SLOVENSKI STANDARD
oSIST prEN 54-20:2014

01-maj-2014

Sistemi za odkrivanje in javljanje požara ter alarmiranje - 20. del: Aspiracijski dimni javljalniki

Fire detection and fire alarm systems - Part 20: Aspirating smoke detectors

Brandmeldeanlagen - Teil 20: Ansaugrauchmelder

Systèmes de détection et d'alarme incendie - Partie 20 : Détecteurs de fumée par aspiration

Ta slovenski standard je istoveten z: **prEN 54-20**

ICS:

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

oSIST prEN 54-20:2014 **en,fr,de**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

DRAFT
prEN 54-20

February 2014

ICS 13.220.20

Will supersede EN 54-20:2006

English Version

Fire detection and fire alarm systems - Part 20: Aspirating smoke detectors

Systèmes de détection et d'alarme incendie - Partie 20 : Détecteurs de fumée par aspiration

Brandmeldeanlagen - Teil 20: Ansaugrauchmelder

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.

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

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

Recipients of this draft are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

Warning : This document is not a European Standard. It is distributed for review and comments. It is subject to change without notice and shall not be referred to as a European Standard.

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

CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels

Contents

Foreword

This document (prEN 54-20:2014) 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 will supersede EN 54–20:2006.

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

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

This edition incorporates the following main changes made with respect to the previous edition of EN 54–20:2006 as follows:

1. correction of a typographical error in the Scope,
2. a major revision of Annex ZA and new clause on AVCP in line with other standards in the EN 54 series,
3. modification of the structure of the standard to match the CEN template,
4. introduction of the concept of design tools including requirements and a process for assessing them,
5. clarification of the assessment of components in the sampling device,
6. addition of an informative annex to describe a method for fire sensitivity testing using an intermediate sampling hole,
7. clarification of air flow testing of ASDs which do not operate below 0 °C and for multi-port ASD systems.
8. example tests for assessing the response to slowly developing fires are provided as opposed on only allowing assessment by inspection of documentation.
9. a note has been added to 5.5.1.3.4 highlighting the importance of clean air.

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 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
- Part 26: Point fire detectors using carbon monoxide sensors
- Part 27: Duct smoke detectors
- Part 28: Non-resettable (digital) line type heat detectors
- Part 29: Multi-sensor fire detectors - Point detectors using a combination of smoke and heat sensors
- Part 30: Multi-sensor fire detectors - Point detectors using a combination of carbon monoxide and heat sensors
- Part 31: Multi-sensor detector – Point detector using
- Part 32: Guidelines for the planning, design, installation, commissioning, use and maintenance of voice alarm systems

NOTE This list includes standards that are in preparation and other standards may be added. For current status of published standards refer to www.cen.eu.

1 Scope

This European standard specifies the requirements, test methods and performance criteria for aspirating smoke detectors for use in fire detection and fire alarm systems installed in or around buildings or other civil engineering works.

This European standard provides for the assessment and verification of constancy of performance (AVCP) of aspirating smoke detectors to this EN. Aspirating smoke detectors developed for the protection of specific risks that incorporate special characteristics (including additional features or enhanced functionality for which this standard does not define a test or assessment method) are also covered by this standard. The performance requirements for any special characteristics are beyond the scope of 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 therefore specified in this standard.

2 Normative references

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

EN 54-1:2011, *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 including* EN 54-2:1997/A1:2006

EN 54-4:1997, *Fire detection and fire alarm systems – Part 4: Power supply equipment including* EN 54-4:1997/A1:2002 and EN 54-4:1997/A2:2006

EN 54-7:2000, *Fire detection and fire alarm systems – Part 7: Smoke detectors – Point detectors using scattered light, transmitted light or ionization* including EN 54-7:2000/A1:2002, and EN 54-7:2000/A2:2006

EN 50130-4:2011, *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 (IEC 60068 1:1988 + Corrigendum 1988 + A1:1992)*

EN 60068-2-1:2007, *Environmental testing – Part 2: tests; tests A: cold (IEC 60068-2-1:2007)*

EN 60068-2-2:2007, *Environmental testing – Part 2-2: tests; tests B: dry heat (IEC 60068-2-2:2007)*

