

Fire detection and fire alarm systems —

Part 21: Alarm transmission and fault warning routing equipment

The European Standard EN 54-21:2006 has the status of a British Standard

ICS 13.220.20

National foreword

This British Standard is the official English language version of EN 54-21:2006.

The UK participation in its preparation was entrusted to Technical Committee FSH/12, Fire detection and alarm systems, which has the responsibility to:

- aid enquirers to understand the text;
- present to the responsible international/European committee any enquiries on the interpretation, or proposals for change, and keep UK interests informed;
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Fire detection and fire alarm systems - Part 21: Alarm transmission and fault warning routing equipment

Systèmes de détection et d'alarme incendie - Partie 21 :
Dispositif de transmission de l'alarme feu et du signal de
dérangement

Brandmeldeanlagen - Teil 21: Übertragungseinrichtungen
für Brand- und Störungsmeldungen

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
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Management Centre: rue de Stassart, 36 B-1050 Brussels

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Foreword

This document (EN 54-21:2006) 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of an identical text or by endorsement, at the latest by November 2006, and conflicting national standards shall be withdrawn at the latest by May 2009.

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 and system requirements.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, 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.

1 Scope

This European Standard specifies requirements, test methods and performance criteria against which the effectiveness and reliability of routing equipment capable of transmitting fire alarm and/or fault warning signals for use with fire detection and fire alarm systems installed in buildings can be assessed (see EN 54-1). The routing equipment is designed to allow the system to function in accordance with the requirements of this European Standard. It also provides for the evaluation of conformity of the equipment to the requirements of this standard.

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 54-1:1996, *Fire detection and fire alarm systems — Part 1: Introduction*

EN 54-2:1997, *Fire detection and fire alarm systems — Part 2: Control and indicating equipment*

EN 54-4:1997, *Fire detection and fire alarm systems — Part 4: Power supply equipment*

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

EN 50136-1-1:1998, *Alarm systems — Alarm transmission systems and equipment — Part 1-1: General requirements for alarm transmission systems*

EN 50136-2-1:1998, *Alarm systems — Alarm transmission systems and equipment — Part 2-1: General requirements for alarm transmission equipment*

EN 60068-1, *Environmental testing - Part 1: General and guidance (IEC 60068-1:1988 + Corrigendum 1988 + A1:1992)*

EN 60068-2-1, *Environmental testing; part 2: tests; tests A: cold (IEC 60068-2-1:1990)*

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

EN 60068-2-47, *Environmental testing - Part 2-47: Test Mounting of specimens for vibration, impact and similar dynamic tests (IEC 60068-2-47:2005)*

EN 60068-2-75, *Environmental testing - Part 2: Tests - Test Eh: Hammer tests (IEC 60068-2-75:1997)*

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

EN 60529:1991, *Degrees of protection provided by enclosures (IP code) (IEC 60529:1989)*

EN 60721-3-3:1995, *Classification of environmental conditions - Part 3: Classification of groups of environmental parameters and their severities - Section 3: Stationary use at weatherprotected locations (IEC 60721-3-3:1994)*

EN ISO 9001:2000, *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 EN 54-1:1996, EN 54-2:1997, EN 54-4:1997 and EN 50136-1-1:1998, 4.7 apply.

3.2 Abbreviations

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

CIE: Control and indicating equipment,

PSE: Power supply equipment.

4 General requirements

4.1 General

If functions other than those specified in this European Standard are provided, they shall not jeopardize the compliance with any requirements of this European Standard.

4.2 Compliance

In order to comply with this standard the routing equipment shall meet the requirements of this clause, which shall be verified by visual inspection or engineering assessment, shall be tested as described in Clause 5 and shall meet the requirements of the tests.

5 Functional requirements

5.1 Alarm transmission routing equipment

The alarm transmission routing equipment shall be capable of processing the following signals:

- a) receiving fire alarm signal from the CIE,
- b) transmitting fault warning signals to the CIE,
- c) receiving fault warning signals from the transmission network,
- d) transmitting fire alarm signal to the fire alarm receiving centre,
- e) receiving acknowledgement signal from the alarm receiving centre,
- f) transmitting acknowledgement to the CIE.

5.2 Fault warning routing equipment

The fault warning routing equipment shall be capable of processing the following signals:

- a) receiving fault warning signal from the CIE,
- b) transmitting fault warning signals to the CIE,

- c) receiving fault warning signals from the transmission network,
- d) transmitting fault warning signals to the fault warning receiving centre.

5.3 Indication of signals

The following signals shall be indicated at the routing equipment by separate light-emitting indicators for a) and b). Alternatively, the signals can be indicated at the CIE, in which case it is not necessary to indicate the signals at the routing equipment.

- a) The received acknowledgement signal from fire alarm receiving centre as defined in EN 50136-2-1:1998, 5.5.
- b) At least one common fault warning shall be used to indicate the following:
 - 1) if the acknowledgement signal is not received at the routing equipment within 100 s for type 1 and 240 s for type 2 (see Annex A, Table A.1) of the initiation of the transmitted fire alarm signal, a fault warning shall be given;
 - 2) a fault warning indicating a failure within the routing equipment (e.g. power supply failure), required to be indicated in accordance with this standard;
 - 3) a fault warning indicating a failure within the alarm transmission network;
 - 4) where the routing equipment is located in a separate enclosure from the CIE, an open circuit or short circuit of the interconnection between the routing equipment and the CIE shall be indicated at the CIE and a fault warning signal sent to the alarm receiving centre.

6 Alarm transmission and fault warning systems requirements

The performance requirements of transmission systems shall be as specified in Annex A.

The verification of this performance is detailed in Annex B.

7 Design requirements

7.1 General requirements and manufacturer's declarations

The routing equipment shall comply with the design requirements of 7.3 relevant to the technology used. Some requirements can be verified by testing. Others (e.g. long-term reliability of the routing equipment) can only be verified by inspection of the design and its accompanying documentation (product or system specification, reports etc.).

In order to assist the process of design inspection, the manufacturer shall declare the following in writing:

- a) that the design has been carried out in accordance with a factory production control system, which incorporates a set of rules for the design of all elements of the routing equipment;
- b) that all the components of the routing equipment have been selected for the intended purpose and are expected to operate within their specification when the environmental conditions outside the enclosure of the routing equipment comply with class 3K5 of EN 60721-3-3:1995.

