3.2** The manufacturer shall provide means to ensure that a RF linked component shall not be accepted by other FDAS.

The test shall be carried out in accordance with 8.2.4.

**4.2.3.3** The manufacturer shall provide the necessary documentation and/or means for the assessment of this requirement.

### 4.2.4 Receiver performance

The receiver shall meet the requirements given in Table 1.

**Table 1 — Minimum receiver performance characteristics**

| Characteristics | Limit | Frequency offset from the working frequency | Notes |
|---|---|---|---|
| Adjacent channel selectivity | ≥ 35 dB | — | For all band widths and modulation schemes |
| Blocking or desensitization | ≥ 40 dB | ± 1 MHz | In direct sequence spread spectrum systems (DSSS) the working frequency is the centre frequency |
| | ≥ 45 dB | ± 2 MHz | |
| | ≥ 60 dB | ± 5 MHz | |
| | ≥ 65 dB | ± 10 MHz | |
| Spurious response rejection | ≥ 40 dB | — | — |

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

### 4.2.5 Immunity to interference

#### 4.2.5.1 General

The following kind of interferences on the RF link shall be covered:

a) radio influences from own system;

b) radio influences from other users of the spectrum.

The following influences are not covered:

c) random influences as a result of electromagnetic effects, because these are covered by EMC guidelines (see EN 50130-4);

d) deliberate attacks on the radio controlled transmission paths with the help of electromagnetic effects (sabotage via the radio controlled route), because no special sabotage resistance is required for fire alarm systems in the parts of EN 54.

#### 4.2.5.2 Availability of RF link in two or more technically similar systems coming from the same manufacturer

In the case of two or more technically similar systems coming from the same manufacturer operating within the radio range it shall be ensured that the RF links do not mutually impede one another.

The manufacturer shall specify the means. The means shall be suitable to ensure the availability of all parts of the system in all expected system configurations.

The test shall be carried out in accordance with 8.2.6.

#### 4.2.5.3 Availability of the RF link in the presence of other band users

The manufacturer shall take measures to ensure that signal transmission is possible even if other users are working in the same band.

These measures shall ensure that an external user who uses the maximum permitted limits in the assigned band or sub-band, such as bandwidth and duty cycle, does not cause interference.

NOTE The definition in EN 300220-1 V 1.3.1:2000 applies for establishing the duty cycle.

The test shall be carried out in accordance with 8.2.7.

#### 4.2.5.4 Integrity of the RF link

The application of one of the interfering RF signals defined in 8.2.7 to one of the FDAS receivers shall cause neither an alarm condition nor a fault warning condition at the CIE.

### 4.2.6 Loss of communication

The loss of the ability of the system to transmit a message of any RF linked component to the CIE within in EN 54-2 defined periods shall be recognized in less than 300 s and shall be indicated in less than 100 s.

The test shall be carried out in accordance with 8.2.8.

#### 4.2.7 Antenna

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

The test shall be carried out in accordance with 8.2.9.

## 5 Components requirements

### 5.1 Compliance

In order to comply with this standard the components shall meet the requirements of this clause which shall be verified by visual inspection or engineering assessment, shall be tested as described in Clause 8 and shall meet the requirements of the tests.

### 5.2 General

**5.2.1** All components shall meet the requirements of the relevant part of EN 54 and the following additional specific requirements, including the transmission paths and/or radio links.

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

**5.2.3** Components that rely on software control in order to fulfil the requirements of this specification shall comply with the relevant part of EN 54.

### 5.3 Power supply equipment

**5.3.1** The components shall be powered by:

a) an autonomous power source, e.g. a primary battery, or

b) a power supply equipment in accordance with EN 54-4.

NOTE In accordance with EN 54-2 a CIE is powered with power supply equipment complying with EN 54-4.

**5.3.2** All components powered by an autonomous power source shall comply with the following requirements:

a) the autonomous power source shall be within the enclosure of the component;

b) the autonomous power source shall allow normal operation of the component for a minimum period of 36 months.

The manufacturer shall declare the type of the autonomous power source and its service life for the component in normal operation. The service life shall be demonstrated by a statement of calculation. This calculation shall take into account the mean consumption and voltage under quiescent and at standard atmospheric conditions. The product of the specified discharge time of 36 months and the mean discharge current shall not be greater than 85 % of the rated capacity of the power source.

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

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

Where calculation is not practical, the mean consumption shall be measured at nominal voltage for at least 1 h under quiescent operation after the stabilisation period given by the manufacturer.

The verification of this calculation shall be made as defined in 8.3.3. Annex C gives an example for the calculation of the service life of the autonomous power source.

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

a) the component shall be capable of generating and transmitting a fault signal within 60 min after replacing a good or new autonomous power source by a preconditioned power source representing a discharged power source at the end of its service life;

b) the component shall be capable of operating as intended when it is activated using the preconditioned power source representing a discharged power source at the end of its service life;

c) the components shall keep the alarm condition and/or another activated condition for at least 30 min (where alarm condition is not applicable).

The procedure to verify this requirement is specified in 8.3.4.

**5.3.4** The loss of the power source shall be indicated as a fault signal from point in accordance with EN 54-2. Where several power sources are used for different functions in one component, the fault signal shall be given for each power source, see 5.3.3.

**5.3.5** The component shall either be designed to make polarity reversal impossible or, if not, the polarity of the connections of the power source shall be identifiable and the polarity reversal shall not damage the component.

The procedure to verify the reversal of polarity is specified in 8.3.5.

## 5.4 Environmental related requirements

### 5.4.1 General

Components shall be subjected to the environmental tests defined in the relevant part of EN 54. The functional tests of the radio part of the component before and after the environmental treatment shall be carried out in accordance with 8.3.

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

— control and indicating equipment (CIE);

— other components (e.g. detectors, manual call points, input/output devices).

### 5.4.2 General test procedure

Unless otherwise stated, the components of the FDAS containing the transmitter and the receiver respectively shall be mounted in the radio frequency shielded test equipment as described in Annex A.

When testing the component transmitting the alarm signal, it shall be tested together with a typical component receiving the alarm signal and vice versa.

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

#### 5.4.3 Provision for testing

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

**Table 2 — Provisions for testing**

| Components | Number of specimens |
|---|---|
| CIE | At least 1 (in accordance with EN 54-2) |
| Other components<br>(e.g. detectors, manual call points, input/output devices) | At least 16 (in accordance with the relevant part of EN 54) |

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

## 6 Documentation

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

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

b) test reports relative to the conformity of the components, with indication of the relevant part of EN 54;

c) characteristics of the RF link between each component and the CIE;

d) utilisation limits of the system, e.g. configuration, number of components which are able to communicate with one base station, functional limits.

The documentation of the input/output devices shall comply with the requirements of this clause.

The input/output devices shall be delivered with technical instructions and sufficient installation and maintenance information to allow their setting and their operation, or, if all of this information is not provided with each input/output device, the reference to the appropriate documents shall be indicated on each device or given with it.

For an efficient operation of the input/output device, this documentation shall detail the requirements for the correct processing of the signals of the input/output device. This can be done by a detailed technical specification or by a reference to an adequate processing protocol or by a reference to the list of CIE that can be connected etc.

NOTE Additional information can be required by the certification body for the assessment of the input/output device according to this European Standard.

# 7 Marking

The marking shall be in accordance with the marking requirements of the relevant part of EN 54.

The element containing radio part shall be additionally clearly marked with:

a) the number of this European Standard, i.e. EN 54-25;

b) marking required by other regulations;

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

c) the type and the reference of the power source(s) recommended by the manufacturer. These indications shall be visible during its replacement.

NOTE Where ZA.3 covers the same information as this clause, the requirements of this clause are met.

# 8 Tests

## 8.1 General requirements

### 8.1.1 General

The combination of the tests in accordance with the other parts of EN 54 with the tests required in this European Standard is permitted.

NOTE Detachable components comprise at least two parts: a base (socket) and a head (body). If the specimens are detachable elements, then at least two parts together are regarded as a complete component.

### 8.1.2 Standard atmospheric conditions for testing

Unless otherwise stated in the test procedures the conditions defined in the relevant part of EN 54 shall apply.

### 8.1.3 Operating conditions for tests

If a test method requires a specimen to be operational, then the specimen shall be powered as required by the manufacturer and shall be connected to a suitable monitoring equipment with characteristics as required by the manufacturer's data. Unless otherwise specified in the test method, the supply parameters applied to the specimen shall be set within the manufacturer's specified range(s) and shall remain substantially constant throughout the tests. The value chosen for each parameter shall normally be the nominal value or the mean of the specified range.

The details of the powered and of the monitoring equipment, as well as the alarm criteria used, shall be given in the test report.

### 8.1.4 Mounting and orientation

The mounting and orientation requirements defined in the relevant part of EN 54 shall apply.

### 8.1.5 Tolerances

The requirements for tolerances defined in the relevant part of EN 54 shall apply.

## 8.2 System tests

### 8.2.1 Test schedule for system tests

The test order and the number of samples are given in Table 3.

**Table 3 — Test schedule for system tests**

| System tests | Subclause | Device/component | |
|---|---|---|---|
| | | CIE | Other components |
| Immunity to site attenuation | 8.2.2 | documentation only | documentation only |
| Alarm signal integrity | 8.2.3 | 1 | 10 or maximum number of acceptable samples by the system, if less than 10 |
| Identification of RF linked components | 8.2.4 | documentation only | documentation only |
| Receiver performance | 8.2.5 | see Table 4 | see Table 4 |
| Mutual disturbance between systems of the same manufacturer | 8.2.6 | at least 2 | 10 or maximum number of acceptable samples by the system, if less than 10 |
| Compatibility with other band users | 8.2.7 | at least 1 | at least 1 |
| Detection of a loss of communication on a link | 8.2.8 | at least 1 | as specified by the manufacturer |
| Antenna | 8.2.9 | 1 | 1 |

### 8.2.2 Test for immunity to site attenuation

#### 8.2.2.1 Object

To demonstrate that the appropriate RF link fulfils the requirements defined in 4.2.1 in a medium free from interference and in the relevant frequency band.