EN 60068-2-6:2008, *Environmental testing – Part 2 6: Tests – Tests Fc: Vibration (sinusoidal) (IEC 60068-2-6:2007)*

EN 60068-2-27:2009, *Environmental testing – Part 2-27: Tests – Test Ea and guidance: Shock (IEC 60068-2-27:2008)*

EN 60068-2-42:2003, *Environmental testing – Part 2-42: Tests; Test Kc: Sulfur dioxide test for contacts and connections (IEC 60068-2-42:2003)*

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

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

EN 61386-1:2008, *Conduit systems for electrical installations – Part 1: General requirements (IEC 61386-1:2008)*

3 Terms, definitions and abbreviations

3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 54-1:2011 and the following apply.

3.1.1
aspirating smoke detector
smoke detector, in which air and aerosols are drawn through a sampling device and carried to one or more smoke sensing elements by an integral aspirator

Note 1 to entry: Fan or pumps are examples of integral aspirators.

Note 2 to entry: Each smoke sensing element may contain more than one sensor exposed to the same smoke sample.

3.1.2
design tool
means for determining the sensitivity class of any sampling device and detector configuration

Note 1 to entry: The design tool may be provided in a variety of forms e.g. as a software tool or a set of tables.

3.1.3
recovery

treatment of a specimen, after conditioning, so that the properties of the specimen may be stabilized before measurement of the said property as required by this standard

3.1.4
response value
measure of the aerosol concentration in the proximity of the smoke sensing element at the moment that the specimen generates an alarm signal

Note 1 to entry: In this document, there is a test method for response value in 5.1.5.

3.1.5
sampling device
component or series of components or dedicated device (e.g. a pipe network, dedicated duct, probe or hood) which forms part of the ASD and transfers samples of air to the smoke sensing element(s)

Note 1 to entry: The sampling device may be supplied separately.

3.1.6
sampling point
any point at which an air sample is drawn into the sampling device

3.1.7
transport time
time for aerosols to transfer from a sampling point to the smoke sensing element

3.2 Abbreviations

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

ASD	Aspirating smoke detector
CIE	Control and indicating equipment
CPC	Condensation particle counter
DUT	Detector under test
EEA	European Economic Area
EMC	Electromagnetic compatibility
EOT	End of test
FPC	Factory production control
MIC	Measuring ionization chamber
RV	Response value

4 Requirements

4.1 General

To conform to this standard the detector shall meet the requirements of this clause, which shall be verified by inspection and engineering assessment, and when tested in accordance with the tests described in Clause 5, shall meet the requirements of the tests.

4.2 Nominal activation conditions/sensitivity

4.2.1 Individual visual alarm indication

Each aspirating smoke detector shall be provided with (an) integral red visual indicator(s), visible from outside the aspirating smoke detector, by which the individual smoke sensing element(s) (see 3.1.1), which released an alarm, can be identified, until the alarm condition is reset. Where other conditions of the detector may be visually indicated, they shall be clearly distinguishable from the alarm indication.

4.2.2 Repeatability

The detector shall have stable behaviour with respect to its sensitivity after a number of alarm conditions. When tested according to 5.2.2.2, test results shall meet the compliance criteria specified in 5.2.2.3.

4.2.3 Reproducibility

The sensitivity of the detector shall not vary unduly from specimen to specimen. When tested according to 5.2.3.2, test results shall meet the compliance criteria specified in 5.2.3.3.

4.2.4 Repeatability - 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), and/or the provision of algorithms to match the sensitivity of a detector to its environment, shall not lead to a significant reduction in the detector's sensitivity to slowly developing fires.

If such drift compensation is included, then it shall not lead to a significant change in the detector's sensitivity to slowly developing fires when assessed as described in 5.2.4 and shall meet the compliance criteria specified therein.

4.3 Operational reliability

4.3.1 Classification of sensitivity

The manufacturer shall clearly state, in the data presented in Clause 9 to which sensitivity class or classes the aspirating smoke detector is designed. To demonstrate compliance with a specific sensitivity class the aspirating smoke detector shall be subjected to appropriate fire sensitivity tests as required in Table 1 and defined in 5.5.1. Various pipe and hole configurations shall be tested in order to assess the design tool as specified in 5.3.1.