7.2 Documentation

7.2.1 The manufacturer shall prepare installation and user documentation, which shall be submitted to the testing authority together with the routing equipment. This shall comprise at least the following:

- a) a general description of the equipment, including:
 - functions relating to other Parts of EN 54,
 - ancillary functions not required by this European Standard,
- b) technical specifications of the inputs and the outputs of the routing equipment, sufficient to permit an assessment of the mechanical, electrical and software compatibility with other components of the system (as described in EN 54-1), including where relevant:
 - the power requirements for recommended operation,
 - the maximum and minimum electrical ratings for each input and output,
 - information on the communication parameters employed on each transmission path,
 - recommended cable parameters for each transmission path,
 - fuse ratings;
- c) installation information, including:
 - the suitability for use in the various environments specified in accordance with Annex A (e.g. the supplier specifies the performance parameters of the routing equipment in a data sheet, and it is these parameters together with the different parameters of the alarm transmission system which have to fulfil the requirements of Annex A),
 - mounting instructions,
 - instructions for connecting the inputs and outputs;
- d) configuring and commissioning instructions;
- e) operating instructions;
- f) maintenance information.

7.2.2 The manufacturer shall also prepare design documentation, which shall be submitted to the testing authority together with the routing equipment. This documentation shall include drawings, parts lists, block diagrams, circuit diagrams and a functional description to such an extent that compliance with this standard may be checked and that a general assessment of the mechanical and electrical design is made possible.

7.3 Mechanical design requirements

7.3.1 The enclosure of the routing equipment shall be of robust construction, consistent with the method of installation recommended in the documentation. It shall meet at least classification IP30 of EN 60529:1991 at access level 2.

7.3.2 All light emitting indicators shall be clearly labelled to indicate their purpose. The information shall be legible at 0,8 m distance in an ambient light intensity from 100 lux to 500 lux.

7.3.3 The terminals for transmission paths and the fuses shall be clearly labelled.

7.4 Electrical and other design requirements

7.4.1 The processing of signals shall give the highest priority to the transmission of fire alarms (item E of Figure 1 of EN 54-1:1996) or fault warning (item J of Figure 1 of EN 54-1:1996). If both E and J are operated in the same routing equipment, then the highest priority should be given to fire alarms.

7.4.2 The availability of the power supply for the routing equipment shall be as a minimum on the same level as the availability of the power supply for the CIE required by EN 54-4.

7.4.3 Transitions between the main and the stand-by power sources shall not change any indications and/or the state of any outputs, except those relating to the power supplies.

7.4.4 If the routing equipment has provision for disconnecting or adjusting the main or the stand-by power source, this shall only be possible at access level 3 or 4.

7.5 Integrity of transmission paths

7.5.1 A fault in any transmission path between the routing equipment and the transmission network (as defined in EN 50136-1-1) shall not affect the correct functioning of the routing equipment or any other transmission path.

7.5.2 If the routing equipment is designed to be used with a power supply (item L of Figure 1 of EN 54-1:1996) contained in a separate enclosure, then an interface shall be provided for at least two transmission paths to the power supply, so that a short circuit or an interruption in one does not prevent the supply of power to the routing equipment.

7.6 Accessibility of indications and controls

NOTE See EN 54-2:1997, Annex A.

Access levels shall be provided on the routing equipment, from access level 1 (most accessible) to access level 4 (least accessible). Manual controls and other functions shall be grouped on the appropriate access level, as specified in EN 54-2:1997, 12.6.

7.7 Indications by means of light-emitting indicators

7.7.1 Mandatory indications from light-emitting indicators shall be visible in an ambient light intensity up to 500 lx, at any angle up to 22,5° from a line through the indicator perpendicular to its mounting surface:

- at 3 m distance: the indication of the supply of power,
- at 0,8 m distance: other indications.

7.7.2 If flashing indications are used, the on- and/or the off-periods shall be not less than 0,25 s and the frequencies of flash shall be not less than 0,2 Hz for fault indications.

7.8 Colours of indications

The colours of the general and specific indications from light-emitting indicators shall be yellow for indications of fault warnings and red for the indication of the acknowledgement.

7.9 Testing of indicators

All mandatory visible indicators at the routing equipment shall be testable by manual operation at access level 1 or 2.

7.10 Additional design requirements for software-controlled routing equipment

7.10.1 General requirements and manufacturer's declarations

The routing equipment may contain elements which are controlled by software in order to fulfil requirements of this European Standard. In this case, the routing equipment shall comply with the requirements of 7.10, as well as those of Clause 7, where relevant to the technology used. See also Annex C.

7.10.2 Software documentation

7.10.2.1 The manufacturer shall prepare documentation which gives an overview of the software design, which shall be submitted to the testing authority together with the routing equipment. This documentation shall be in sufficient detail for the design to be inspected for compliance with this European Standard, and shall comprise at least the following:

- a) a functional description of the main program flow, including:
 - a brief description of each module and the tasks it performs,
 - the way in which the modules interact,
 - the way in which the modules are called, including any interrupt processing,
 - the overall hierarchy of the program,

The functional description of the main program flow shall be explained using a clear methodology appropriate to the nature of the software, e.g. graphical representations of the system design, data flows and control flows;

- b) description of which areas of memory are used to store the program, site specific data and running data.

Where dynamic memory management is employed, a separation shall be implemented between the program, site specific data and running data, and this shall be described in connection with the method of memory allocation;

- c) a description of how the software interacts with the hardware of the routing equipment.

7.10.2.2 The manufacturer shall prepare and maintain detailed design documentation. This need not be submitted to the testing authority, but shall be available for inspection in a manner which respects the manufacturer's rights of confidentiality. This documentation shall comprise at least the following:

- a) a description of each module of the program, as it is implemented in the source code of the program, containing the following:
 - the name of the module,
 - the date and/or version reference,
 - a description of the tasks performed,
 - a description of the interfaces, including the type of data transfer, the valid data range, and the checking for valid data;
- b) the source code listing, including all global and local variables, constants and labels used, and sufficient comment for the program flow to be recognised;
- c) details of any software tools used in the preparation of the program (e.g. high level design tools, compilers or assemblers).

7.10.3 Software design

In order to ensure the reliability of the routing equipment the following requirements for software design shall apply:

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

7.10.4 Program monitoring

7.10.4.1 The execution of the program shall be monitored as under 7.10.4.2 or 7.10.4.3. If routines associated with the main functions of the program are no longer executed, this shall be indicated at least as a common fault warning as in Clause 5.

7.10.4.2 If the program executes in one processor, the execution of the routines as in 7.10.4.1 shall be monitored by a monitoring device as in 7.10.4.4.

7.10.4.3 If the program executes in more than one processor, the execution of the routines as in 7.10.4.1 shall be monitored in each processor. A monitoring device as in 7.10.4.4 shall be associated with one or more processors, and at least one such processor shall monitor the functioning of any processor not associated with such a monitoring device.