#### 8.2.2.2 Test procedure

In accordance with the manufacturer's documentation the requirement of 4.2.1 shall be verified by engineering assessment.

NOTE The assessment takes into account the difference of the technical approaches of different manufacturers to avoid communication loss by site attenuation.

#### 8.2.2.3 Requirements

The assessment shall indicate that the requirements of 4.2.1 are fulfilled.

### 8.2.3 Test for alarm signal integrity

#### 8.2.3.1 Object

To demonstrate that an alarm message to or from a component is not lost due to collisions and/or RF link occupation and the system complies with the requirements defined in 4.2.2.

#### 8.2.3.2 Procedure

10 components shall be simultaneously triggered to transmit or receive alarm messages by means provided by the manufacturer. If the system capacity is less than 10 components, the maximum number of components shall be triggered.

#### 8.2.3.3 Requirements

The first alarm message shall be indicated within 10 s and the last alarm message within 100 s. No alarm message shall be lost.

NOTE The value of 100 s is not intended to show the compliance with the alarm response time or with the fault response time of EN 54-2.

### 8.2.4 Test for identification of RF linked components

#### 8.2.4.1 Object

To demonstrate, that the component complies with the requirements of 4.2.3.

#### 8.2.4.2 Procedure

Verification of the documentation provided by the manufacturer that the requirements in accordance with 4.2.3.1 and 4.2.3.2 are fulfilled.

#### 8.2.4.3 Requirements

The manufacturer shall show that the identification of the RF linked component complies with the requirements defined in 4.2.3.

The probability that the RF linked component is identified and accepted as belonging to another system from the same system manufacturer unintended to receive shall be less than 1:1 000 000.

### 8.2.5 Test for the receiver performance

#### 8.2.5.1 Object

To demonstrate, that the component complies with the requirements of 4.2.4.

#### 8.2.5.2 Test procedure

The characteristics shall be tested in accordance with Table 4.

**Table 4 — Test procedure for the receiver performance**

| Characteristics | Test procedure in accordance with | Notes |
|---|---|---|
| Adjacent channel selectivity | EN 300220-1 V 1.3.1:2000, 9.1 | In frequency hopping systems the hopping shall be disabled |
| Blocking or desensitization | EN 300220-1 V 1.3.1:2000, 9.3 | In accordance with Table 1,the frequency offset is defined as the offset from the working frequency |
| Spurious response rejection | EN 300113-1 V 1.4.1:2002, 9.7 | — |

#### 8.2.5.3 Requirements

The requirements in accordance with the test procedures as given in Table 4 shall be fulfilled.

### 8.2.6 Test for mutual disturbance between systems of the same manufacturer

#### 8.2.6.1 Object

To demonstrate that the component complies with the requirements of 4.2.5.2 and to demonstrate the ability of RF link to convey signals even when many radio components within systems of the same manufacturer and the same system type work in a limited area. The test shall prove the basic function of the component.

#### 8.2.6.2 Test procedure

The documentation shall be checked to show that the interaction between the RF links does not negatively impact the transmission time and fault detection time during normal operation as set out in this document.

Subsequently two independent base stations each with 5 components shall be set up at the minimum distance between all the components permitted by the manufacturer and commissioned in accordance with the manufacturer's specifications. If the maximum number of components per system is below 5, the maximum number of components shall be installed.

The manufacturer shall provide means to ensure the simultaneous triggering of the devices.

The test for alarm signal integrity may be combined with this test.

#### 8.2.6.3 Requirements

The systems shall operate for 48 h without fault messages and the following shall be met:

a) after triggering of two alarm messages in one of the two systems at an interval within 2 s each message shall be received and/or indicated correctly within 10 s after each activation;

b) after simultaneously triggering of 5 alarm messages in each system (or the maximum number of acceptable alarm messages if less than 5, the following is required for each system:

   1) the first message shall be received and/or indicated correctly within 10 s. To verify that no message has been lost the following 9 messages shall be correctly received and indicated on the appropriate CIE within 100 s,

   2) if the maximum number of components in a system is less than the required number of alarm messages, this maximum number shall be used;

c) after decommissioning of one component in a system the fault shall be displayed correctly on the CIE in accordance with 4.2.6.

The fault or alarm messages shall be correctly addressed within the assigned system without producing a fault or an alarm signal on the non-assigned system.

#### 8.2.7 Test of compatibility with other band users

##### 8.2.7.1 Object

To demonstrate that the component complies with the requirements of 4.2.5.3.

##### 8.2.7.2 Test procedure

###### 8.2.7.2.1 General

The manufacturer shall provide a suitable test equipment and sufficient information about the measures to ensure the availability of the transmission path in the presence of other band users in accordance with the National Regulations where the tested system is used.

**CAUTION — The allowed use of bands, sub-bands, channels and frequencies depends on National Regulations.**

The attenuation between the components under test shall fall within a mean range. If a number of components is to be tested, these shall be installed in the test equipment.

A RF link with two components (i.e. CIE and component) shall be set up. The signal level at the point where the messages are received shall fall within a mean range.

NOTE The formulation “The signal level shall fall within a mean range” was chosen because the absolute level is not relevant for this measurement. In practice, a level between – 80 dBm and – 70 dBm makes sense.

If a transmission uses one or more remote receivers, an interfering signal shall only be applied to one receiver at any one time. The test shall be repeated for each receiver.

###### 8.2.7.2.2 Test procedure for multi-channel components

An un-modulated interfering signal sufficient to block the transmission shall be applied to the message recipient (e.g. CIE).

NOTE It is generally sufficient if the interfering level on the message recipient is > 10 dB above the current signal level of the transmission in its bandwidth.

The test shall be carried out on all of the frequencies used by the component under test.

Each frequency shall be blocked for at least 1 s in turn. The time of frequency change shall not exceed 1 s. This procedure shall be continuously repeated for the duration of the function test.

After the start of the blocking procedure five separate non-contiguous alarm messages shall be triggered at the transmitting component.

###### 8.2.7.2.3 Test procedure for single-channel components

An un-modulated interfering signal shall be generated to mimic the other users on the wanted channel and shall be sufficient to block the transmission shall be applied to the message recipient (e.g. CIE).

The "on" time and "off" time for the interfering signal shall be in accordance with Table 5.

**Table 5 — Duty cycle categories**

| Transmitting time/full cycle | "on" time | "off" time | Notes |
|---|---|---|---|
| < 0,1 % | 0,72 s | 0,72 s | e.g. 5 transmissions of 0,72 s within 1 h |
| < 1 % | 3,6 s | 1,8 s | e.g. 10 transmissions of 3,6 s within 1 h |
| < 10 % | 36 s | 3,6 s | e.g. 10 transmissions of 36 s within 1 h |
| < 100 % | — | — | Typically continuous transmissions, but also those with a duty cycle > 10 % |

**WARNING — Single-channel systems using frequencies where the "on" time is longer than 10 s are likely to fail.**

#### 8.2.7.3 Requirements

The RF links shall operate appropriately and as intended and:

a) no un-intentional fault or alarm message shall be indicated on the control equipment when the interfering signal occurs and

b) all intended messages, e.g. alarm messages shall be processed correctly.

### 8.2.8 Test for the detection of a loss of communication on a link

#### 8.2.8.1 Object of the test

To demonstrate the ability of the receiving equipment to detect the loss of the communication with a transmitter in the system.

The test shall prove the basic function of the system.

#### 8.2.8.2 Test procedure

The manufacturer shall provide a suitable test equipment and sufficient information about the measures to ensure that the RF link operates appropriately and as intended.

The attenuation between the component being tested and its partners shall not influence the communication paths. If there are a number of components to be checked, these shall likewise be installed.

It shall then be verified that monitoring signals are correctly received by the receiving equipment in accordance with the specification provided by the manufacturer. The transmission of the monitoring signals from a randomly selected component shall then be prevented for at least 300 s, e.g. by disconnecting the power supply to the transmitting equipment.

During the test the maximum number of components as specified by the manufacturer shall be connected to the base station.

NOTE Depending on the system design it is possible that the maximum number of components assigned to the CIE is greater than the number of components directly connected to the base station.

The test shall be carried out with one component randomly chosen and shall be repeated twice.

#### 8.2.8.3 Requirements

The CIE shall enter the fault warning condition after the loss of communication by the times given in 4.2.6.

#### 8.2.9 Test of the antenna

##### 8.2.9.1 Object of the test

To demonstrate that an antenna or its cable cannot easily be detached.

##### 8.2.9.2 Test procedure

The requirement of 4.2.7 shall be verified by engineering assessment.

The manufacturer shall provide the components for the assessment.

##### 8.2.9.3 Requirements

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

### 8.3 Components tests

#### 8.3.1 General

All environmental tests shall be carried out as defined in the relevant parts of EN 54. For components powered by autonomous power source(s), these tests shall be made with fully charged autonomous power source(s), with the exception of the endurance tests (i.e. vibration with the power source in the original position but not connected, damp heat (steady state) and sulphur dioxide ($SO_2$) corrosion tests).

The test “supply voltage variation” defined in the appropriate standards shall be done with the extreme power supply values. The minimum value to be considered is the value leading to the fault signal defined in 5.3.3.

In addition to the tests defined in the relevant part of EN 54 with which the component shall comply, the tests defined in 8.3.3 to 8.3.20 shall apply.

#### 8.3.2 Test schedule for components tests

The test order is given in Table 6. The manufacturer may provide more than one CIE for the environmental tests.

Where applicable, the test order can be changed in the interest of test economy.

