SLOVENSKI STANDARD
SIST EN 54-12:2003

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Sistemi za odkrivanje in javljanje požara ter alarmiranje - 12. del: Dimni javljalniki - Linijski javljalniki z optičnim žarkom

Fire detection and fire alarm systems - Part 12: Smoke detectors - Line detectors using an optical light beam

Brandmeldeanlagen - Teil 12: Rauchmelder - Linienförmige Melder nach dem Durchlichtprinzip

Systemes de détection et d'alarme incendie - Partie 12: Détecteurs de fumée - Détecteurs linéaires fonctionnant suivant le principe de la transmission d'un faisceau d'ondes optiques rayonnées

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Brandmeldeanlagen - Teil 12: Rauchmelder - Linienförmiger Melder nach dem Durchlichtprinzip

This European Standard was approved by CEN on 19 August 2002.

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Foreword

This document EN 54-12:2002 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of an identical text or by endorsement, at the latest by May 2003, and conflicting national standards shall be withdrawn at the latest by November 2005.

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.

This standard has been prepared in cooperation with the CEA (Comité Européen des Assurances) and with EURALARM (Association of European Manufacturers of Fire and Intruder Alarm Systems).

Information on the relationship between this European Standard and other standards of the EN 54 series is given in annex A of EN 54-1:1996.

In this European Standard the annexes A to G are normative.

This document includes a Bibliography.

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, Malta, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

1 Scope

This European Standard specifies requirements, test methods and performance criteria for line smoke detectors utilising the attenuation and/or changes in attenuation of an optical beam, for use in fire detection systems installed in buildings.

This European Standard does not cover:

—Line smoke detectors designed to operate with separations between opposed components of less than 1 m;

—Line smoke detectors whose optical path length is defined or adjusted by an integral mechanical connection;

Line smoke detectors with special characteristics, which cannot be assessed by the test methods in this European Standard.

NOTE The term "optical" is used to describe that part of the electromagnetic spectrum produced by the transmitter to which the receiver is responsive; this is not restricted to visible wavelengths.

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 (including amendments).

EN 54-1	1996	*Fire detection and fire alarm systems - Part 1: Introduction.*
EN 54-7		*Fire detection and fire alarm systems - Part 7: Smoke detectors - Point detectors using scattered light, transmitted light or ionization.*
EN 50130-4	1995	*Alarm systems - Part 4: Electromagnetic compatibility - Product family standard: Immunity requirements for components of fire, intruder and social alarm systems.*
EN 60064		*Tungsten filament lamps for domestic and similar general lighting purposes. Performance requirements (IEC 60064:1993, modified).*
EN 60068-1		*Environmental testing - Part 1: General and guidance (IEC 60068-1:1988 + Corrigendum 1988 + A1:1992).*
EN 60068-2-1	1993	*Environmental testing - Part 2: Tests - Test A: Cold (IEC 60068-2-1:1990).*
EN 60068-2-2	1993	*Basic environmental testing procedures - Part 2: Tests - Test B: dry heat (IEC 60068-2-2:1974 + IEC 68-2-2A:1976).*
EN 60068-2-6	1995	*Environmental testing – Part 2: Tests - Test Fc: Vibration, (sinusoidal) (IEC 60068-2-6:1995 + Corrigendum 1995).*
EN 60068-2-75		*Environmental testing - Part 2: Tests – Test Eh: Hammer tests (IEC 60068-2-75:1997).*
EN 60081		*Double-capped fluorescent lamps – Performance specifications (IEC 60081:1997).*
HD 323.2.3 S2		*Basic environmental testing procedures - Part 2: tests; test Ca: damp heat, steady state.*

HD 323.2.56 S1	1990	*Basic environmental testing procedures - Part 2: Tests - Test Cb: Damp heat, steady state, primarily for equipment.*
IEC 60068-2-42	1982	*Basic environmental testing procedures - Part 2: Tests - Test Kc: Sulphur dioxide test for contacts and connections.*

3 Terms and definitions

For the purposes of this European Standard the terms and definitions given in EN 54-1:1996 and the following apply.