NOTE Due to the inherent flexibility in the design of sampling devices, aspirating smoke detectors are generally intended for use in many varied and often rather specialized applications. Therefore it is not possible to conduct type tests that define acceptance criteria for all of these applications. However, in recognition of the diversity of application three sensitivity classes are defined to enable system designers and installers to select the most appropriate sensitivity.

Table 1 provides a summary of the three sensitivity classes of detector and the corresponding fire tests used for this classification of sensitivity.

Table 1 — Sensitivity classes for aspirating smoke detectors

Class	Description	Example application(s)	Requirement
A	Aspirating smoke detector providing very high sensitivity	Very early detection: the detection of very dilute smoke for example entering air conditioning ducts to detect the extremely dilute concentrations of smoke that might emanate from equipment in the environmentally controlled area such as a clean room.	Passes test fires TF2A, TF3A, TF4 and TF5A
B	Aspirating smoke detector providing enhanced sensitivity	Early detection: for example special fire detection within or close to particularly valuable, vulnerable or critical items such as computer or electronic equipment cabinets.	Passes test fires TF2B, TF3B, TF4 and TF5B
C	Aspirating smoke detector providing normal sensitivity	Standard detection: general fire detection in normal rooms or spaces, giving, for example, at least an equivalent level of detection as a point or beam type smoke detection system.	Passes test fires TF2, TF3, TF4 and TF5

4.3.2 Connection of ancillary devices

The detector may provide for connections to ancillary devices (e.g. remote indicators, control relays). Where such connections are present, the detector shall be assessed in accordance with 5.3.2 to ensure that open or short circuit failure of such connections do not prevent correct operation of the detector.

4.3.3 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. See 5.3.3 for evaluation method.

4.3.4 On site adjustment of response behaviour

NOTE 1 The effective response behaviour of an aspirating smoke detector is dependent upon both the sensitivity settings of the smoke sensing element and the design of the sampling device. Many types of aspirating smoke detectors therefore have facilities to adjust the smoke sensing element sensitivity to suit the application and sampling device etc..

If there is provision for field-adjustment of the sensitivity of the smoke sensing element then:

a) access to the means of adjustment shall be limited by the need for the use of tools or a special code;

b) it shall be possible to determine what sensitivity settings have been selected and to relate these to documentation which describes the sensitivity settings required for different sampling devices and applications;

NOTE 2 These adjustments may be made at the detector or at the control and indicating equipment.

NOTE 3 Changing sensitivity settings may affect the sensitivity class of the installed ASD – see Clause 7.

c) if it is possible to configure the detector (including the sampling device and the sensitivity settings) in such a way that the detector does not conform to this standard, it shall be clearly marked on the detector or in the associated data that, if such configurations are used, the detector does not conform to this standard.

d) See 5.3.4 for evaluation method.

4.3.5 Mechanical strength of the pipework

Sampling pipes and fittings shall have adequate mechanical strength and temperature resistance.

Pipes shall either be classified in accordance with EN 61386-1:2008 to at least class 1131 (for the significance of the digits, see Table 2) or shall be tested in accordance with 5.3.5.

Table 2 — Mechanical requirements of sampling pipe

Property	Class	Severity
Resistance to compression	1	125 N
Resistance to impact	1	0,5 kg, 100 mm height to fall
Temperature range	31	−15 °C to +60 °C

Where the supplier of the ASD does not supply pipes for the sampling device, the product documentation shall specify that the requirements of this subclause shall be met.

4.3.6 Components in the sampling device

The use of components (box, filter, sensor, valve etc.) in the sampling device shall be described in the documentation which shall be assessed in accordance with 5.3.6. The ASD, including any allowed combination of components (in particular the worst case combination in accordance with the manufacturer's documentation and/or design tool), shall meet the requirements of this standard.

If the component in the sampling device incorporates a sensing element which participates in the signal output of the ASD (e.g. for localisation information) then the performance of the ASD, including these sensing elements, shall meet the requirements of this standard.

It shall be possible to identify any optional component which is permitted for use on the ASD as described in the manufacturer's documentation (or design tool) which shall include information on the effects of the components in terms of flow restriction and smoke attenuation and how these are compensated to ensure compliance with EN 54-20 (e.g. shortening pipes, reducing the number of holes or increasing detector sensitivity).