**Table 6 — Test schedule for components tests**

| Components tests | Clause | Device/component | | Remarks |
|---|---|---|---|---|
| | | CIE | Other | |
| Verification of service life of power sources | 8.3.3 | Documentation only | | only applicable for the components powered by an autonomous power source |
| Low power condition fault signal | 8.3.4 | no test | 1 | |
| Polarity reversal | 8.3.5 | no test | 1 | |
| Repeatability test | 8.3.6 | 1 | 1 | — |
| Reproducibility test | 8.3.7 | 1 | 1 to 16 | if more than one CIE is provided these shall be included in the test |
| Variation of supply parameters | 8.3.8 | 1 | a | — |
| Dry heat (operational) | 8.3.9 | no test | a | for heat detectors temperatures in accordance with EN 54-5 |
| Dry heat (endurance) | 8.3.10 | no test | a | for heat detectors temperatures in accordance with EN 54-5, class C to G |
| Cold (operational) | 8.3.11 | 1 | a | — |
| Damp heat, cyclic (operational) | 8.3.12 | no test | a | not applicable for smoke detectors |
| Damp heat, steady state (operational) | 8.3.13 | 1 | a | only applicable for smoke detectors and CIE |
| Damp heat, steady state | 8.3.14 | 1 | a | — |
| $SO_2$-corrosion test (endurance) | 8.3.15 | no test | a | — |
| Shock (operational) | 8.3.16 | no test | a | — |
| Impact (operational) | 8.3.17 | 1 | a | — |
| Vibration, sinusoidal (operational) | 8.3.18 | 1 | a | — |
| Vibration, sinusoidal (endurance) | 8.3.19 | 1 | a | — |
| Electrostatic discharge | 8.3.20 a) | 1 | 11 b | — |
| Radiated electromagnetic fields | 8.3.20 b) | 1 | 12 b | — |
| Fast transient disturbances/bursts | 8.3.20 d) | 1 | 13 b | only applicable if cables are connected to the component |
| Slow high energy surges | 8.3.20 e) | 1 | 14 b | |
| Conducted disturbances induced by electromagnetic fields | 8.3.20 c) | 1 | 15 b | |
| Mains supply voltage variations | 8.3.20 f) | 1 | 16 b | only applicable for mains supplied components |
| Mains supply voltage dips and short interruptions | 8.3.20 g) | 1 | 16 b | only applicable for mains supplied components |

[a] For environmental testing the numbering of other components to be tested shall be adapted to the assigned standard.

[b] In the interests of test economy, it is permitted to use the same specimen for more than one EMC test. In that case, intermediate functional test(s) on the specimen(s) used for more than one test may be deleted, and the functional test conducted at the end of the sequence of tests. However, it should be noted that in the event of a failure, it may not be possible to identify which test exposure caused the failure (see EN 50130-4).

### 8.3.3 Verification of the service life of the autonomous power source(s)

#### 8.3.3.1 Object of the verification

To demonstrate, by analysis and calculation, that the power source functions during the required time.

#### 8.3.3.2 Verification procedure

The manufacturer shall provide the electric current consumption of the component powered in quiescent conditions.

#### 8.3.3.3 Requirements

The service life calculation shall be provided by the manufacturer and shall be verified by the test authority. The requirements of 5.3.2 shall be fulfilled.

### 8.3.4 Test for the low power condition fault signal

#### 8.3.4.1 Object of the test

To demonstrate, if the component is powered by an autonomous power source, that a low power fault signal is transmitted by the powered component in time before the component is not able to operate as intended due to the failure of the autonomous power source.

#### 8.3.4.2 Test procedure

For test purposes, the autonomous power source shall be preconditioned as follows:

a) an autonomous power source recommended by the manufacturer shall be connected to the component. In order to shorten the time until the low power condition threshold is reached, an additional current sink shall be connected to the autonomous power source. This can be done by a resistor or a constant current sink. In order not to change the behaviour of the battery too much, the current should be calculated to reach the threshold within a reasonable time, e.g. 30 days to 90 days. Details shall be agreed between the test laboratory and the manufacturer and shall be documented in the test report. The fault signal shall be monitored on the CIE through the real transmission path.

   In addition, to minimize the preconditioning expenses at the test laboratory the manufacturer may provide an already preconditioned autonomous power source which can be used by the test laboratory. At the test laboratory an additional current sink agreed between the test laboratory and the manufacturer shall then be connected to the autonomous power source again;

b) after the occurrence of the fault signal the additional current sink shall still remain connected for a further time of 10 % of the days needed for the discharge.

   The additional current sink and the autonomous power source shall then be disconnected and the autonomous power source shall be labelled as "preconditioned" in conjunction with the component in which it was discharged.

In addition, to minimize the recovery effect of the preconditioned power source, the following tests shall be performed immediately:

c) the preconditioned power source shall be connected again to the component. The component shall be connected to a suitable monitoring equipment;

d) after a period of at least 60 min the powered component shall be triggered to the alarm condition;

e) if the component under test is an intermediate element, a functional test shall be performed in accordance with the manufacturer's requirements.

After that all possible inputs/outputs shall be activated such that the power consumption of the intermediate element is on a maximum level.

#### 8.3.4.3 Requirements

The following shall be fulfilled:

a) after reconnecting the preconditioned power source the component shall generate and transmit a fault signal within 60 min;

b) after the occurrence of the fault signal and the subsequent triggering, the component shall recognize and indicate the alarm condition, e.g. sound output. The component shall keep the alarm condition for at least 30 min;

c) if the component under test is an intermediate element, the functional test shall be within the manufacturer's specifications.

The activated inputs/outputs shall not change there preset conditions for at least 30 min.

### 8.3.5 Test for the polarity reversal

#### 8.3.5.1 Object of the test

To demonstrate that, if the component is powered by an autonomous power source and if a mechanical polarity reversal is possible, that this polarity reversal does not damage the powered component.

#### 8.3.5.2 Test procedure

##### 8.3.5.2.1 General

If the manufacturer can demonstrate to the test laboratory that the polarity reversal cannot adversely affect the performance of the component, the tests of 8.3.5.2.2 and 8.3.5.2.3 shall not be applied.

##### 8.3.5.2.2 Functional part

The measurement of the response or the functional test of the powered component shall be carried out as specified in the relevant part of EN 54 to which the component under test shall comply.

The polarity shall then be reversed, if this is mechanically possible. This polarity reversal shall be maintained for 2 h, unless a fault signal is transmitted by the component under test.

After the polarity reversal, the component shall be powered in its normal condition and its response shall be measured.

If the component under test is an intermediate element, each response measurement shall be replaced by a functional test performed in accordance with the manufacturer's requirements.

##### 8.3.5.2.3 Radio part

The transmission threshold value shall be determined in accordance with Annex A before and after the polarity reversal test. The threshold values $A_{before}$ and $A_{after}$ shall be recorded for each measurement.

#### 8.3.5.3 Requirements

##### 8.3.5.3.1 Functional part

The response values (qualitative or quantitative) measured shall comply with the test requirements as defined in the relevant part of EN 54 to which the component under test shall comply.

If the component under test is an intermediate element, it shall comply with the manufacturer's specifications when the function tests are performed.

##### 8.3.5.3.2 Radio part

The difference $|A_{before} - A_{after}|$ shall be less than 6 dB.

### 8.3.6 Repeatability test

#### 8.3.6.1 Object of the test

To demonstrate that the transmission behaviour is stable.

#### 8.3.6.2 Test procedure

The transmission threshold shall be determined in accordance with Annex A six times in sequence. The threshold values *A* shall be recorded for each measurement.

The maximum attenuation shall be designated $A_{max}$ and the minimum attenuation shall be designated $A_{min}$.

#### 8.3.6.3 Requirements

The difference $|A_{max} - A_{min}|$ shall be less than 6 dB.

### 8.3.7 Reproducibility test

#### 8.3.7.1 Object of the test

To demonstrate that the transmission behaviour does not vary unduly from specimen to specimen and to establish threshold value data for comparison with the threshold values measured after the environmental tests.

#### 8.3.7.2 Test procedure

The transmission threshold of each of the specimen shall be determined in accordance with Annex A. The threshold values *A* shall be recorded for each measurement.

The maximum attenuation shall be designated $A_{max}$ and the minimum attenuation shall be designated $A_{min}$.

#### 8.3.7.3 Requirements

The difference $|A_{max} - A_{min}|$ shall be less than 6 dB.

### 8.3.8 Variation of supply parameters

#### 8.3.8.1 Object of the test

To demonstrate that within the specified range(s) of the supply parameters (e.g. voltage), the transmission behaviour is not unduly dependent on these parameters.

#### 8.3.8.2 Test procedure

The transmission threshold of the specimen shall be determined in accordance with Annex A, using a bench-top power supply. The upper and lower limits of the supply parameter range(s) shall be specified by the manufacturer. The threshold values $A$ shall be recorded for each measurement.

The maximum attenuation shall be designated $A_{max}$ and the minimum attenuation shall be designated $A_{min}$.

#### 8.3.8.3 Requirements

The difference $|A_{max} – A_{min}|$ shall be less than 6 dB.

### 8.3.9 Dry heat (operational)

#### 8.3.9.1 Object of the test

To demonstrate the ability of the specimen to function correctly at high ambient temperatures appropriate to the anticipated service environment.

#### 8.3.9.2 Test procedure

The specimen shall be exposed to the conditions as given in Table 7 unless otherwise stated in the relevant parts of EN 54.

The test apparatus and the test procedure shall be as described in EN 60068-2-2, test Bb.

**Table 7 — Conditions for dry heat (operational) test**

| Exposure | Heat detectors | Other components | |
|---|---|---|---|
| | | indoor use | outdoor use |
| Temperature | Maximum ambient temperature in accordance with the appropriate class of EN 54-5 | (55 ± 2) °C | (70 ± 2)°C |
| Duration | 2 h | 16 h | |

The specimen shall be monitored during the conditioning period to detect any alarm or fault signal.

During the last 0,5 h of the conditioning period the transmission threshold of the specimen shall be determined in accordance with Annex A. The threshold value $A_{during}$ shall be recorded.