7.10.4.4 The monitoring device of 7.10.4.2 and 7.10.4.3 shall have a time base independent of that of the monitored system. The functioning of the monitoring device, and the signalling of a fault warning, shall not be prevented by a failure in the execution of the program of the monitored system.

7.10.4.5 In the event of a system fault as specified in 7.10.4.1 or 7.10.6, those parts of the routing equipment affected shall enter a safe state not later than the indication of the system fault. This safe state shall not result in the false activation of mandatory signals.

7.10.5 The storage of programs and data

7.10.5.1 All executable code and data necessary to comply with this European Standard shall be held in memory which is capable of continuous, non-maintained, reliable operation for a period of at least 10 years.

7.10.5.2 For the program, the following requirements shall apply:

- a) the program shall be held in non-volatile memory, which can only be written to at access level 4;
- b) it shall be possible to identify the version reference or references of the program at access level 3. The version reference or references shall be in accordance with the documentation of 7.10.2.1.

7.10.5.3 For site specific data, the following requirements shall apply:

- a) the alteration of site specific data shall only be possible at access level 3 or 4;
- b) the alteration of site specific data shall not affect the structure of the program;
- c) if stored in volatile memory, the site-specific data shall be protected against power loss by a back-up energy source which can only be separated from the memory at access level 4, and which is capable of maintaining the memory contents for at least 2 weeks;
- d) if stored in read-write memory, there shall be a mechanism which prevents the memory being written to during normal operation at access level 1 or 2, such that its contents are protected during a failure in program execution;

- e) it shall be possible to either read or interrogate the site specific data at access level 2 or 3, or the site specific data shall be given a version reference that shall be updated when each set of alterations is carried out;
- f) if the site specific data has a version reference, it shall be possible to identify this at access level 2.

7.10.6 The monitoring of memory contents

The contents of the memories containing the site specific data shall be automatically checked at intervals not exceeding 1 h. The checking device shall signal a system fault if a corruption of the memory contents is detected.

8 Marking

The routing equipment shall be marked with the following information, which shall be legible at access level 1:

- a) number of this Part of the Standard (EN 54-21),
- b) name or trade mark of the manufacturer or supplier,
- c) model designation (type or number).

It shall be possible to identify the code or number that identifies the production period of the routing equipment at access level 2 or 3.

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

9 Power supply

The routing equipment shall be powered by the fire alarm system power supply (item L of Figure 1 of EN 54-1:1996 as specified by EN 54-4) or by a separate power supply (item L of Figure 1 of EN 54-1:1996 as specified by EN 54-4).

10 Tests

10.1 General

10.1.1 Standard atmospheric conditions for testing

Unless otherwise stated in a test procedure, the testing shall be carried out after the test specimen has been allowed to stabilize in the standard atmospheric conditions for testing as described in EN 60068-1 as follows:

Temperature:	15 °C – 35 °C,
Relative humidity:	25 % – 75 %,
Air pressure:	86 kPa – 106 kPa.

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

10.1.2 Specimen configuration

The specimen configuration shall include the connection to the transmission path to the CIE and the network as specified by the manufacturer.

10.1.3 Mounting and orientation

Unless otherwise stated in a test procedure, the specimen shall be mounted in its usual orientation by the normal means of mounting indicated by the manufacturer. Where required for functional testing, the equipment shall be in the condition of access level 1, except where otherwise required for functional testing.

10.1.4 Electrical connection

If the test procedure requires the specimen to be in the operating condition, it shall be connected to or powered by a power supply according to EN 54-4.

Unless otherwise required, the power supply shall be in the nominal operating condition.

All transmission paths shall be connected to cables and equipment or to dummy loads. Equipment other than the routing equipment may be kept in the standard atmospheric conditions during the tests.

10.1.5 Provisions for tests

At least one example of the routing equipment shall be provided for testing compliance with this standard.

The specimen(s) submitted shall be representative of the manufacturer's normal production and shall include the claimed options.

10.2 Functional test

10.2.1 Object of the test

The object of the functional test is to demonstrate the operation of the equipment before, during and/or after the environmental conditioning.

10.2.2 Test schedule

A test schedule shall be drawn up which ensures that during the functional test each type of input function and each type of output function is exercised.

If the routing equipment has the functionality of transmitting alarm signals then the following tests shall be carried out:

Test 1

- Initiate and reset a fire alarm signal via a control panel (CIE) or other means.
- Check if the fire alarm signal is sent to the network.
- Initiate an acknowledgement signal within 100 s for Type 1 and within 240 s for Type 2.
- Check if the correct indication is given.

Test 2

- Initiate and reset a fire alarm signal via a control panel (CIE) or other means.

- Check if the fire alarm signal is sent to the network.
- Initiate an acknowledgement signal after 100 s for Type 1 and after 240 s for Type 2.
- Check if the correct indication is given.

Test 3

- Short-circuit the network.
- Check if the correct indication is given.

Test 4

- Disconnect the network.
- Check if the correct indication is given.

If the routing equipment has the functionality of transmitting fault-warning signals then the following test shall be carried out:

Test 5

- Initiate and reset a fault-warning signal to the fault warning routing equipment via a control panel (CIE) or other means.
- Check if the fault-warning signal is sent to the network and, if provided, its correct indication.

10.3 Environmental tests**10.3.1 General**

More than one specimen may be supplied for environmental testing. The tests to be applied are shown in Table 1.

Table 1 — Environmental tests

Test	Operational or endurance	Clause number
Cold	Operational	10.4
Damp heat, steady state	Operational	10.5
Impact	Operational	10.6
Vibration, sinusoidal	Operational	10.7
Electromagnetic compatibility (EMC) immunity tests	Operational	10.8
Supply voltage variations	Operational	10.9
Damp heat, steady state	Endurance	10.10
Vibration, sinusoidal	Endurance	10.11

10.3.2 Tests for one specimen

If a single specimen is supplied for environmental testing, the specimen shall be subjected to all of the tests. These may be carried out in any order. A functional test shall be carried out before and after each environmental test. The functional test after one environmental test may be taken as the functional test before the next environmental test.

10.3.3 Tests for more than one specimen

If more than one specimen is supplied for environmental testing, the tests may be divided between the specimens and carried out in any order. A functional test shall be carried out before and after each environmental test. For each specimen, the functional test after one environmental test may be taken as the functional test before the next environmental test.

10.3.4 Requirements

During the tests of 10.4 to 10.11 the specimen shall not change status in any of the functional conditions as specified in the corresponding clauses, except when such a change is required by the test procedure or when the change is a result of a functional test.

