SLOVENSKI STANDARD
oSIST prEN 54-26:2008

01-julij-2008

Sistemi za odkrivanje in javljanje požara ter alarmiranje - 26. del: Točkovni javljalniki požara s senzorji ogljikovega monoksida

Fire detection and fire alarm systems - Part 26: Point fire detectors using carbon monoxide sensors

Brandmeldeanlagen - Teil 26: Punktförmige Melder mit Kohlenmonoxidsensoren

Système de détection et d'alarme incendie - Partie 26: Détecteurs ponctuels d'incendie utilisant des capteurs de monoxyde de carbone

Ta slovenski standard je istoveten z: **prEN 54-26**

ICS:

13.220.20	Požarna zaščita	Fire protection
13.320	Alarmni in opozorilni sistemi	Alarm and warning systems

oSIST prEN 54-26:2008 **en,fr,de**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

DRAFT
prEN 54-26

April 2008

ICS 13.220.20

English Version

Fire detection and fire alarm systems - Part 26: Point fire detectors using carbon monoxide sensors

Système de détection et d'alarme incendie - Partie 26: Détecteurs ponctuels d'incendie utilisant des capteurs de monoxyde de carbone

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This draft European Standard is submitted to CEN members for enquiry. It has been drawn up by the Technical Committee CEN/TC 72.

If this draft becomes a European Standard, 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.

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

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Foreword

This document (prEN 54-26:2008) has been prepared by Technical Committee CEN/TC 72 “Fire detection and fire alarm systems”, the secretariat of which is held by BSI.

This document is currently submitted to the CEN Enquiry.

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 ionization

Part 10: Flame detector – Point detectors

Part 11: Manual call points

Part 12: Smoke detectors – Line detector 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 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 routine equipment

Part 22: Line-type heat detectors (in preparation)

Part 23: Fire alarm devices – Visual alarms (in preparation)

Part 24: Components of voice alarm systems – Loudspeakers

Part 25: Components using radio links and system requirements

Part 26: Point fire detectors using carbon monoxide sensors (in preparation)

Part 27: Duct smoke detectors (in preparation)

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

Introduction

Carbon monoxide (CO) is a product of the incomplete combustion of carbon-based materials. CO fire detectors can react promptly to smouldering fires involving carbonaceous materials because CO does not depend solely on convection, but also moves by diffusion. CO fire detectors might be better suited to applications where other fire detection techniques are prone to false alarms, i.e. due to dust, steam and cooking vapours.

A number of different methods for sensing CO are suitable. However, most sensors will also be influenced by other gases and phenomena. Tests have therefore been included in the test schedule to assess cross-sensitivity to substances normally present in the service environment that may affect the performance of the detector.

As CO detectors are specifically well suited for the detection of incipient fires rather than flaming fires this standard only includes tests to verify performance in smouldering fires. For this purpose, test fires TF2 and TF3 from EN 54-7 have been included in the test schedule. These have been modified to include monitoring of the CO level during the test.

1 Scope

This European Standard specifies requirements, test methods and performance criteria for point fire detectors using carbon monoxide sensing for use in fire detection and fire alarm systems for buildings (see EN 54-1).

This standard does not cover fire detectors incorporating at least one CO sensing element in combination with other elements sensing different fire phenomena.

CO fire detectors with special characteristics and developed for specific risks are not covered by 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 54-7:2000, *Fire detection and fire alarm systems — Part 7: Smoke detectors — Point detectors using scattered light, transmitted light or ionization*
EN 54-7:2000/A1:2002, *Fire detection and fire alarm systems — Part 7: Smoke detectors — Point detectors using scattered light, transmitted light or ionization*
EN 54-7:2000/A2:2006, *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 50130-4:1995/A1:1998, *Alarm systems — Part 4: Electromagnetic compatibility — Product family standard: immunity requirements for components of fire, intruder and social alarm systems*
EN 50130-4:1995/A2:2003, *Alarm systems — Part 4: Electromagnetic compatibility — Product family standard: immunity requirements for components of fire, intruder and social alarm systems*

EN 60068-1:1994, *Environmental testing — Part 1: General and guidance*

EN 60068-2-1:1993, *Environmental testing — Part 2-1: Tests; Test A: Cold*
EN 60068-2-1:1993/A1:1993*, Environmental testing — Part 2-1: Tests; Test A: Cold*
EN 60068-2-1:1993/A2:1994, *Environmental testing — Part 2-1: Tests; Test A: Cold*

EN 60068-2-2:1993, Environmental testing — Part 2-2: Tests; Tests B; Dry heat
EN 60068-2-2:1993/A1:1993, Environmental testing — Part 2-2: Tests; Tests B; Dry heat

EN 60068-2-6:1995, *Environmental testing — Part 2-6: Tests — Test Fc: Vibration*

EN 60068-2-27:1993, *Environmental testing, Test methods, Environmental testing procedures — Part 2-27: Tests; Test Ea & Guidance: Shock*

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

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

EN 60068-56:1988, *Environmental testing — Part 2: Tests — Test Cb: Damp heat steady state, primarily for equipment*

EN 60068-2-75:1997, *Environmental testing — Part 2-75: Tests — Test Eh: Hammer*

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

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

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply / the terms and definitions given in EN 54-1: 1996 and the following apply.

3.1
CO response threshold value
CO concentration 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

3.2
rate-sensitive
behaviour of a detector that depends on the rate of change of CO concentration

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 that 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 Rate-sensitive CO response

The CO response threshold value of the detector may depend on the rate of change of CO concentration in the vicinity of the detector. Such behaviour may be incorporated in the detector design to improve the discrimination between ambient CO levels and those generated by a fire. If such rate sensitive behaviour is included then it shall not lead to a significant reduction in the detector's sensitivity to fires, nor to a significant increase in the probability of false alarm.