After a recovery period of at least 1 h under standard laboratory conditions the transmission threshold of the specimen shall be measured again in accordance with Annex A. The threshold value $A_{after}$ shall be recorded.

#### 8.3.9.3 Requirements

No alarm or fault signal shall be given during the conditioning.

The difference $|A_{during} - A|$ shall be less than 10 dB, where $A$ was measured in reproducibility test.

The difference $|A_{after} - A|$ shall be less than 6 dB, where $A$ was measured in reproducibility test.

### 8.3.10 Dry heat (endurance)

#### 8.3.10.1 Object

To demonstrate the ability of the component to withstand a high ambient temperature.

#### 8.3.10.2 Test procedure

The specimen shall be exposed to the conditions as given in Table 8 unless otherwise stated in the relevant parts of EN 54.

The test apparatus and procedure shall be as described in EN 60068-2-2, test Ba or Bb, and as indicated below.

**Table 8 — Conditions for dry heat (endurance) test**

| Exposure | Heat detectors | Other components |
|---|---|---|
| Temperature | Maximum ambient temperature in accordance with class C to G of EN 54-5 | (70 ± 2) °C |
| Duration | 21 d | |

After a recovery period of at least 1 h under standard laboratory conditions the transmission threshold of the specimen shall be measured again in accordance with Annex A. The threshold value $A_{after}$ shall be recorded.

#### 8.3.10.3 Requirements

No fault signal, attributable to the endurance conditioning, shall be given on reconnection of the specimen.

The difference $|A_{after} - A|$ shall be less than 6 dB, where $A$ was measured in reproducibility test.

### 8.3.11 Cold (operational)

#### 8.3.11.1 Object of the test

To demonstrate the ability of the specimen to function correctly at low ambient temperatures appropriate to the anticipated service environment.

#### 8.3.11.2 Test procedure

The specimen shall be exposed to the low ambient temperature given in the Table 9 unless otherwise stated in the relevant parts of EN 54.

The test apparatus and procedure shall be as described in EN 60068-2-1, test Ab, and as described below.

**Table 9 — Conditions for cold (operational)**

| Exposure | CIE | Other components | |
|---|---|---|---|
| | | Indoor use | Use in special environments, e.g. freeze facilities or outdoor use |
| Temperature | (-5 ± 3) °C | (-10 ± 3) °C | (-25 ± 3) °C [a] |
| Duration | 16 h | | |
| [a] For countries with special cold conditions: (- 40 ± 3) °C. | | | |

The specimen shall be monitored during the conditioning period to detect any alarm or fault signal.

During the last 0,5 h of the conditioning period the transmission threshold of the specimen shall be determined in accordance with Annex A. The threshold value $A_{during}$ shall be recorded.

After a recovery period of at least 1 h under standard laboratory conditions the transmission threshold of the specimen shall be measured again in accordance with Annex A. The threshold value $A_{after}$ shall be recorded.

#### 8.3.11.3 Requirements

No alarm or fault signal shall be given during the conditioning.

The difference $|A_{during} - A|$ shall be less than 10 dB, where $A$ was measured in reproducibility test.

The difference $|A_{after} - A|$ shall be less than 6 dB, where $A$ was measured in reproducibility test.

### 8.3.12 Damp heat, cyclic (operational)

#### 8.3.12.1 Object of the test

To demonstrate the ability of the specimen to function correctly at a high relative humidity (with condensation) which can occur for short periods in the anticipated service environment.

#### 8.3.12.2 Test procedure

The specimen shall be exposed to the ambient climate given in Table 10 unless otherwise stated in the relevant parts of EN 54.

The test apparatus and the test procedure shall be as described in EN 60068-2-30, test Db, using the Variant 1 test cycle and controlled recovery conditions.

**Table 10 — Conditions for damp heat, cyclic (operational)**

| Exposure | Indoor use | | Use in special environments, e.g. freeze facilities or outdoor use | |
|---|---|---|---|---|
| | Low temperature | High temperature | Low temperature | High temperature |
| Temperature | (25 ± 3) °C | (40 ± 2) °C | (25 ± 3) °C | (55 ± 2) °C |
| Relative humidity | > 95 % | (93 ± 3) % | > 95 % | (93 ± 3) % |
| Number of cycles | 2 | | | |
| NOTE The test is not applicable for smoke detectors | | | | |

The specimen shall be monitored during the conditioning period to detect any alarm or fault signal.

During the last 0,5 h of the conditioning period the transmission threshold of the specimen shall be determined in accordance with Annex A. The threshold value $A_{during}$ shall be recorded.

After a recovery period of at least 1 h under standard laboratory conditions the transmission threshold of the specimen shall be measured again in accordance with Annex A. The threshold value $A_{after}$ shall be recorded.

#### 8.3.12.3 Requirements

No alarm or fault signal shall be given during the conditioning.

The difference $|A_{during} - A|$ shall be less than 10 dB, where $A$ was measured in the reproducibility test.

The difference $|A_{after} - A|$ shall be less than 6 dB, where $A$ was measured in the reproducibility test.

### 8.3.13 Damp heat, steady state (operational)

#### 8.3.13.1 Object of the test

To demonstrate the ability of the specimen to function correctly at a high relative humidity (without condensation) which can occur for short periods in the anticipated service environment.

#### 8.3.13.2 Test procedure

The specimen shall be exposed to the ambient climate given in Table 11.

For the CIE the test procedure shall be as described in EN 60068-2-78 and for the smoke detector the test apparatus and procedure shall be as described in EN 60068-2-78, test Cab and as described below.

**Table 11 — Conditions for damp heat, steady state (operational)**

| Exposure | CIE | Smoke detector |
|---|---|---|
| Temperature | (40 ± 2) °C | (40 ± 2) °C |
| Relative humidity | (93 ± 3) % | (93 ± 3) % |
| Duration | 4 days | |

The specimen shall be monitored during the conditioning period to detect any alarm or fault signal.

During the last 0,5 h of the conditioning period the transmission threshold of the specimen shall be determined in accordance with Annex A. The threshold value $A_{during}$ shall be recorded.

After a recovery period of at least 1 h under standard laboratory conditions the transmission threshold of the specimen shall be measured again in accordance with Annex A. The threshold value $A_{after}$ shall be recorded.

#### 8.3.13.3 Requirements

No alarm or fault signal shall be given during the conditioning.

The difference $|A_{during} - A|$ shall be less than 10 dB, where $A$ was measured in reproducibility test.

The difference $|A_{after} - A|$ shall be less than 6 dB, where $A$ was measured in reproducibility test.

### 8.3.14 Damp heat, steady state (endurance)

#### 8.3.14.1 Object of the test

To demonstrate the ability of the specimen to withstand long term effects of humidity in the service environment.

#### 8.3.14.2 Test procedure

The specimen shall be disconnected from its power supply and exposed to the ambient climate given in Table 12.

The test apparatus and the test procedure shall be as described in EN 60068-2-78, test Cab.

**Table 12 — Conditions for damp heat, steady state (endurance)**

| Exposure | CIE | Other components |
|---|---|---|
| Temperature | (40 ± 2) °C | (40 ± 2) °C |
| Relative humidity | (93 ± 3) % | (93 ± 3) % |
| Duration | 21 days | 21 days |

After a recovery period of at least 1 h under standard laboratory conditions the transmission threshold of the specimen shall be measured again in accordance with Annex A. The threshold value $A_{after}$ shall be recorded.

#### 8.3.14.3 Requirements

No alarm or fault signal, attributable to the endurance conditioning shall be given on reconnection of the specimen.

The difference $|A_{after} – A|$ shall be less than 6 dB, where $A$ was measured in reproducibility test.

### 8.3.15 $SO_2$-corrosion (endurance)

#### 8.3.15.1 Object of the test

The object of the test is to demonstrate the ability of the specimen to withstand the corrosive effects of sulphur dioxide as an atmospheric pollutant.

#### 8.3.15.2 Test procedure

The specimen shall be disconnected from its power supply and exposed to the ambient climate given in Table 13.

The test apparatus and procedure shall be as described in EN 60068-2-42, test Kc, except that the conditioning shall be as described below.

**Table 13 — Conditions for $SO_2$-corrosion (endurance)**

| Exposure | Other components |
|---|---|
| Temperature | (25 ± 2) °C |
| Relative humidity | (93 ± 3) % |
| $SO_2$ concentration (volume fraction) | (25 ± 5) × $10^{-6}$ |
| Duration | 21 days |

Immediately after the conditioning the specimen shall be subjected to a drying period of 16 h at (40 ± 2) °C and ≤ 50 % RH followed by a recovery period of at least 1 h under standard laboratory conditions.

The transmission threshold of the specimen shall be measured again in accordance with Annex A. The threshold value $A_{after}$ shall be recorded.

#### 8.3.15.3 Requirements

No alarm or fault signal, attributable to the endurance conditioning, shall be given on reconnection of the specimen.

The difference $|A_{after} – A|$ shall be less than 6 dB, where $A$ was measured in reproducibility test.

### 8.3.16 Shock (operational)

#### 8.3.16.1 Object of the test

To demonstrate the immunity of the specimen to mechanical shocks which are likely to occur in the anticipated service environment.

#### 8.3.16.2 Test procedure

The specimen shall be exposed to the conditions given in Table 14.

The test apparatus and the test procedure shall be as described in EN 60068-2-27, test Ea, for a half sine wave pulse, but with the peak acceleration related to the specimen mass as indicated in Table 14.

**Table 14 — Conditions for shock (operational)**

| Exposure | Other components |
|---|---|
| Shock pulse type | Half sine |
| Pulse duration | 6 ms |
| Peak acceleration | $10 \times (100 – 20\ M)$ m/s$^2$, where $M$ is the mass of the specimen in kilogram |
| Number of directions | 6 |
| Pulses per direction | 3 |

No test is applied for specimen with a mass > 4,75 kg.

The specimen shall be monitored during the conditioning period and for a further 2 min to detect any alarm or fault signal.

