SLOVENSKI STANDARD
SIST EN 54-7:2001

01-oktober-2001

Sistemi za odkrivanje in javljanje poģara ter alarmiranje - 7. del: Dimni javljalniki - Toļ kovni javljalniki na principu sipanja svetlobe, prepuģļ ene svetlobe ali ionizacije

Fire detection and fire alarm systems - Part 7: Smoke detectors - Point detectors using scattered light, transmitted light or ionization

Brandmeldeanlagen - Teil 7: Rauchmelder - Punkförmige Melder nach dem Streulicht-, Durchlicht- oder Ionisationprinzip

Systemes de détection et d'alarme incendie - Partie 7: Détecteurs de fumée - Détecteurs ponctuels fonctionnant suivant le principe de la diffusion de la lumiere, de la transmission de la lumiere ou de l'ionisation

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Fire detection and fire alarm systems - Part 7: Smoke detectors - Point detectors using scattered light, transmitted light or ionization

Systèmes de détection et d'alarme incendie - Partie 7: Détecteurs de fumée - Détecteurs ponctuels fonctionnant suivant le principe de la diffusion de la lumière, de la transmission de la lumière ou de l'ionisation

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This European Standard was approved by CEN on 2 June 2000.

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 Management Centre or to any CEN member.

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

CEN members are the national standards bodies of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

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Foreword

This European Standard 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 replaces EN 54-7:1982, EN 54-7:1982/A1:1988, EN 54-9:1982.

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 June 2001, and conflicting national standards shall be withdrawn at the latest by June 2003. For products which have complied with the relevant national standard before the date of withdrawal (dow), as shown by the manufacturer or by a certification body, this previous standard may continue to apply for production until June 2006.

This European Standard 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).

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.

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).

The significant differences from EN 54-7:1982+A1:1988 include:

— changes in the title of the EN 54 series and in the title of this Part;

— the incorporation of the full descriptions of the test fires for fire sensitivity into the standard;

NOTE These descriptions were previously given in Part 9 of the standard.

— the introduction of requirements for the limitation of the effects of *drift compensation* on the response to slowly developing fires;

— the introduction of requirements for protection against ingress of foreign bodies;

— changes in the environmental test procedures to use IEC tests where possible, to harmonise with test procedures applied to other types of detectors and to include EMC immunity tests;

— the requirement for an integral alarm indication.

EN 54-9:1982 and its amendments will all be withdrawn on publication of this revision.

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.

1 Scope

This European Standard specifies requirements, test methods and performance criteria for point smoke detectors that operate using scattered light, transmitted light or ionization, for use in fire detection and fire alarm systems for buildings (see EN 54-1:1996).

For other types of smoke detector, or smoke detectors working on different principles, this standard should only be used for guidance. Smoke detectors with special characteristics and developed for specific risks are not covered by this standard.

NOTE Certain types of detector contain radioactive materials. The national requirements for radiation protection differ from country to country and they are not specified in this standard.

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.

ISO/IEC Publication	Year	Title	EN/HD	Year
-	-	Fire detection and fire alarm systems - Part 1: Introduction.	EN 54-1	1996
-	-	Alarm Systems - Part 4: Electromagnetic compatibility - Product family standard: Immunity requirements for components of fire, intruder and social alarm systems + A1:1998.	EN 50130-4	1995
IEC 60068-1	1988	Environmental testing - Part 1: General and guidance, + A1:1992.	EN 60068-1	1994
IEC 60068-2-1	1990	Environmental testing - Part 2: Tests - Tests A: Cold, + A1:1993, A2:1994.	EN 60068-2-1	1993
IEC 60068-2-3	1969	Basic environmental testing procedures - Part 2: Tests - Test Ca: Damp heat, steady state, + A1:1984.	HD 323.2.3 S2	1987

IEC 60068-2-6	1995	Environmental testing - Part 2: Tests - Test Fc: Vibration, sinusoidal, + Corr.:1995.	EN 60068-2-6	1995
IEC 60068-2-27	1987	Basic environmental testing procedures - Part 2: Tests - Test Ea & Guidance: Shock.	EN 60068-2-27	1993
IEC 60068-2-42	1982	Basic environmental testing procedures - Part 2: Tests - Test Kc: Sulphur dioxide test for contacts and connections.	-	-
IEC 60068-2-56	1988	Environmental testing - Part 2: Tests - Test Cb: Damp heat steady state, primarily for equipment.	HD 323.2.56 S1	1990
ISO 209-1	1989	Wrought aluminium and aluminium alloys - Chemical composition and forms of products — Part 1: Chemical composition.	-	-

3 Terms and definitions

For the purposes of this standard, the following term and definition and those given in EN 54-1:1996 apply:

3.1
response threshold value
the aerosol density in the proximity of the specimen at the moment that it generates an alarm signal, when tested as described in 5.1.5

NOTE The response threshold value may depend on signal processing in the detector and in the control and indicating equipment.