Any mechanical damage to the specimen, observed following the tests of 10.4, 10.5, 10.6, 10.7, 10.10 and 10.11, shall not jeopardize any mandatory function of this European Standard.

When subjected to the functional test each specimen shall respond correctly (see 10.2).

10.4 Cold (operational)

10.4.1 Object of the test

The object of the test is to demonstrate the ability of the specimen to function correctly at low ambient temperatures appropriate to the anticipated service environment.

10.4.2 Test procedure

10.4.2.1 General

The test procedures with gradual changes in temperature described in EN 60068-2-1 shall be used. Test Ad shall be used for heat-dissipating specimens (as defined in EN 60068-2-1) and test Ab shall be used for non heat-dissipating specimens.

10.4.2.2 Initial examination

Before conditioning, subject the specimen to the functional test.

10.4.2.3 State of the specimen during conditioning

Mount the specimen as specified in 10.1.3 and connect it to suitable power supply, monitoring and loading equipment (see 10.1.4).

The specimen shall be in the quiescent condition.

10.4.2.4 Conditioning

Apply the following severity of conditioning:

Temperature:	$(-5 \pm 3) ^\circ\text{C}$,
Duration:	16 h.

10.4.2.5 Measurements during conditioning

Monitor the specimen during the conditioning period to detect any change in status. During the last hour of the conditioning period, subject the specimen to the functional test.

10.4.2.6 Final measurements

After the recovery period, subject the specimen to the functional test and inspect it visually for mechanical damage both externally and internally.

10.5 Damp heat, steady state (operational)**10.5.1 Object of the test**

The object of the test is to demonstrate the ability of the specimen to function correctly at high relative humidity (without condensation), which may occur for short periods in the service environment.

10.5.2 Test procedure**10.5.2.1 General**

Use the test procedure described in EN 60068-2-78.

10.5.2.2 Initial examination

Before conditioning, subject the specimen to the functional test.

10.5.2.3 State of the specimen during conditioning

Mount the specimen as specified in 10.1.3 and connect it to suitable power supply, monitoring and loading equipment (see 10.1.4).

The specimen shall be in the quiescent condition.

10.5.2.4 Conditioning

Apply the following severity of conditioning:

Temperature:	$(40 \pm 2) ^\circ\text{C}$,
Relative humidity:	$(93 \begin{smallmatrix} +2 \\ -3 \end{smallmatrix}) \%$,
Duration:	4 days.

Pre-condition the specimen at the conditioning temperature $(40 \pm 2) ^\circ\text{C}$ until temperature stability has been reached, to prevent the formation of water droplets on the specimen.

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10.5.2.5 Measurements during conditioning

Monitor the specimen during the conditioning period to detect any change in status. During the last hour of the conditioning period, subject the specimen to the functional test.

10.5.2.6 Final measurements

After the recovery period, subject the specimen to the functional test and inspect it visually for mechanical damage both externally and internally.

10.6 Impact (operational)

10.6.1 Object of the test

The object of the test is to demonstrate the immunity of the equipment to mechanical impacts upon the surface, which it may sustain in the normal service environment and which it can reasonably be expected to withstand.

10.6.2 Test procedure

10.6.2.1 General

Apply the test apparatus and procedure described in EN 60068-2-75, test Ehb.

10.6.2.2 Initial examination

Before conditioning, subject the specimen to the functional test.

10.6.2.3 State of the specimen during conditioning

Mount the specimen as specified in 10.1.3 and connect it to a suitable power supply, monitoring and loading equipment (see 10.1.4).

The specimen shall be in the quiescent condition.

10.6.2.4 Conditioning

Apply impacts to all surfaces of the specimen that are accessible at access level 1.

For all such surfaces three blows shall be applied to any point(s) considered likely to cause damage to or impair the operation of the specimen.

Care shall be taken to ensure that the results from a series of three blows do not influence subsequent series.

In case of doubts, the defect shall be disregarded and a further three blows shall be applied to the same position on a new specimen.

Apply the following severity of conditioning:

Impact energy: (0,5 ± 0,04) J,

Number of impacts per point: 3.

10.6.2.5 Measurements during conditioning

Monitor the specimen during the conditioning periods to detect any changes in functional condition and to ensure that results of three blows do not influence subsequent series.

10.6.2.6 Final measurements

After the conditioning, subject the specimen to the functional test and inspect it visually for mechanical damage, both externally and internally.

10.7 Vibration, sinusoidal (operational)**10.7.1 Object of the test**

The object of the test is to demonstrate the immunity of the equipment to vibrations at levels appropriate to the service environment.

10.7.2 Test procedure**10.7.2.1 General**

Use the test procedure described in EN 60068-2-6.

NOTE The vibration operational test may be combined with the vibration endurance test, so that the specimen is subjected to the operational test conditioning followed by the endurance test conditioning in each axis.

10.7.2.2 Initial examination

Before conditioning, subject the specimen to the functional test.

10.7.2.3 State of the specimen during conditioning

Mount the specimen as specified in 10.1.3 and in accordance with EN 60068-2-47 and connect it to a suitable power supply, monitoring and loading equipment (see 10.1.4).

The specimen shall be in the quiescent condition.

10.7.2.4 Conditioning

Subject the specimen to vibration in each of the three mutually perpendicular axes in turn, one of which shall be perpendicular to the plane of mounting of the specimen.

Apply the following severity of conditioning:

Frequency range:	10 Hz to 150 Hz,
Acceleration amplitude:	0,981 m/s ² (0,1g _n),
Number of axes:	3,
Number of sweep cycles per axis:	1 for each functional condition.

10.7.2.5 Measurements during conditioning

Monitor the specimen during the conditioning periods to detect any changes in functional condition.

10.7.2.6 Final measurements

After the conditioning, subject the specimen to the functional test and inspect it visually for mechanical damage both externally and internally.

10.8 Electromagnetic (EMC) immunity tests (operational)

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

- a) mains supply voltage variations ¹⁾;
- b) mains supply voltage dips and interruptions¹⁾;
- c) electrostatic discharge;
- d) radiated electromagnetic fields;
- e) conducted disturbances induced by electromagnetic fields;
- f) fast transient bursts;
- g) slow high energy voltage surges.