Since it is not practical to make tests with all possible rates of increase in CO concentration, an assessment of the detector's rate sensitivity 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 CO concentration less than 1 µl/l per minute the detector will signal an alarm condition before the CO concentration reaches 60 µl/l, and;

b) the detector does not signal an alarm condition when subjected to a step change in CO concentration of 10 µl/l, superimposed on a background level between 0 and 1,5 µl/l.

4.8 Marking

Each detector shall be clearly marked with the following information:

a) the number of this standard (i.e. EN 54-26);

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

4.9 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 this data is 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.

4.10 Additional requirements for software controlled detectors

4.10.1 General

For detectors which rely on software control in order to fulfil the requirements of this standard, the requirements of 4.10.2, 4.10.3 and 4.10.4 shall be met.

4.10.2 Software documentation

4.10.2.1 Design overview

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.

4.10.3 Design detail

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;

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1) To enable correct operation of the detectors, this 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.

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).

4.10.4 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.

4.10.5 The storage of programs and data

The program necessary to comply with this standard and any pre-set 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 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 IEC 60068-1:1988+A1:1992 as follows:

— temperature: (15 to 35) °C;

— relative humidity: (25 to 75) %;

— 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 and in its normal orientation in accordance with the manufacturer's instructions. If these instructions describe more than one method of mounting, or more than one acceptable orientation, 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 CO response threshold value

The specimen, for which the CO response threshold value is to be measured, shall be installed in the gas test chamber, 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 gas test chamber shall be purged to ensure that the concentration of CO in the tunnel is less than 1,5 µl/l.

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

Unless otherwise specified in the test procedure, the air temperature in the gas test chamber 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.

CO shall be introduced into the gas test chamber such that the rate of increase of CO concentration is between 1 µl/l per minute and 6 µl/l per minute, unless otherwise specified in the test procedure. For detectors with a rate sensitive behaviour, the manufacturer may specify a rate of increase within this range to ensure that the measured CO response threshold value is representative of the static CO response threshold value of the detector.

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

The CO concentration at the moment that the specimen gives an alarm shall be recorded as S (µl/l). This shall be taken as the CO 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 five detector heads and bases; for non-detachable detectors; twenty five specimens.

b) The data required in 4.9.

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 deemed 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 seven specimens found in the reproducibility test, 5.4, 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 22 to 25, and the others shall be numbered 1 to 21 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
Long term stability	5.5	1
Variation in supply parameters	5.6	2
Air movement	5.7	3
Dry heat (operational)	5.8	4
Dry heat (endurance)	5.9	5
Cold (operational)	5.10	6
Damp heat, cyclic (operational)	5.11	7
Damp heat, steady state (operational)	5.12	8
Damp heat, steady state (endurance)	5.13	9
Low humidity steady state (operational)	5.14	10
Sulphur dioxide SO_2 corrosion (endurance)	5.15	11
Shock (operational)	5.16	12
Impact (operational)	5.17	13
Vibration, sinusoidal (operational)	5.18	14
Vibration, sinusoidal (endurance)	5.19	14
Exposure to chemical agents at environmental concentrations	5.20	15
Exposure to high levels of carbon monoxide	5.21	16
Error! Reference source not found. — Electrostatic discharge (operational) — Radiated electromagnetic fields (operational) — Conducted disturbances induced by electromagnetic fields (operational) — Fast transient bursts (operational) — Slow high energy voltage surge (operational)	5.22	 17 [a] 18 [a] 19 [a] 20 [a] 21 [a]
Fire sensitivity	5.23	22, 23, 24, 25

[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 can 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 as amended by EN 54130-4:1995/A1:1998 and EN 54130-4:1995/A2:2003).

5.2 Repeatability

5.2.1 Object

To show that the detector has stable behaviour with respect to its sensitivity even after a number of alarm conditions.

5.2.2 Test procedure

The response threshold value of the specimen to be tested shall be measured as described in 5.1.5 six times.

The specimen's orientation relative to the direction of airflow is arbitrary, but it shall be the same for all six measurements.

The maximum response threshold value shall be designated S_{max}, the minimum value shall be designated S_{min}.

5.2.3 Requirements

The detector shall be deemed to comply with the requirements of this sub-clause if:

a) the ratio of the response threshold values S_{max} : S_{min} shall be not greater than 1,6; and

b) the lower response threshold value S_{min} shall be not less than 25 µl/l.

5.3 Directional dependence

5.3.1 Object

To confirm that the sensitivity of the detector is not unduly dependent on the direction of airflow around the detector.

5.3.2 Test procedure

The response threshold value of the specimen to be tested shall be measured eight times as described in 5.1.5, the specimen being rotated 45º. about its vertical axis between each measurement, so that the measurements are taken for eight different orientations relative to the direction of air flow.

The maximum response threshold value shall be designated S_{max}, the minimum value shall be designated S_{min}

The orientations, for which the maximum and minimum response threshold values were measured, shall be noted.

In the following tests the orientation for which the maximum response threshold was measured is referred to as the least sensitive orientation, and the orientation for which the minimum response threshold was measured is referred to as the most sensitive orientation.

5.3.3 Requirements

The detector shall be deemed to comply with the requirements of this sub-clause if:

a) the ratio of the response threshold values S_{max} : S_{min} shall not be greater than 1,6; and

b) the lower response threshold value S_{min} shall not be less than 25 µl/l.