After the conditioning the transmission threshold of the specimen shall be measured again in accordance with Annex A. The threshold value $A_{after}$ shall be recorded.

#### 8.3.16.3 Requirements

No alarm or fault signal shall be given during the conditioning.

The difference $|A_{after} - A|$ shall be less than 6 dB, where $A$ was measured in reproducibility test.

### 8.3.17 Impact (operational)

#### 8.3.17.1 Object of the test

To demonstrate the immunity of the specimen to mechanical impacts upon its surface which it may sustain in the normal service environment and which it can reasonably be expected to withstand.

#### 8.3.17.2 Test procedure

The specimen shall be exposed to the conditions given in Table 15.

**Table 15 — Conditions for impact (operational)**

| Exposure | Components conditioned with spring hammer in accordance with the relevant part of EN 54, e.g. CIE | Other components conditioned with swinging hammer in accordance with the relevant part of EN 54, e.g. smoke detectors |
|---|---|---|
| Impact energy | (0,5 ± 0,04) J | (1,9 ± 0,1) J |
| Hammer velocity | — | (1,5 ± 0,13) m/s |
| Number of impacts | 3 per spot | 1 |
| Number of positions | In accordance with the relevant part of EN 54 | |

The specimen shall be monitored during the conditioning period and for a further 2 min to detect any alarm or fault signal.

After the conditioning the transmission threshold of the specimen shall be measured again in accordance with Annex A. The threshold value $A_{after}$ shall be recorded.

#### 8.3.17.3 Requirements

No alarm or fault signal shall be given during the conditioning.

The difference $|A_{after} - A|$ shall be less than 6 dB, where $A$ was measured in reproducibility test.

### 8.3.18 Vibration, sinusoidal (operational)

#### 8.3.18.1 Object of the test

To demonstrate the immunity of the specimen to vibration at levels considered appropriate to the normal service environment.

#### 8.3.18.2 Test procedure

The specimen shall be exposed to the conditions given in Table 16.

The test apparatus and the test procedure shall be as described in EN 60068-2-6, test Fc.

**Table 16 — Conditions for vibration (operational)**

| Exposure | CIE | Other components |
|---|---|---|
| Frequency range | (10 to 150) Hz | (10 to 150) Hz |
| Acceleration amplitude | 0,981 $m/s^2$ | 5 $m/s^2$ |
| Number of axes | 3 | 3 |
| Sweep rate | 1 octave per minute | 1 octave per minute |
| Number of sweep cycles | 1 per axis | 1 per axis |

The specimen shall be monitored during the conditioning period to detect any alarm or fault signal.

After the conditioning the transmission threshold of the specimen shall be measured again in accordance with Annex A. The threshold value $A_{after}$ shall be recorded.

#### 8.3.18.3 Requirements

No alarm or fault signal shall be given during the conditioning.

The difference $|A_{after} – A|$ shall be less than 6 dB, where $A$ was measured in reproducibility test.

### 8.3.19 Vibration, sinusoidal (endurance)

#### 8.3.19.1 Object of the test

To demonstrate the ability of the specimen to withstand the long term effects of vibration at levels appropriate to the service environment.

#### 8.3.19.2 Test procedure

The specimen shall be disconnected from its power supply and be exposed to the conditions given in Table 17.

The test apparatus and the test procedure shall be as described in EN 60068-2-6, test Fc.

**Table 17 — Conditions for vibration (endurance)**

| Exposure | CIE | Other components |
|---|---|---|
| Frequency range | (10 to 150) Hz | (10 to 150) Hz |
| Acceleration amplitude | 5 $m/s^2$ | 10 $m/s^2$ |
| Number of axes | 3 | 3 |
| Sweep rate | 1 octave per minute | 1 octave per minute |
| Number of sweep cycles | 20 per axis | 20 per axis |

After the conditioning the transmission threshold of the specimen shall be measured in accordance with Annex A. The threshold value $A_{after}$ shall be recorded.

#### 8.3.19.3 Requirements

No alarm or fault signal, attributable to the endurance conditioning shall be given on reconnection of the specimen.

The difference $|A_{after} – A|$ shall be less than 6 dB, where $A$ was measured in reproducibility test.

### 8.3.20 Electromagnetic Compatibility (EMC), Immunity tests (operational)

#### 8.3.20.1 Object of the test

To demonstrate the immunity to electromagnetic disturbances which can occur in the normal service environment.

#### 8.3.20.2 Test procedure

The following EMC immunity tests shall be carried out as described in EN 50130-4:

a) electrostatic discharge;

b) radiated electromagnetic fields;

c) conducted disturbances induced by electromagnetic fields;

d) fast transient bursts;

e) slow high energy voltage surges;

f) mains supply voltage variations;

g) mains supply voltage dips and short interruptions.

The specimen shall be monitored during the conditioning period to detect any alarm or fault signal.

After the conditioning the transmission threshold of the specimen shall be measured again in accordance with Annex A. The threshold value $A_{after}$ shall be recorded.

#### 8.3.20.3 Requirements

For these tests the criteria for compliance specified in EN 50130-4, in the appropriate part of EN 54 and the following shall apply:

The difference $|A_{after} – A|$ shall be less than 6 dB, where $A$ was measured in reproducibility test.

# Annex A
(normative)

# Test configuration by using radio frequency shielded test equipment

## A.1 Radio frequency shielded test equipment for the component or the radio part of the component transmitting the alarm signal

The component or the radio part of the component transmitting the alarm signal shall be mounted in a test equipment as shown in Figure A.1 which complies with the following:

a) the test equipment shall be a radio frequency shielded metal casing which provides sufficient attenuation of the radio frequency free field from the transmitter in order to avoid any possible free field transmitted signal activation of the corresponding receiver;

b) the cavity resonances shall be reduced by covering the inside of the casing with a radio frequency absorbing material (e.g. by ferrite tiles) or by other means;

c) the mechanical positioning of the component or the radio part of the component transmitting the alarm signal shall be reproducible to the extent where the output level from the equipment does not change more than ± 1 dB after removal and remounting;

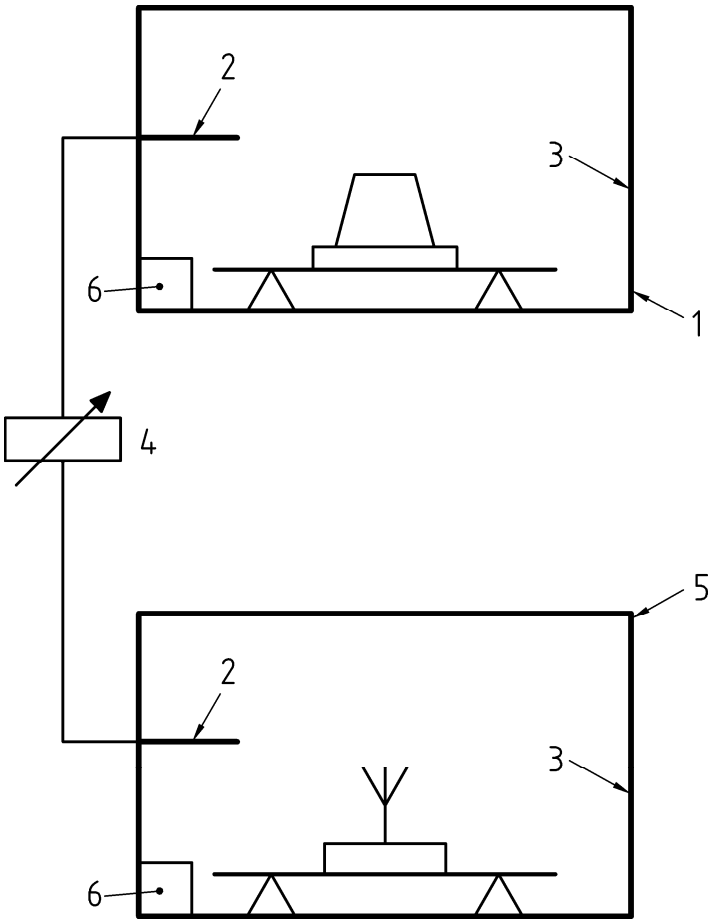
d) a honeycomb shall be mounted at each side of the RF-shielded box and filtered-through connections shall be available at the side of the box to enable functional testing to be carried out. Through the honeycombs it is possible for instance to activate an inside mounted smoke detector by applying a test smoke or to activate an inside mounted heat detector by applying heat from for instance a hair dryer. Also filtered-through connections shall be available at the side of the RF-shielded box to allow mains or low voltage AC/DC signals to be fed into the box for powering the component or the radio part of the component transmitting the alarm signal or to enable powering of appliances for activation of its different types;

e) the small holes in the honeycombs can be used for external manual activation of the component or the radio part of the component transmitting the alarm signal by means of some non-conducting activation rod, e.g. when using push-button types of manual call points;

f) the equipment shall not be affected by the different environmental test exposures with respect to the output level by more than ± 1 dB, i.e. avoid the use of dielectric materials which change the relative dielectric constant under different temperature and humidity conditions;

g) the antenna of the component or the radio part of the component transmitting the alarm signal shall be fixed in the same position during all the environmental tests in accordance with the specification given by the manufacturer.

NOTE The purpose of working with test equipment is to convert the free field transmission into a cable signal transmission situation, where the test reproducibility is high and the immunity to the interfering surroundings negligible.