10.8.2 For the tests of 10.8.1, the following shall apply:

- a) the functional test, called for in the initial and final measurements, shall be the functional test described in 10.2,
- b) the required operating condition shall be as described in 10.1.4 and the equipment shall be tested in the quiescent condition,
- c) the connections to the various inputs and outputs shall be made with unscreened cables, unless the manufacturer's installation data specifies that only screened cables shall be used,
- d) in the electrostatic discharge test, the discharges shall be applied to parts of the equipment accessible at access level 2,
- e) in the fast transient burst test, the transients shall be applied to the a.c. mains lines by the direct injection method and to the other inputs, signal, data and control lines by the capacitive clamp method,
- f) if the equipment has a number of identical types of inputs or outputs, then the tests of 10.8.1 e), f), and g), and if applicable a) and b), shall be applied to one of each type.

NOTE These tests are included as they should be applied to a PSE housed in the CIE (see 10.4.1 of EN 54-4:1997), or if the CIE includes other mains inputs for which these tests are applicable.

¹ These tests are included as they should be applied to a PSE housed in the routing equipment (see 9.4.1 of EN 54-4:1997), or if the routing equipment includes other mains inputs for which these tests are applicable.

10.9 Supply voltage variation (operational)

10.9.1 Object of the test

The object of the test is to demonstrate the ability of the specimen to function correctly over the anticipated range of supply voltage conditions.

10.9.2 Test procedure

10.9.2.1 General

The specimen shall be subjected to each of the power supply conditions specified in 10.9.2.4 until temperature stability is reached and the functional test has been conducted.

10.9.2.2 Initial examination

Before conditioning, subject the specimen to the functional test.

10.9.2.3 State of the specimen during conditioning

Mount the specimen as specified in 10.1.3 and connect it to suitable power supply, monitoring and loading equipment (see 10.1.4).

The specimen shall be in the quiescent condition.

10.9.2.4 Conditioning

Apply the following conditions:

- a) supply of power at the maximum input voltage as specified by the manufacturer, or for a CIE with an integrated PSE the conditions specified in Table 1 of EN 54-4:1997;
- b) supply of power at the minimum input voltage as specified by the manufacturer, or for a CIE with an integrated PSE the conditions specified in Table 1 of EN 54-4:1997.

10.9.2.5 Measurements during conditioning

Monitor the specimen at the supply voltage conditions until temperature stability is reached and then subject the specimen to the functional test at each voltage condition.

10.9.2.6 Final measurements

After the conditioning, subject the specimen to the functional test.

10.10 Damp heat, steady state (endurance)

10.10.1 Object of the test

The object of the test is to demonstrate the ability of the equipment to withstand the long-term effects of humidity in the service environment (e.g. changes in electrical properties due to absorption, chemical reactions involving moisture, galvanic corrosion).

10.10.2 Test procedure

10.10.2.1 General

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Use the test procedure described in EN 60068-2-78.

10.10.2.2 Initial examination

Before conditioning, subject the specimen to the functional test.

10.10.2.3 State of the specimen during conditioning

Mount the specimen as required in 10.1.3 and connect to suitable power supply, monitoring and loading equipment (see 10.1.4). The specimen shall not be supplied with power during the conditioning.

10.10.2.4 Conditioning

Apply the following severity of conditioning:

Temperature: $(40 \pm 2) ^\circ\text{C}$,

Relative humidity: $(93 \begin{smallmatrix} +2 \\ -3 \end{smallmatrix}) \%$,

Duration: 21 days.

Pre-condition the specimen at the conditioning temperature $(40 \pm 2) ^\circ\text{C}$ until temperature stability has been reached, to prevent the formation of water droplets on the specimen.

10.10.2.5 Final measurements

After the recovery period, subject the specimen to the functional test and inspect it visually for mechanical damage both externally and internally.

10.11 Vibration, sinusoidal (endurance)

10.11.1 The object of the test

The object of the test is to demonstrate the ability of the equipment to withstand the term effects of vibration at levels appropriate to the environment.

10.11.2 Test procedure

10.11.2.1 General

Use the test procedure described in EN 60068-2-6.

NOTE The vibration endurance test may be combined with the vibration operational test, so that the specimen is subjected to the operational test conditioning followed by the endurance test conditioning in each axis in turn.

10.11.2.2 Initial examination

Before conditioning subject the specimen to the functional test.

10.11.2.3 State of the specimen during conditioning

Mount the specimen as required in 10.1.3 and in accordance with EN 60068-2-47 and connect it to a suitable power supply, monitoring and loading equipment (see 10.1.4). The specimen shall not be supplied with power during the conditioning.

10.11.2.4 Conditioning

Subject the specimen to vibration in each of the three mutually perpendicular axes in turn, one of which shall be perpendicular to the plane of mounting of the specimen.

Apply the following severity of conditioning:

Frequency range:	10 Hz to 150 Hz,
Acceleration amplitude:	4,905 m/s ² (0,5 g _n),
Number of axes:	3,
Number of sweep cycles:	20 per axis.

10.11.2.5 Final measurements

After conditioning subject the specimen to the functional test and inspect it visually for mechanical damage both externally and internally.

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Annex A
(normative)

Performance requirements for alarm and fault warning transmission systems

With reference to EN 50136-1-1, the parameters in Table A.1 shall be achieved for any alarm transmission system.

Table A.1 — Requirements in accordance with EN 50136-1-1

Type of transmission system	Primary transmission path	Redundancy/duplication	Transmission time classification D ^{c)}	Transmission time, maximum values M ^{c)}	Reporting time classification T ^{c)}	Availability classification A ^{a)}	Substitution security S	Information security I
Type 1 ^{b)}	Dedicated alarm paths	In accordance with EN 50136-1-1:1998, 6.4.1	D4 = 10 s	M4 = 20 s	T5 = 90 s ^{d)}	A4 ^{a)}	S0	I0
Type 2 ^{b) e)}	Digital communicator systems using the public switched telephone network	In accordance with EN 50136-1-1:1998, 6.4.1	D4 = 10 s	M3 = 60 s	T2 = 25 h (complete path) T5 = 90 s (network access)	A4 ^{a)}	S0	I0

a) This is the overall availability that includes all signalling paths.
b) To achieve the availability requirements of this standard redundancy/duplication in accordance with EN 50136-1-1:1998, 6.4.1 may be used.
c) Each of the parameters – D, M and T – shall be fulfilled by at least one of the transmission paths of the chosen type (Type 1 or Type 2).
d) The reporting time classification T3 may be applied when using radio systems.
e) When using analogue public switched networks (PSTN) D2 and M2 may be applied.

Annex B

(normative)

Verification of performance requirements for alarm and fault warning transmission systems

B.1 General

The verification of performance requirements for alarm transmission systems (see Clause 6) shall be done in accordance with EN 50136-1-1:1998, 6.3 and the requirements stated in Annex A.

B.2 Transmission time

The transmission time shall be verified according to EN 50136-1-1:1998, 6.3.2 and the requirements stated in Annex A.