3.1
line smoke detector using an optical beam
detector consisting at least of a transmitter and a receiver and which may include reflector(s) for the detection of smoke by the attenuation and/or changes in attenuation of an optical beam

3.2
transmitter
component from which the optical beam emanates

3.3
receiver
component which receives the optical beam

3.4
optical path length
total distance traversed by the optical beam between the transmitter and the receiver

3.5
opposed component
component [transmitter and receiver or transmitter-receiver and reflector(s)] of the beam detector whose position determines the optical path

3.6
separation
physical distance between the opposed components [transmitter and receiver or transmitter-receiver and reflector(s)]

3.7
attenuation
value "C", expressed in dB, of the reduction in intensity of the optical beam at the receiver, defined by the following equation:

$$C = 10 \log_{10}(I_0/I)$$

where

I_0 is the received intensity without reduction in intensity;

I is the received intensity after reduction in intensity.

3.8
response threshold value
value of attenuation at the moment an alarm signal is generated by a specimen, when tested in accordance with 5.1.5

3.9
sensitivity adjustment
any adjustment during or after commissioning which leads to a change in the response to fire

4 Requirements

4.1 Compliance

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

4.2 Individual alarm indication

Each detector shall be provided with an integral red visible indicator, by means of which each individual detector which releases an alarm can be identified, until the alarm condition is reset.

4.3 Connection of ancillary devices

If the detector provides for connections to ancillary devices (e.g. remote indicators, control relays), open or short-circuit failures of these connections shall not prevent the correct operation of the detector.

4.4 Manufacturer's adjustments

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

4.5 On-site adjustment of response threshold value

If there is provision for on-site adjustment of the response threshold value of the detector then:

a) For each setting, at which the manufacturer claims compliance with this standard, the detector shall comply with the requirements of this standard, and access to the adjustment means shall only be possible by the use of a code or special tool or by removing the detector from its base or mounting;

b) any setting(s), at which the manufacturer does not claim compliance with this standard, shall only be accessible by the use of a code or special tool, and it shall be clearly marked on the detector or in the associated data, that if these setting(s) are used, the detector does not comply with this standard.

NOTE These adjustments may be carried out at the detector or at the control and indicating equipment, for example.

4.6 Protection against ingress of foreign bodies

The detector shall be designed so that a sphere of diameter (1,3 ± 0,05) mm cannot pass into any enclosure containing active opto-electronic components, when the detector is in operational condition.

4.7 Monitoring of detachable detectors and connections

For detachable detectors, a means shall be provided for a remote monitoring system (e.g. the control and indicating equipment) to detect the removal of the head from the base, in order to give a fault signal.

If there are cables connecting separate parts of the detector, then a means shall be provided for a remote monitoring system (e.g. the control and indicating equipment) to detect a short or open circuit on those cables, in order to give a fault signal.

4.8 Limit of compensation

The detector shall emit either a fault or alarm signal at the limit of compensation for the effect of a slowly changing response (signal).

Since it is practically impossible to perform tests with very slight increases in smoke density, an evaluation of the detector's conformity shall be made by analysing the circuits/software and/or by physical tests and simulations.

4.9 Additional requirements for software controlled detectors

4.9.1 General

For detectors which rely on software control in order to fulfil the requirements of this standard, the requirements of 4.9.2 and 4.9.3 shall be met.

4.9.2 Software design

In order to ensure the reliability of the detector, 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 error in the program operation;

c)the software shall be designed to avoid the occurrence of deadlock of the program flow.

4.9.3 The storage of programs and data

The program necessary to comply with this standard and any preset data, such as manufacturer's settings, shall be held in non-volatile memory. Writing to areas of memory containing this program and data shall only be possible by the use of some special tool or code and shall not be possible during normal operation of the detector.

Site-specific data shall be held in memory which will retain data for at least two weeks without external power to the detector, unless provision is made for the automatic renewal of such data, following loss of power, within 1 h of power being restored.

4.10 Fault signalling

A fire alarm signal shall not be cancelled by a fault resulting from a rapid change in obscuration (in accordance with 5.6) or by a result of the limit of compensation being reached (in accordance with 4.8).

5 Test methods

5.1 General

5.1.1 Atmospheric conditions for tests

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 to 35 °C;

— relative humidity: 25 % to 75 %;

— air pressure: 86 kPa to 106 kPa.