**Key**

1 radio frequency shielded box for the FDAS part with a component transmitting the alarm signal
2 antenna
3 radio frequency absorbing material
4 RF attenuator ($A_T$ = 0 dB to 100 dB)
5 radio frequency shielded box for the FDAS part with a component receiving the alarm signal
6 inputs/outputs, e.g. mains, DC or signalling

**Figure A.1 — Radio frequency shielded test equipment and interconnections**

## A.2 Radio frequency shielded test equipment for the component or the radio part of the component receiving the alarm signal

The component or the radio part of the component receiving the alarm signal shall be mounted in a test equipment as shown in Figure A.1 which complies with the following:

a) the test equipment shall be a radio frequency shielded metal casing which provides a very high attenuation of the radio frequency free field signal from the corresponding transmitter in order to avoid any possible free field transmitted signal activation of the receiver;

b) the cavity resonance shall be reduced by covering the inside of the casing with a radio frequency absorbing material (e.g. by ferrite tiles) or by other means;

c) the mechanical positioning of the component or the radio part of the component receiving the alarm signal shall be reproducible to the extent where the attenuation level for 80 % of successful transmission trials,

as measured by the RF-attenuator connected between the two test equipment, does not change more than ± 1 dB after its removal and remounting;

d) the equipment shall not be affected by the different environmental test exposures with respect to the measured attenuation level for 80 % of successful transmission trials, as measured by the RF-attenuator connected between the two test equipment, with more than ± 1 dB, i.e. avoid the use of dielectric materials which change the relative dielectric constant under different temperature and humidity conditions;

e) the antenna of the component or the radio part of the component receiving the alarm signal shall be fixed in the same position during all the environmental tests in accordance with the specification given by the manufacturer.

NOTE The purpose of working with a test equipment is to convert the free field transmission into a cable signal transmission situation, where the test reproducibility is high and the immunity to the interfering surroundings negligible. For the test equipment used for the component or the radio part of the component receiving the alarm signal, it is in general more difficult to achieve a high degree of screening, since mains power and/or input/output cables are led through the screened casing.

## A.3 Cable connection between test equipment with component transmitting the alarm signal and test equipment with component receiving the alarm signal

The equipment as described in A.1 and A.2 are interconnected by shielded cables with the radio frequency attenuator connected in series with the signalling lead as shown in Figure A.1.

The complete test set-up shall provide sufficient attenuation to avoid direct coupling between the components under test.

## A.4 Determination of the transmission threshold *A*

The transmission threshold *A* is the highest value of attenuation where a minimum of 80 % of the alarm transmission trials are successful. This value is found by affecting the component or the radio part of the component to change from its normal condition to alarm condition by e.g. applying smoke, heat, light or by mechanical movements of rods.

In most cases the highest *A* value, where 80 % of the alarm transmission trials are successful, can be found as the *A* value, where 4 out of 5 transmission trials are successful.

Some components or radio parts of the component are polled at certain time intervals by the control and indicating equipment or its related repeater/gateway and some just transmit a message telling that it is alive. If the time intervals between these status transmissions are known and sufficiently short, and if the transmitted power from the component or radio parts of the component is the same as when transmitting alarm signals, the transmissions of status signals can be used to verify the highest *A* value instead. The attenuator is simply increased until a fault indication due to no communication with the component or radio parts of the component is given on the control and indicating equipment. Having found what is believed to be the highest *A* value, the *A* value is finally verified by performing alarm transmission trials as described above starting at the same *A* value.

The alarm condition of the component or radio parts of the component is achieved by many different methods depending on the type of device. Therefore, the method of generating alarms shall be suitable for the type of component or radio parts of the component under test.

For fire detectors such as smoke, heat or flame detectors, the test smoke, heat generator or flickering light test source can be applied to the detector through the honeycombs, which are installed at both sides of the RF-test equipment in accordance with A.1.

For manual call points the alarm triggering element or service facility can be affected to change it to alarm condition by pressing or pushing on it by a rod made of a non-conducting material and led through the honeycomb cells. It shall be ensured before the test starts that the test object is securely fixed at the mounting plate inside the test equipment.

During the conditioning period of the operational climatic tests it shall be ensured that the components under test are exposed to the climatic conditions. This can be achieved e.g. by opening the box, except for the measurement of the attenuation.

In general it is very important that all cables as well as the equipment under test are properly fixed to the mounting plate in the same position during each *A* measurement. If this is not the case, deviations in the *A* values due to the positioning can influence the test result.

# Annex B
(normative)

# Immunity to site attenuation (path loss)

NOTE See 4.2.1.

Experience shows that in practice the occurrence of site attenuation fluctuations can be managed by adherence to the following requirement.

The attenuation reserve as required in 4.2.1 b) shall be calculated as follows:

$$A_{reserve} \geq 10 \log (f)$$

*f* frequency in MHz

By using one of the methods of Table B.1 the attenuation reserve can be reduced, but shall not be less than 10 dB.

**Table B.1 — Methods for the reduction of the attenuation reserve**

| Method | Minimum attenuation reserve |
|---|---|
| Standard transmission link | $A_{reserve}/1$ |
| Automatic alteration of the directional characteristics of the transmitter or receiver aerial<br>Gain difference at least 5 dB (e.g. aerial diversity) | $A_{reserve}/1,5$ |
| Automatic change in carrier frequency by at least 1 MHz | $A_{reserve}/2$ |
| Automatic space diversity<br>Distance between two antennas at least two times the wavelength | $A_{reserve}/3$ |
| The destination of the alarm signal (CIE) can be reached automatically via multiple routes (repeaters) | $A_{reserve}/3$ |

# Annex C
(informative)

# Data and calculation of the service life of the autonomous power source(s)

NOTE See 5.3.2.

The manufacturer should declare the type of the autonomous power source and its service life for the component in normal operation. The service life can be attested by a statement of calculation. This calculation should take into account the mean consumption and voltage under quiescent and at standard atmospheric conditions.

Table C.1 shows an example of data required from the manufacturer of a detector with sounder function. The way of the example calculation is given in Table C.2.

**Table C.1 — Data required for the calculation of the service life**

| Parameters | Variables and calculations | Example values |
|---|---|---|
| **COMPONENT PARAMETERS** | | |
| **General circuit** | | |
| Processor current consumption | $I_{PR}$ | 10,86 µA |
| Tantalum capacitor leakage current | $I_{CL}$ | 3,7 µA |
| Voltage detector leakage current | $I_{DL}$ | 2,4 µA |
| Voltage regulator leakage current | $I_{VL}$ | 0,8 µA |
| Subtotal quiescent current consumption | $I_Q = I_{PR} + I_{CL} + I_{DL} + I_{VL}$ | 17,76 µA |
| **Receiver** | | |
| Receiver current consumption | $I_R$ | 3,4 mA |
| Receiver on time (no message) | $t_{Ron}$ | 32,8 ms |
| Period of wakeups | $T_W$ | 1,35 s |
| Number of receiver wakeups per hour | $N_{RW} = 3\,600$ s/h/$T_W$ | 2 666,67 |
| **Transmitter** | | |
| Transmitter current consumption | $I_T$ | 32,1 mA |
| Transmitter on time (periodic communications) | $t_{Ton}$ | 352 ms |
| Period of periodic communications | $T_{PC}$ | 6 min |
| Number of periodic communications per hour | $N_{PC} = 60$ min/h/$T_{PC}$ | 10 |
| **Sounder** | | |
| Current consumption | $I_S$ | 50 mA |
| **PARAMETERS FOR FREQUENT FUNCTION TEST** | | |
| **Sounder** | | |
| Sounder current consumption | $I_S$ | 50 mA |
| Sounder on time | $t_{test}$ | 8,36 min |
| Number of tests per week | $N_{Soundtest}$ | 1 |

**Table C.1** (*concluded*)

| | | |
|---|---|---|
| **LED** | | |
| LED current consumption | $I_{LED}$ | 8 mA |
| LED on time | $t_{LEDon}$ | 5 min |
| Number of tests per year | $N_{LEDtest}$ | 1 |
| Number of tests per week | $N_{LEDtest}$/(52 weeks/year) | 1/52 |
| **POWER SUPPLY PARAMETERS** | | |
| **Battery data** | | |
| Theoretical available battery capacity for battery No. 1 | $C_{batt1}$ | 7,75 Ah |
| Theoretical available battery capacity for battery No. 2 | $C_{batt2}$ | 2,70 Ah |
| Total battery capacity theoretical available | $C_{batt} = C_{batt1} + C_{batt2}$ | 10,45 Ah |

**Table C.2 — Example calculation of the service life of an autonomous power source**

| Parameters | Variables and calculations | Example values |
|---|---|---|
| **Capacity required by the component** | | |
| 30 min sounding before end of life | $C_S = 0{,}5\ h \times I_S$ | 25 mAh |
| Quiescent circuit capacity demand for 1 week | $C_Q = I_Q \times 168$ h/week | 2,98 mAh/week |
| Periodic communications capacity demand per week | $C_P = I_T \times t_{Ton} \times N_{PC}/(3\,600$ s/h) $\times 168$ h/week | 5,27 mAh/week |
| Receiver capacity demand per week | $C_R = I_R \times t_{Ron} \times N_{RW}/(3\,600$ s/h) $\times$ 168 h/week | 13,9 mAh/week |
| **Fire tests 5 min** | | |
| Capacity used for sounder | $C_{Sounder} = I_S \times t_{test}/(60$ min/h) $\times N_{Soundtest}$ | 6,96 mAh/week |
| Capacity used for LED | $C_{LED} = I_{LED} \times t_{LEDon}/(60$ min/h) $\times N_{LEDtest}/(52$ weeks/year) | 0,0128 mAh/week |
| **Total quiescent capacity usage per week** | $C_{total} = C_Q + C_P + C_R + C_{Sounder} + C_{LED}$ | 29,12 mAh/week |
| **Total capacity required by the powered component in the last 30 days** | | |
| End on life reserve for 30 min sounding | $C_S$ | 0,025 Ah |
| End of life 30 days quiescent operation | $C_{30} = C_{total} \times 4$ weeks | 0,116 Ah |
| **Available battery capacity for service life** | $C_{av} = C_{batt} - C_S - C_{30}$ | 10,31 Ah |
| **Service life of the power source** | | |
| Actual usage of the power source | $t_{Life} = C_{av}/C_{total}$ | 354 weeks |
| Actual usage of the power source | $t_{Life} = C_{av}/C_{total}$/(52 weeks/year) | 6,8 years |

# Annex ZA
(informative)

# Clauses of this European Standard addressing the provisions of the EU Construction Products Directive (89/106/EEC)

## ZA.1 Scope and relevant clauses

This European Standard has been prepared under the mandate M/109 "Fire alarm/detection, fixed firefighting, fire and smoke control and explosion suppression products" given to CEN by the European Commission and the European Free Trade Association.