The measurement shall be carried out according to EN 50136-2-1:1998, 5.11.

B.3 Reporting time

The reporting time shall be verified according to EN 50136-1-1:1998, 6.3.3 and 6.3.4 and the requirements stated in Annex A.

The measurement is carried out according to EN 50136-2-1:1998, 5.13.

B.4 Availability

The availability shall be verified according to EN 50136-1-1:1998, 6.4 and the requirements stated in Annex A.

Annex C (informative)

Design requirements for software controlled routing equipments

The routing equipment may incorporate software controlled elements, which are required to fulfil mandatory requirements of this European Standard, but which are supplied to the manufacturer. A good example is an alphanumeric display module, but there are many possibilities, including both physical modules and embedded software (e.g. operating systems). Such elements may be traded world-wide as commodity items, and detailed software documentation (and details of the hardware design) may not be available to the routing equipment manufacturer. It is not the intention of this European Standard to forbid the use of appropriate technology, and in such cases the detailed requirements for documentation and design of 7.10.2 and 7.10.3 may be relaxed, as long as sufficient information is provided to allow performance to be evaluated. However, it is expected that products from third parties which are designed and produced exclusively for routing equipment are fully documented and fulfil the requirements. The manufacturer has to ensure that the element is of proven reliability and is suitable for the application. Proven reliability can be assumed if the components under question are freely available on the market and there is sufficient field experience (e.g. ≥ 1 year). The interface with the main application has to be clearly and comprehensively specified, and this documentation has to be available to the testing authority.

7.10.4 deals with program monitoring. The program is the software necessary for the routing equipment to carry out mandatory functions (including any declared options with requirements). The execution of the entire program has to be monitored. Monitoring can be carried out either by means of a hardware watchdog system, or by another processor. The program may include software which runs in more than one processor and software in elements supplied to manufacturer. The degree of monitoring should be sufficient to ensure that the routing equipment is at least able to meet the requirements of this standard. In the case of an alphanumeric display module, it is considered to be sufficient to routinely check that data written to the module may be read back from it.

7.10.4.5 requires that, in the event of a failure of program execution, the routing equipment shall enter a safe state. The safe state is defined by the manufacturer, but should not result in the false activation of mandatory signals, nor give a false impression to a user that the routing equipment remains operational if it is not. In practice, it may be acceptable either to stop, or automatically restart the program execution. If there is a possibility that memory may have been corrupted, the restart procedure should check the contents of this memory and if necessary re-initialise running data to ensure that the routing equipment enters a safe operating state. Even if program execution is successfully restarted, it is important that the user is made aware of the incident. For this reason it may be advantageous for the routing equipment to be capable of automatically recording details of the restart event. In any event the system fault indication has to be latched until a manual intervention.

7.10.5.1 requires that all executable code and data necessary to comply with this European Standard is held in memory which is capable of continuous, non-maintained, reliable operation for a period of at least 10 years. In the existing state of the art, memory with moving mechanical parts is not believed to be sufficiently reliable. For example the use of tapes, or magnetic or optical data discs, for the storage of programs and data could therefore not be considered to be acceptable at the time of drafting this European Standard.

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 Mandate M/109 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 (as defined by the Construction Products Directive) of the construction product covered by this European Standard for its intended use according to Clause 1 (Scope) of this European Standard; 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 European Standard, attention is drawn to other requirements that may be applicable to the products falling within its scope (e.g. transposed European legislation and national laws, regulations and administrative provisions). An informative database of European and national provisions on dangerous substances is available at the Construction web site on EUROPA (accessed through <http://europa.eu.int/comm/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 alarm transmission and fault warning routing equipment intended for the use shown below and identifies the relevant clauses applicable.

Construction product: **Alarm transmission and fault warning routing equipment for fire alarm systems installed in buildings.**

Intended use: **Fire safety.**

Table ZA.1 — Relevant clauses

Essential characteristics	Clauses in this European Standard	Mandated level(s)	Notes
Performance of transmission	4, 5	None	None
Operational reliability	4, 5, 7, 8, 9		
Durability of operational reliability, Temperature resistance	10.4		
Durability of operational reliability, Vibration resistance	10.6, 10.7, 10.11		
Durability of operational reliability, Electrical stability	10.8, 10.9		
Durability of operational reliability, Humidity resistance	10.5, 10.10		

ZA.2 Procedures for the attestation of conformity of alarm transmission and fault warning routing equipment covered by this standard

ZA.2.1 System of attestation of conformity

The mandate requires that the attestation of conformity system to be applied shall be that shown in Table ZA.2.

Table ZA.2 — Attestation of conformity system

Product	Intended use	Levels or classes	Attestation of conformity system
Fire detection/Fire alarm Alarm transmission and fault warning routing equipment	Fire safety	None	1
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 with the requirements of this European Standard shall be demonstrated by:

- a) Tasks to be provided by the manufacturer:
 - 1) factory production control;
 - 2) testing of samples by the manufacturer in accordance with a prescribed test plan;

- b) Tasks to be undertaken under the responsibility of a Notified Product Certification Body:
- 1) type testing of the product;
 - 2) initial inspection of the factory and factory production control;
 - 3) periodic 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 should 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.

The manufacturer shall always retain the overall control and shall have the necessary competence to take the responsibility for the product. The manufacturer shall be fully responsible for the conformity of the product to all relevant regulatory requirements.

ZA.2.2.2 Type testing

ZA.2.2.2.1 Type testing shall be performed to demonstrate conformity with this European Standard.

Type testing of the product should 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 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 third party, who should select 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 type tested samples are representative of the product being produced.

ZA.2.2.2.5 All 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 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 shall 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 4.2.1a),
- 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.

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 plan or quality plan, which identifies procedures to demonstrate conformity of the product at appropriate stages, i.e.:

- a) the controls and tests to be carried out prior to and/or during manufacture according to a frequency laid down; and/or
- b) 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 either case any operation under b) shall lead to an equivalent level of conformity of the product as though normal FPC had been carried out during the production (as under a)).

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 and tests 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. 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, discarding 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 FPC shall be carried out when the production process has been finalized 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 the 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 the product complies or will comply with the initial type testing samples, for which compliance with this European Standard has been verified.

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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 Periodic surveillance of FPC

Surveillance of the FPC shall be undertaken 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 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 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 their results shall be documented in a report.