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

5.1.2 Operating conditions for tests

If a test method requires a specimen to be operational, the specimen shall be connected to suitable supply and 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.

If a test procedure requires a specimen to be monitored to detect any alarm or fault signals, then connections shall be made to any necessary ancillary devices (e.g. through wiring to an end-of-line device for conventional detectors) to allow a fault signal to be recognised.

The details of the supply and monitoring equipment and the alarm criteria used shall be given in the test report.

5.1.3 Mounting arrangements

The specimen shall be mounted by its normal means of attachment and aligned in accordance with the manufacturer's instructions. If these instructions describe more than one method of mounting, the method considered to be most unfavourable shall be chosen for each test.

5.1.4 Tolerances

Unless otherwise stated, the tolerances for the environmental test parameters shall be as given in the basic reference standards for the test (e.g. the relevant Part of IEC/EN 60068).

If a requirement or a test procedure does not specify a tolerance or deviation limits, deviation limits of ± 5 % shall be applied.

5.1.5 Measurement of response threshold value

5.1.5.1 General

The specimen, for which the response threshold value is to be measured, shall be installed on the measuring bench, conforming to annex A, in its normal operating position, by its normal means of attachment in accordance with 5.1.3.

The specimen shall be connected to its supply and monitoring equipment in accordance with 5.1.2, and shall be allowed to stabilize for at least 15 min.

The response threshold value shall be recorded as *C*.

5.1.5.2 Operating conditions

On a rigid support assemble the receiver at a longitudinal distance of at least 500 mm from the transmitter or the transmitter - receiver at the same distance from the reflector (see Figure A.1), then place a filter holder as close as possible to the front of the receiver, adjusting the filter holder so that the whole beam passes through the filter. This filter holder shall be used to mount the filters used during the measurement of response threshold value.

The height *h* separating the axis of the optical beam above the support shall be 10 times the diameter (or the vertical dimension) of the optical system of the receiver.

Adjustment for path length or alignment, if required, shall be carried out in accordance with the manufacturer's instructions.

Unless otherwise stated in a test procedure, the response threshold value shall be measured with a simulated maximum separation carried out using means agreed by the manufacturer.

5.1.5.3 Measurements

The response threshold value is determined by the value of the lowest value test filter required to give an alarm within 30 s after introduction in the beam. The minimum resolution for optical density filters shall be in accordance with Table A.1 (see annex A).

5.1.6 Provision for tests

The following shall be provided for testing compliance with this standard:

a)seven detectors;

b)the documentation required in 6.2.

The specimens submitted shall be representative of the manufacturer's normal production with regard to their construction and calibration.

NOTE This implies that the mean response threshold value of the seven specimens, found in the reproducibility test should also represent the production mean, and that the limits specified in the reproducibility test should also be applicable to the manufacturer's production.

5.1.7 Test schedule

The specimens shall be tested in accordance with the test schedule in Table 1. After the reproducibility test, the two least sensitive specimens (i.e. those with the highest response thresholds) shall be numbered 6 and 7, and the others shall be numbered 1 to 5.

Table 1 — Test Schedule

Test	Clause	Specimen N°(s)
Reproducibility	5.2	all specimens
Repeatability	5.3	2
Directional dependence	5.4	1
Variation of supply parameters	5.5	1
Rapid changes in obscuration	5.6	1
Slow changes in obscuration	5.7	1
Optical path length dependence	5.8	1
Fire sensitivity	5.9	6 and 7
Stray light	5.10	6
Dry heat (operational)	5.11	3
Cold (operational)	5.12	3
Damp heat, steady state (operational)	5.13	2
Damp heat, steady state (endurance)	5.14	2
Vibration (endurance)	5.15	7
Electrostatic discharge (operational)	5.16	4 [a]
Radiated electromagnetic fields (operational)	5.16	6 [a]
Conducted disturbances induced by electromagnetic fields (operational)	5.16	6 [a]
Fast transient bursts (operational)	5.16	4 [a]
Slow high energy voltage surges (operational)	5.16	6 [a]
Sulphur dioxide SO_2 corrosion (endurance)	5.17	5
Impact (operational)	5.18	1

[a] 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 clause 4 of EN 50130-4:1995).