The clauses of this European Standard, shown in this annex, meet the requirements of the Mandate given under the EU Construction Products Directive (89/106/EEC).

Compliance with these clauses confers a presumption of fitness of the construction products covered by this annex for the intended use indicated herein; reference shall be made to the information given with the CE marking (see ZA.3).

**WARNING — Other requirements and other EU Directives may be applicable to the products falling within the scope of this standard.**

NOTE In addition to any specific clauses relating to dangerous substances contained in this standard, there may be other requirements applicable to the products falling within its scope (e.g. transposed European legislation and national laws, regulations and administrative provisions). In order to meet the provisions of the EU Construction Products Directive, these requirements need also to be complied with, when and where they apply. An informative database of European and national provisions on dangerous substances is available at the Construction web site on EUROPA (accessed through: http://ec.europa.eu/enterprise/construction/internal/dangsub/dangmain.htm).

This Annex ZA has the same scope, in relation to the products covered, as Clause 1 of this European Standard. This annex establishes the conditions for the CE marking of components using RF links intended for the use shown below and identifies the relevant clauses applicable (see Table ZA.1).

**Construction products:** Components using RF links for fire detection and fire alarm systems in and around buildings.

**Intended use:** Fire safety.

**Table ZA.1 — Relevant clauses**

| Essential characteristics | Requirement clauses in this European Standard | Mandated level(s) and class(es) | Notes |
|---|---|---|---|
| Performance parameters under fire conditions | 4.1, 4.2.2, 5.2, 8.3.7 | None | [a] |
| Response delay (response time to fire) | 8.2.3, 8.2.6 | | [a] |
| Operational reliability | 4.2.1, 4.2.3 to 4.2.7, 5.3, 5.4, 6, 7, 8.2.2, 8.2.4, 8.2.5, 8.2.7, 8.2.8 [b], 8.2.9, 8.3.1, 8.3.2, 8.3.3, 8.3.4, 8.3.5, 8.3.6 | | |
| Durability of operational reliability, Temperature resistance | 8.3.9 [c], 8.3.10 [c], 8.3.11 | | |
| Durability of operational reliability, Vibration resistance | 8.3.16 [c], 8.3.17 to 8.3.19 | | |
| Durability of operational reliability, Humidity resistance | 8.3.12 [d], 8.3.13 [e], 8.3.14 | | |
| Durability of operational reliability, Corrosion resistance | 8.3.15 [c] | | |
| Durability of operational reliability, Electrical stability | 8.3.20 | | |

[a] The products covered by this standard are assumed to enter the alarm condition, in an event of fire, before the fire becomes so large as to affect their functioning. There is therefore no requirement to function when exposed to direct attack from fire.

[b] Only applicable to components required to indicate loss of communication or to transmit this information to the CIE.

[c] Not applicable for CIE.

[d] Not applicable for CIE and smoke detectors.

[E] Only applicable for CIE and smoke detectors.

## ZA.2 Procedures for the attestation of conformity of components using RF links covered by this standard

### ZA.2.1 System of attestation of conformity

The system of attestation of conformity of components using RF links indicated in Table ZA.1 in accordance with the Decision of the European Commission 96/577/EC of 1996-06-24 (*see OJEC L254 of 1996-10-08*), as amended by 2002/592/EC of 2002-07-15 (*see OJEC L192, 2002-07-20*), as given in Annex III of the Mandate for fire alarm/detection, fixed firefighting, fire and smoke control and explosion suppression products, is shown in Table ZA.2 for the indicated intended use and relevant level or class.

**Table ZA.2 — Attestation of conformity system**

| Product | Intended use | Levels or classes | Attestation of conformity system |
|---|---|---|---|
| Fire detection/Fire alarm: Components using RF links | Fire safety | None | 1 [a] |
| [a] System 1: See CPD Annex III.2.(i), without audit-testing of samples by the notified body. | | | |

## ZA.2.2 Evaluation of conformity

### ZA.2.2.1 General

The evaluation of conformity of the product (i.e. component using radio links) with the requirements of this European Standard shall be demonstrated by:

a) tasks under responsibility of the manufacturer:

   1) factory production control;

   2) further testing of samples by the manufacturer in accordance with a prescribed test plan;

b) tasks under responsibility of a notified product certification body:

   1) initial type testing of the product;

   2) initial inspection of the factory and factory production control;

   3) continuous surveillance, assessment and approval of the factory production control.

NOTE The manufacturer is a natural or legal person, who places the product on the market under his own name. Normally, the manufacturer designs and manufactures the product himself. As a first alternative, he may have it designed, manufactured, assembled, packed, processed or labelled by subcontracting. As a second alternative he may assemble, pack, process, or label ready-made products.

The manufacturer shall ensure:

— that the initial type testing in accordance with this European Standard is initiated and carried out (where relevant, under the responsibility of a notified product certification body) and

— that the product continuously complies with the initial type testing samples, for which compliance with the European Standard in question has been verified.

He shall always retain the overall control and shall have the necessary competence to take the responsibility for the product.

### ZA.2.2.2 Initial type testing

**ZA.2.2.2.1** Initial type testing shall be performed to demonstrate conformity with this European Standard.

Initial type testing of the product shall be carried out in accordance with the clauses shown in Table ZA.1, except as described in ZA.2.2.2.2 and ZA.2.2.2.3.

**ZA.2.2.2.2** Tests previously performed, such as type tests for product certification, may be taken into account for the purpose of the type testing as required by this European Standard providing that they were made to the

same or a more rigorous test method under the same system of attestation of conformity as required by this European Standard on the same product or products of similar design, construction and functionality, such that the results are applicable to the product in question.

NOTE Same system of attestation of conformity means testing by an independent third party under the responsibility of a product certification body which is now a notified product certification body.

**ZA.2.2.2.3** Where one or more characteristics are the same for products with similar design, construction and functionality, then the results of tests for these characteristics on one product may be applied to the other similar product or products.

**ZA.2.2.2.4** Test samples shall be representative of the normal production. If the test samples are prototypes, they shall be representative of the intended future production and shall be selected by the manufacturer.

NOTE In the case of prototypes and third party certification, this means that it is the manufacturer, not the product certification body who is responsible for selecting the samples. During the initial inspection of the factory and of the factory production control (see ZA.2.2.3.4), it is verified that the initial type tested samples are representative of the product being produced.

**ZA.2.2.2.5** All initial type testing and its results shall be documented in a test report. All test reports shall be retained by the manufacturer for at least ten years after the last date of production of the product to which they relate.

### ZA.2.2.3 Factory production control

#### ZA.2.2.3.1 General

Factory production control (FPC) is the permanent internal control of production exercised by the manufacturer.

All the elements, requirements and provisions adopted by the manufacturer shall be documented in a systematic manner in the form of written policies and procedures. This production control system documentation shall ensure a common understanding of conformity evaluation and enable the achievement of the required product characteristics and the effective operation of the production control system to be checked.

Factory production control therefore brings together operational techniques and all measures allowing maintenance and control of the conformity of the product with its technical specifications. Its implementation may be achieved by controls and tests on measuring equipment, raw materials and constituents, processes, machines and manufacturing equipment and finished products, including material properties in components, and by making use of the results thus obtained.

#### ZA.2.2.3.2 General requirements

The manufacturer shall establish, document and maintain a FPC system to ensure that the products placed on the market conform to the stated performance characteristics and the samples subjected to initial type testing.

Where subcontracting takes place, the manufacturer shall retain the overall control of the product and ensure that he receives all the information that is necessary to fulfil his responsibilities according to the European Standard in question. If the manufacturer has part of the product designed, manufactured, assembled, packed, processed and/or labelled by subcontracting, the FPC of the subcontractor may be taken into account, where appropriate, for the product in question. The manufacturer who subcontracts all of his activities may in no circumstances pass these responsibilities on to a subcontractor.

The FPC system shall fulfil the requirements as described in the following clauses of EN ISO 9001:2000, where applicable:

— 4.2 except 4.2.1 a);

— 5.1 e), 5.5.1, 5.5.2;

— Clause 6;

— 7.1 except 7.1 a), 7.2.3 c), 7.4, 7.5, 7.6;

— 8.2.3, 8.2.4, 8.3, 8.5.2.

NOTE The FPC system may be part of an existing quality management system, (e.g. in accordance with EN ISO 9001:2000), the scope of which covers the manufacture of the product.

Where a quality management system is certified in accordance with EN ISO 9001:2000, by a certification body which is now a notified body, then the assessment reports of this quality management system should be taken into account with respect to these clauses.

#### ZA.2.2.3.3 Product specific requirements

The FPC system shall:

— address this European Standard and

— ensure that the products placed on the market conform to the stated performance characteristics.

The FPC system shall include a product specific FPC or quality plan, which identifies procedures to demonstrate conformity of the product at appropriate stages, i.e.:

— the controls and tests to be carried out prior to and/or during manufacture according to a frequency laid down and/or

— the verifications and tests to be carried out on finished products according to a frequency laid down.

If the manufacturer uses only finished products, the operations under b) shall lead to an equivalent level of conformity of the product as if normal FPC had been carried out during the production.

If the manufacturer carries out parts of the production himself, the operations under b) will be reduced and partly replaced by operations under a). Generally, the more parts of the production that are carried out by the manufacturer, the more operations under b) will be replaced by operations under a). In any case the operation shall lead to an equivalent level of conformity of the product as if FPC had been carried out during the production.

NOTE Depending on the specific case, it can be necessary to carry out the operations referred to under a) and b), only the operations under a) or only those under b).