ZA.3 CE marking and labelling and accompanying documentation

The manufacturer, or his authorised 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 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:

- a) identification number of the Notified Product Certification Body,
- b) name or identifying mark and registered address of the manufacturer,
- c) last two digits of the year in which the marking was affixed,
- d) number of the EC certificate of conformity,
- e) reference to this European Standard (EN 54-21), its date and any amendments,
- f) description of the construction product (i.e. Alarm transmission and fault warning routing equipment for fire alarm systems installed in buildings),
- g) type/model designation of the product,
- h) other information required by 7.2.1 or a reference to a document, which shall be uniquely identifiable and available from the manufacturer, containing this information.

NOTE Reference to a separate document is permitted only where the quantity of information would be so large that it could not practically be included in the commercial documentation accompanying the product.

Where the product exceeds the minimum performance levels stated in this standard, and where the manufacturer so desires, the CE marking may be accompanied by an indication of the parameter(s) concerned and the actual test result(s).

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

 0123
AnyCo Ltd, P.O. Box 21, B1050 06 0123 – CPD – 002
EN 54-21:2006 Alarm transmission and fault warning routing equipment for fire alarm systems installed in buildings ABC 123 Technical data: see Doc.123/2006 held by the manufacturer.

Figure ZA.1 — Example of CE marking information in the accompanying commercial documentation

ZA.4 EC certificate and declaration of conformity

The manufacturer or his authorised representative established in the EEA, shall prepare and retain a declaration of conformity, which authorizes the affixing of the CE marking. This declaration shall include:

- name and address of the manufacturer, or his authorized representative established in the EEA, and the place of production;

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.

- description of the construction product (i.e. Alarm transmission and fault warning routing equipment for fire alarm systems installed in buildings);

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.

- type/model designation of the product;
- provisions to which the product conforms (e.g. Annex ZA of this EN);
- any particular conditions applicable to the use of the product (if necessary);
- name and address (or identification number) of the Notified Product Certification Body;
- name of and position held by the person empowered to sign the declaration on behalf of the manufacturer or of his authorized representative.

The declaration shall contain a certificate of conformity with the following information:

- name and address of the Notified Product Certification Body;
- certificate number;
- name and address of the manufacturer, or his authorized representative established in the EEA;
- description of the construction product (i.e. Alarm transmission and fault warning routing equipment for fire alarm systems installed in buildings);
- type/model designation of the product;
- provisions to which the product conforms (e.g. Annex ZA of this EN);
- any particular conditions applicable to the use of the product (if necessary);
- any conditions and period of validity of the certificate, where applicable;
- name of and position held by the person empowered to sign the certificate.

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 to be used.

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Methods of test for mortar for masonry —

Part 4: Determination of consistence of fresh mortar (by plunger penetration)

The European Standard EN 1015-4:1998 has the status of a
British Standard

ICS 91.100.10

ICS 91.100.10

Descriptors: masonry work, mortars: materials, tests, penetration tests, determination, consistency

English version

Methods of test for mortar for masonry — Part 4: Determination of consistence of fresh mortar (by plunger penetration)

Méthodes d'essai des mortiers pour maçonnerie —
Partie 4: Détermination de la consistance des
mortiers frais (par pénétration du piston)

Prüfverfahren für Mörtel für Mauerwerk —
Teil 4: Bestimmung der Konsistenz von Frischmörtel
(mit Eindringgerät)

This European Standard was approved by CEN on 4 September 1998.

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 Central Secretariat 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 Central Secretariat has the same status as the official versions.

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CEN

European Committee for Standardization
Comité Européen de Normalisation
Europäisches Komitee für Normung

Central Secretariat: rue de Stassart 36, B-1050 Brussels

Foreword

This European Standard has been prepared by Technical Committee CEN/TC 125, Masonry, 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 April 1999, and conflicting national standards shall be withdrawn at the latest by September 2000.

This European Standard has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association and includes the performance requirements referred to in the Eurocode for masonry structures.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

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Introduction

Fresh mortar is brought to a defined level of consistence as measured using the plunger penetration rod prior to the assessment of those properties which are used to characterize it.

Consistence is a measure of the fluidity and/or wetness of the fresh mortar and gives a measure of the deformability of the fresh mortar when subjected to a certain type of stress. The consistence however is not directly associated with the manner in which the fresh mortar handles when used by a craftsman.

Normally there will be a linear correlation between the plunger penetration value, measured according to this test method, and the flow value measured in accordance with prEN 1015-3, for the same type of mortar with increasing water content, but the slope will differ with different types of mortars.

1 Scope

This European Standard specifies a method for determining the consistence of freshly mixed mortars (in the following briefly referred to as fresh mortars) including those containing mineral binders and both dense and lightweight aggregates, which is by means of the plunger penetration value.

2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

EN 1015-2, *Methods of test for mortar for masonry — Part 2: Bulk sampling of mortars and preparation of test mortars.*

3 Principle

The plunger penetration value of a defined sample of fresh mortar is measured by the vertical penetration of a defined plunger rod which has been allowed to fall freely through a given height into the fresh mortar sample.

4 Apparatus

4.1 Plunger apparatus, conforming to Figure 1, and consisting of the following parts:

Plunger stand, with the base plate (A), frame, clamp with guide bushes (B) and fixing screw (C).

Cylindrical vessel, (D) secured centrally in a positioning recess.

Penetration rod, (E) with an upper scale and having a plastics plunger (F) of circular cross-section at the base and with a hemispherical lower end of the same diameter. The total mass of the penetration rod and plunger is $90 \text{ g} \pm 2 \text{ g}$. The penetration rod is fixed in an initial position 100 mm above the mortar surface, measured from the lower, hemispherical end of the plunger.

4.2 Tamper, consisting of a rigid, non-absorptive rod of circular cross-section, approximately 40 mm in diameter and approximately 200 mm long. The tamping face is flat and at right angles to the length of the tamper. The mass of the tamper is $0,250 \text{ kg} \pm 0,015 \text{ kg}$.

4.3 Trowel.

4.4 Palette knife.

5 Sampling, preparation and storage of test samples

The fresh mortar for this test shall have a minimum volume of 1,5 l and shall be obtained by reduction of the bulk test sample (see EN 1015-2) using a sample divider or by quartering.

Ready to use mortars (factory-made wet mortars which are retarded), and pre-batched air-lime/sand wet mortars when not gauged with hydraulic binders, shall be tested within their specified workable life.

Mortars that are made from dry constituents and water shall be mixed in accordance with EN 1015-2 unless otherwise specified.

The length of mixing period shall be measured from the moment all the constituents are introduced into the mixer.

Before testing, the batch shall be gently stirred by hand using a trowel (4.3) or palette knife (4.4) in 5 to 10 seconds to counteract any false setting etc., but without any additional mixing of the batch.

Any deviation from the mixing procedure shall be noted.