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 as described in clause 5 and shall meet the requirements of the tests.

4.2 Individual alarm indication

Each detector shall be provided with an integral red visual indicator, by which the individual detector, which released an alarm, can be identified, until the alarm condition is reset. Where other conditions of the detector can be visually indicated, they shall be clearly distinguishable from the alarm indication, except when the detector is switched into a service mode. For detachable detectors the indicator may be integral with the base or the detector head. The visual indicator shall be visible from a distance of 6 m directly below the detector, in an ambient light intensity up to 500 lux.

4.3 Connection of ancillary devices

Where 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 Monitoring of detachable detectors

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.

4.5 Manufacturer's adjustments

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

4.6 On-site adjustment of response behaviour

If there is provision for on-site adjustment of the response behaviour 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 the standard.

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

4.7 Protection against the ingress of foreign bodies

The detector shall be so designed that a sphere of diameter (1,3 ± 0,05) mm cannot pass into the sensor chamber(s).

NOTE This requirement is intended to restrict the access of insects into the sensitive parts of the detector. It is known that this requirement is not sufficient to prevent the access of all insects, however it is considered that extreme restrictions on the size of access holes may introduce the danger of clogging by dust etc. It may therefore be necessary to take other precautions against false alarms due to the entry of small insects.

4.8 Response to slowly developing fires

The provision of "drift compensation" (e.g. to compensate for sensor drift due to the build up of dirt in the detector), shall not lead to a significant reduction in the detector's sensitivity to slowly developing fires.

Since it is not practical to make tests with very slow increases in smoke density, an assessment of the detector's response to slow increases in smoke density shall be made by analysis of the circuit/software, and/or physical tests and simulations.

The detector shall be deemed to meet the requirements of this clause if this assessment shows that:

a) for any rate of increase in smoke density R, which is greater than $A/4$ per hour (where A is the detector's initial uncompensated response threshold value), the time for the detector to give an alarm does not exceed $1{,}6 \times A/R$ by more than 100 s; and

b) the range of compensation is limited such that, throughout this range, the compensation does not cause the response threshold value of the detector to exceed its initial value by a factor greater than 1,6.

NOTE Further information about the assessment of these requirements is given in annex L.

4.9 Marking

Each detector shall be clearly marked with the following information:

a) the number of this standard (i.e. EN 54-7);

b) the name or trademark of the manufacturer or supplier;

c) the model designation (type or number);

d) the wiring terminal designations;

e) some mark(s) or code(s) (e.g. serial number or batch code), by which the manufacturer can identify, at least, the date or batch and place of manufacture, and the version number(s) of any software, contained within the detector.

For detachable detectors, the detector head shall be marked with a), b), c) and e), and the base shall be marked with, at least c) (i.e. its own model designation) and d).

Where any marking on the device uses symbols or abbreviations not in common use then these shall be explained in the data supplied with the device.

The marking shall be visible during installation of the detector and shall be accessible during maintenance.

The markings shall not be placed on screws or other easily removable parts.

4.10 Data

Detectors shall either be supplied with sufficient technical, installation and maintenance data to enable their correct installation and operation[1)] or, if all of these data are not supplied with each detector, reference to the appropriate data sheet shall be given on, or with each detector.

NOTE Additional information may be required by organisations certifying that detectors produced by a manufacturer conform to the requirements of this standard.

4.11 Additional requirements for software controlled detectors

4.11.1 General

For detectors which rely on software control in order to fulfil the requirements of this standard, the requirements of 4.11.2, 4.11.3 and 4.11.4 shall be met.

4.11.2 Software documentation

4.11.2.1 The manufacturer shall submit documentation which gives an overview of the software design. This documentation shall be in sufficient detail for the design to be inspected for compliance with this standard and shall include at least the following:

a) a functional description of the main program flow (e.g. as a flow diagram or structogram) including:

   1) a brief description of the modules and the functions that they perform;

   2) the way in which the modules interact;

   3) the overall hierarchy of the program;

   4) the way in which the software interacts with the hardware of the detector;

   5) the way in which the modules are called, including any interrupt processing.

b) a description of which areas of memory are used for the various purposes (e.g. the program, site specific data and running data);

c) a designation, by which the software and its version can be uniquely identified.

1) To enable correct operation of the detectors, these data should describe the requirements for the correct processing of the signals from the detector. This may be in the form of a full technical specification of these signals, a reference to the appropriate signalling protocol or a reference to suitable types of control and indicating equipment etc.