The operations under a) centre as much on the intermediate states of the product as on manufacturing machines and their adjustment, and measuring equipment etc. These controls and tests and their frequency shall be chosen based on product type and composition, the manufacturing process and its complexity, the sensitivity of product features to variations in manufacturing parameters etc.

The manufacturer shall establish and maintain records that provide evidence that the production has been sampled and tested. These records shall show clearly whether the production has satisfied the defined acceptance criteria and shall be available for at least three years. These records shall be available for inspection.

Where the product fails to satisfy the acceptance measures, the provisions for non-conforming products shall apply, the necessary corrective action shall immediately be taken and the products or batches not conforming shall be isolated and properly identified. Once the fault has been corrected, the test or verification in question shall be repeated.

The results of controls/tests and verification shall be properly recorded. The product description, date of manufacture, test method adopted, test results and acceptance criteria shall be entered in the records under the signature of the person responsible for the control/test and verification. With regard to any control result not meeting the requirements of this European Standard, the corrective measures taken to rectify the situation (e.g. a further test carried out, modification of manufacturing process, and throwing away or putting right of product) shall be indicated in the records.

Individual products or batches of products and the related manufacturing documentation shall be completely identifiable and retraceable.

#### ZA.2.2.3.4 Initial inspection of factory and FPC

Initial inspection of factory and FPC shall be carried out when the production process has been finalised and preferably in operation. The factory and FPC-documentation shall be assessed to verify that the requirements of ZA.2.2.3.1 and ZA.2.2.3.2 are fulfilled.

In the assessment it shall be verified:

a) that all resources necessary for the achievement of each product characteristics required by this European Standard are or will be available and

b) that the FPC procedures in accordance with the FPC-documentation are or will be implemented and followed in practice and

c) that each product complies or will comply with the initial type testing samples, for which compliance with this European Standard has been verified.

All locations where final assembly or at least final testing of the relevant product is performed shall be assessed to verify that the above conditions a) to c) are in place.

If the FPC system covers more than one product, production line or production process, and it is verified that the general requirements are fulfilled when assessing one product, production line or production process, then the assessment of the general requirements does not need to be repeated when assessing the FPC for another product, production line or production process.

Provided that the production process is similar, assessments previously performed in accordance with the provisions of this standard may be taken into account providing that they were made to the same system of attestation of conformity on the same product or products of similar design, construction and functionality, such that the results may be considered applicable to the product in question.

NOTE Same system of attestation of conformity means inspection of FPC by an independent third party under the responsibility of a product certification body which is now a notified product certification body.

All assessments and their results shall be documented in a report.

#### ZA.2.2.3.5 Continuous surveillance of FPC

Surveillance of the FPC shall be undertaken at least once a year.

The surveillance of the FPC shall include a review of the quality plan(s) and production process(es) for each product to determine if any changes have been made since the last assessment or surveillance and the significance of any changes shall be assessed.

Checks shall be made to ensure that the quality plans are still correctly implemented and that the production equipment is still correctly maintained and calibrated.

The records of tests and measurement made during the production process and to finished products shall be reviewed to ensure that the values obtained still correspond with those values for the samples submitted to initial type testing and that the correct actions have been taken for non-compliant devices.

The surveillance of the FPC may be carried out as part of a surveillance or reassessment of a quality management system (e.g. in accordance with EN ISO 9001:2000).

#### ZA.2.2.4 Procedure for modifications

If modifications are made to the product, production process or FPC system that could affect any of the product characteristics required by this European Standard, then all characteristics covered by the clauses shown in Table ZA.1, which may be changed by the modification, shall be subject to initial type testing or engineering evaluation, except as described in ZA.2.2.2.3 and ZA.2.2.2.4. Where relevant, a re-assessment of the factory and of the FPC system shall be performed for those aspects, which may be affected by the modification.

All assessments and its results shall be documented in a report.

## ZA.3 CE marking and labelling and accompanying documentation

The manufacturer, or his authorized representative established in the EEA, is responsible for the affixing of the CE marking. The CE-marking symbol (in accordance with Directive 93/68/EEC) shall be placed on the product and shall be accompanied by the number of the EC certificate of conformity and the notified product certification body number. If the notified body number is included as part of the number of the EC certificate of conformity, then the number of the EC certificate of conformity is sufficient.

The CE marking symbol shall in addition be shown on the accompanying commercial documentation supplemented by:

— the identification number of the notified product certification body;

— the name or identifying mark and registered address of the manufacturer;

— the last two digits of the year in which the marking was affixed;

— the number of the EC certificate of conformity;

— the reference to this European Standard (i.e. EN 54-25), its date and any amendments;

— description of the product, as:

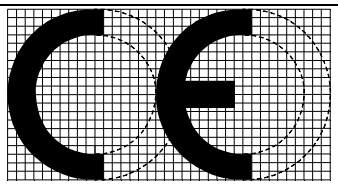
  — generic name: component using RF links,

  — intended use: for fire detection and fire alarm systems for buildings,

  — type/model designation of the product;

— other information required by 12.2.1 or a reference to a document, which shall be uniquely identifiable and available from the manufacturer, containing this information.

Figure ZA.1 gives an example of the CE marking information to be given in the accompanying commercial documentation.



0123

AnyCo Ltd, P.O. Box 21, B1050
08
0123—CPD—002

EN 54-25

Component using RF links for fire detection and fire alarm systems for buildings
ABC 123
Technical data: see Doc.123 held by the manufacturer.

**Figure ZA.1 — Example of CE marking information to be given in the accompanying commercial documentation**

NOTE 1 European legislation without national derogations needs not to be mentioned.

NOTE 2 Affixing the CE marking symbol means, if a product is subject to more than one directive, that it complies with all applicable directives.

## ZA.4 EC certificate of conformity and EC declaration of conformity

When compliance with this annex is achieved, the notified product certification body shall draw up a certification of conformity (i.e. EC certification of conformity), which entitles manufacturer to affix the CE marking. This certificate shall include:

— the name, address and identification number of the notified product certification body;

— the certificate number;

— the name and address of the manufacturer, or his authorised representative established in the EEA;

NOTE 1 The manufacturer may also be the person responsible for placing the product onto the EEA market, if he takes responsibility for CE marking.

— the description of the construction product (i.e. component using RF links for fire detection and fire alarm systems for buildings);

— the type/model designation of the product;

— the provisions to which the product conforms (i.e. Annex ZA of this EN);

— any particular conditions applicable to the use of the product (if necessary);

— any conditions of validity of the certificate, where applicable;

— the name of and position held by the person empowered to sign the certificate.

In addition, the manufacturer shall draw up and retain a declaration of conformity (i.e. EC declaration of conformity) including the following:

— the name and address of the manufacturer, or his authorised representative established in the EEA;

— the description of the construction product (i.e. component using RF links for fire detection and fire alarm systems for buildings) and a copy of the information accompanying the CE marking;

NOTE 2 Where some of the information required for the declaration is already given in the CE marking information, it does not need to be repeated.

— the type/model designation of the product;

— the provisions to which the product conforms (i.e. Annex ZA of this EN), and a reference to the initial type testing report(s) and factory production control records (if appropriate);

— any particular conditions applicable to the use of the product (if necessary);

— the number of accompanying EC certificate of conformity;

— the name of and position held by the person empowered to sign the declaration on behalf of the manufacturer or of his authorized representative.

The above-mentioned declaration and certificate shall be presented (if requested) in the language or languages accepted in the Member State in which the product is intended to be used.

# Bibliography

[1] EN 54-13:2005, *Fire detection and fire alarm systems — Part 13: Compatibility assessment of system components*

[2] EN 54-18, *Fire detection and fire alarm systems — Part 18: Input/output devices*

[3] REC 70/03, ERC RECOMMENDATION 70-03 (Tromsø 1997 and subsequent amendments) Relating to the use of short range devices (SRD) — Recommendation adopted by the Frequency Management, Regulatory Affairs and Spectrum Engineering Working Groups; Version of 21 October 2005

*blank*

# BSI — British Standards Institution

BSI is the independent national body responsible for preparing British Standards. It presents the UK view on standards in Europe and at the international level. It is incorporated by Royal Charter.

**Revisions**

British Standards are updated by amendment or revision. Users of British Standards should make sure that they possess the latest amendments or editions.

It is the constant aim of BSI to improve the quality of our products and services. We would be grateful if anyone finding an inaccuracy or ambiguity while using this British Standard would inform the Secretary of the technical committee responsible, the identity of which can be found on the inside front cover. Tel: +44 (0)20 8996 9000. Fax: +44 (0)20 8996 7400.

BSI offers members an individual updating service called PLUS which ensures that subscribers automatically receive the latest editions of standards.

**Buying standards**

Orders for all BSI, international and foreign standards publications should be addressed to Customer Services. Tel: +44 (0)20 8996 9001. Fax: +44 (0)20 8996 7001. Email: orders@bsi-global.com. Standards are also available from the BSI website at http://www.bsi-global.com.

In response to orders for international standards, it is BSI policy to supply the BSI implementation of those that have been published as British Standards, unless otherwise requested.

**Information on standards**

BSI provides a wide range of information on national, European and international standards through its Library and its Technical Help to Exporters Service. Various BSI electronic information services are also available which give details on all its products and services. Contact the Information Centre. Tel: +44 (0)20 8996 7111. Fax: +44 (0)20 8996 7048. Email: info@bsi-global.com.

Subscribing members of BSI are kept up to date with standards developments and receive substantial discounts on the purchase price of standards. For details of these and other benefits contact Membership Administration. Tel: +44 (0)20 8996 7002. Fax: +44 (0)20 8996 7001. Email: membership@bsi-global.com.

Information regarding online access to British Standards via British Standards Online can be found at http://www.bsi-global.com/bsonline.

Further information about BSI is available on the BSI website at http://www.bsi-global.com.

**Copyright**



BSI
389 Chiswick High Road
London
W4 4AL