Two test samples shall be tested.

6 Procedure

Using the fixing screw [4.1(C)], secure the penetration rod [4.1(E)] in its initial position. Wipe the plunger [4.1(F)] clean with a damp cloth and dry before use.

Fill the vessel [4.1(D)] with mortar in two layers, each layer being compacted by 10 short strokes of the tamper (4.2), to ensure uniform filling of the vessel. Skim off the excess mortar with a palette knife leaving the mortar surface plane and level with the top rim of the vessel. Do not trowel further.

Place the filled vessel on the base plate [4.1(A)] and release the fixing screw, allowing the plunger to fall freely, starting from its initial position.

Determine the penetration of the plunger into the mortar by reading the scale on the lower side of the upper guide bush [4.1(B)] to the nearest mm.

7 Calculation and expression of results

Calculate the mean value of the plunger penetration from the individual values for each mortar test sample, to the nearest mm. If the two individual values deviate from their mean value by less than 10 % use this mean value as the plunger penetration value of the mortar. If the two individual plunger penetration values deviate from their mean value by more than 10 %, repeat the test using further mortar from the reduced bulk test sample (see clause 5) and if the results deviate from their mean value by less than 10 % use the mean value from the repeat test as the plunger penetration value of the mortar. If the results differ by more than 10 % consider the measurements unsatisfactory and take fresh test samples from the bulk test sample or laboratory prepared mortar and repeat the test.

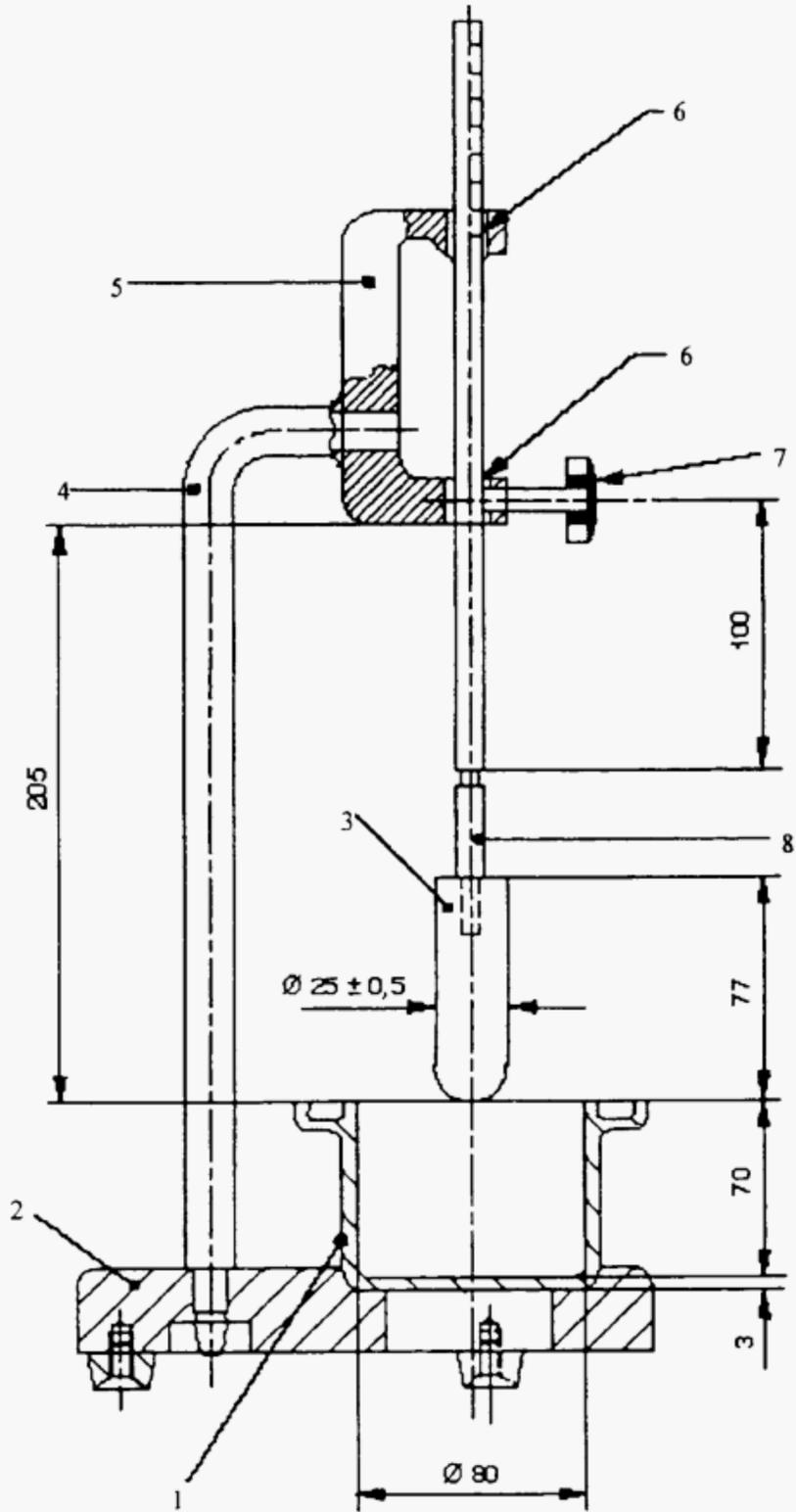
8 Test report

The test report shall include the following information:

- a) the number, title and date of issue of this European Standard;
 - b) the place, date and time of taking the bulk test sample¹⁾;
- NOTE This is the sample taken from the bulk supply that is to be used for all of the tests in EN 1015.
- c) the method used for taking the bulk test sample (if known) and the name of the organization that took it;
 - d) the type, origin and designation of the mortar by reference to the relevant part of prEN 998;
 - e) preparation (mixing, casting) and storage (curing) conditions;
 - f) the date and time of preparing test samples for test (i.e. date and time of any mixing, casting, moulding, or demoulding procedure, if appropriate);
 - g) the date and time of testing;
 - h) test results (individual measurements and the plunger penetration values in mm for each test sample);
 - i) remarks, if any.

¹⁾ This information is contained on the certificate of sampling (see EN 1015-2).

Dimensions in millimetres



Key:	1	Cylindrical vessel	2	Base plate
	3	Plastics plunger	4	Frame
	5	Clamp	6	Guide bush
	7	Fixing screw	8	Penetration rod

Figure 1 — Plunger test apparatus

Annex A (informative)

Bibliography

The following informative reference is made in this standard:
 prEN 1015-3, *Methods of test for mortar for masonry — Part 3: Determination of consistence of fresh mortar (by flow table)*.

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