4.11.2.2 The manufacturer shall have available detailed design documentation, which only needs to be provided if required by the testing authority. It shall comprise at least the following:

a) an overview of the whole system configuration, including all software and hardware components;

b) a description of each module of the program, containing at least:

   1) the name of the module;

   2) a description of the tasks performed;

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

c) full source code listings, as hard copy or in machine-readable form (e.g. ASCII-code), including all global and local variables, constants and labels used, and sufficient comment for the program flow to be recognized;

d) details of any software tools used in the design and implementation phase (e.g. CASE-tools, compilers).

4.11.3 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.

4.11.4 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.

5 Tests

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 IEC 60068-1:1988+A1:1992 as follows:

a) temperature: (15 to 35) °C;

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

c) air pressure: (86 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, then 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.

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

5.1.3 Mounting arrangements

The specimen shall be mounted by its normal means of attachment in accordance with the manufacturer's instructions. If these instructions describe more than one method of mounting then 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 60068).

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

5.1.5 Measurement of response threshold value

The specimen, for which the response threshold value is to be measured, shall be installed in the smoke tunnel, described in annex A, in its normal operating position, by its normal means of attachment. The orientation of the specimen, relative to the direction of airflow, shall be the least sensitive orientation, as determined in the directional dependence test, unless otherwise specified in the test procedure.

Before commencing each measurement the smoke tunnel shall be purged to ensure that the tunnel and the specimen are free from the test aerosol.

The air velocity in the proximity of the specimen shall be (0,2 ± 0,04) m s^{-1} during the measurement, unless otherwise specified in the test procedure.

Unless otherwise specified in the test procedure, the air temperature in the tunnel shall be (23 ± 5) °C and shall not vary by more than 5 K for all the measurements on a particular detector type.

The specimen shall be connected to its supply and monitoring equipment as described in 5.1.2, and shall be allowed to stabilise for a period of at least 15 min, unless otherwise specified by the manufacturer.

The test aerosol, as described in annex B, shall be introduced into the tunnel such that the rate of increase of aerosol density is as follows:

$$0{,}015 \leq \frac{\Delta m}{\Delta t} \leq 0{,}1 \qquad \text{dB m}^{-1}\ \text{min}^{-1}$$

for detectors using scattered or transmitted light, or

$$0{,}05 \leq \frac{\Delta y}{\Delta t} \leq 0{,}3 \qquad \text{min}^{-1}$$

for detectors using ionization.

NOTE 1 These ranges are intended to allow the selection of a convenient rate, depending upon the detector's sensitivity, to get a response in a reasonable time.

NOTE 2 The equations for m and y are given in annex C.

The rate of increase in aerosol density shall be similar for all measurements on a particular detector type.

The aerosol density at the moment that the specimen gives an alarm shall be recorded as m (dB m^{-1}) for detectors using scattered or transmitted light, or as y for detectors using ionization (see annex C). This shall be taken as the response threshold value.

5.1.6 Provision for tests

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

a) For detachable detectors: twenty detector heads and bases;

For non-detachable detectors: twenty specimens;

b) The data required in 4.10.

NOTE 1 Detachable detectors comprise at least two parts; a base (socket) and a head (body). If the specimens are detachable detectors, then the two, or more, parts together are regarded as a complete detector.

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

NOTE 2 This implies that the mean response threshold value of the twenty 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 according to the following test schedule (see Table 1). After the reproducibility test, the four least sensitive specimens (i.e. those with the highest response thresholds) shall be numbered 17 to 20, and the others shall be numbered 1 to 16 arbitrarily:

Table 1 — Test schedule

Test	Clause	Specimen No(s)
Repeatability	5.2	one chosen arbitrarily
Directional dependence	5.3	one chosen arbitrarily
Reproducibility	5.4	all specimens
Variation in supply parameters	5.5	1
Air movement	5.6	2
Dazzling[1)]	5.7	3
Dry heat (operational)	5.8	4
Cold (operational)	5.9	5
Damp heat, steady state (operational)	5.10	6
Damp heat, steady state (endurance)	5.11	7
Sulphur dioxide (SO_2) corrosion (endurance)	5.12	8
Shock (operational)	5.13	9
Impact (operational)	5.14	10
Vibration, sinusoidal (operational)	5.15	11
Vibration, sinusoidal (endurance)	5.16	11
Electrostatic discharge (operational)	5.17	12[2)]
Radiated electromagnetic fields (operational)	5.17	13[2)]
Conducted disturbances induced by electromagnetic fields (operational)	5.17	14[2)]
Fast transient bursts (operational)	5.17	15[2)]
Slow high energy voltage surge (operational)	5.17	16[2)]
Fire sensitivity	5.18	17, 18, 19 & 20

[1)] This test only applies to detectors using scattered or transmitted light.

[2)] 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+A1:1998).