4.3.7 Airflow monitoring

4.3.7.1 Airflows outside operational limits

A fault signal shall be given when the airflow is outside the operational limits as specified by the manufacturer in his data

This requirement shall be assessed as described in 5.3.7.

4.3.7.2 Monitoring of Airflow

The airflow through the aspirating smoke detector shall be monitored to detect leakage or obstruction of the sampling device or sampling point(s).

Either a fault signal shall be given when any leakage or obstruction results in an increase or decrease in the volumetric airflow of 20 % and greater through the aspirating smoke detector, or where the aspirating smoke detector incorporates technology which provides for constant (or near constant) volumetric flow rate, which is largely independent of the sampling device (e.g. incorporates speed control of the fan or uses a positive displacement pump), then a fault signal shall be given when there is a loss of 50 % and greater of sampling points.

In both cases a period of 300 s is allowed between the fault being applied and the fault signal being given.

See 5.1.6 for evaluation method.

NOTE 1 This time is independent of any delay times between signalling the fault and its indication at the CIE and is to allow for spurious short term flow variations which would otherwise result in unwanted fault signals.

NOTE 2 The 20% deviation in flow is applied to the volumetric flow through the whole detector. Where there are multiple inlets to the detector (which may or may not have individual flow sensors) the flow should be reduced evenly across all the ports. However, where there is a flow sensor in each inlet port, the manufacture and the testing authority may agree to test using a 20 % deviation on one port only. For further details see Annex K.

4.3.7.3 Memorizing the 'normal' flow

Where an aspirating smoke detector has a facility to memorize the 'normal' flow (present when the detector is installed or serviced) and thereafter monitor for deviations from this normal flow, the action of setting the memorized 'normal' flow and the fault thresholds shall be a voluntary action under level 3 access (as defined in EN 54-2).

Power cycling the aspirating smoke detector (turning it off and on) shall not result in a change to the memorized normal flow.

These requirements shall be assessed as described in 5.3.7.

NOTE The implication of this clause is that *automatic* adjustment of the memorized normal flow and subsequent monitoring for deviations is not allowed.

4.3.8 Power supply

The power for the aspirating detector shall be supplied by a power supply conforming to EN 54–4.

NOTE This power supply may be common to the control and indicating equipment, be incorporated into the ASD or be provided as a separate unit.

4.3.9 Software controlled detectors

4.3.9.1 General

For detectors that rely on software control to fulfil the requirements of this standard, the requirements of 4.3.9.2, 4.3.9.3 and 4.3.9.4 when assessed as specified in 5.3.9 shall be met.

4.3.9.2 Software documentation

4.3.9.2.1 The manufacturer shall submit documentation to the testing authority 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) functional description of the main program flow (e.g. as a flow diagram or structogram) including:

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

   2) way in which the modules interact,

   3) overall hierarchy of the program,

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

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

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

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

4.3.9.2.2 The manufacturer shall also 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) overview of the whole system configuration, including all software and hardware components;

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

   1) name of the module,

   2) description of the tasks performed,

   3) 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 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).

4.3.9.3 Software design

To ensure the reliability of the detector, the following requirements for software design shall apply:

a) software shall have a modular structure,

b) design of the interfaces for manually and automatically generated data shall not permit invalid data to cause error in the program operation,

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

4.3.9.4 The storage of programs and data

The program necessary to conform to this European 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.

4.4 Tolerance to supply voltage

4.4.1 Variation in supply parameters

Within the specified range(s) of the supply parameters, the sensitivity of the detector shall not be unduly dependent on these parameters (e.g. voltage). To confirm this, the detector shall be tested as specified in 5.4.1.

4.5 Performance parameters under fire conditions

4.5.1 Fire sensitivity

The detector shall have adequate sensitivity to incipient type fires that may occur in buildings. To confirm this, the detector shall be tested as specified in 5.5.1.

4.6 Durability of nominal activation conditions/sensitivity and operational reliability

4.6.1 Temperature resistance

4.6.1.1 Dry heat (operational)

The detector shall function correctly at high ambient temperatures when tested according to 5.6.1.1.

4.6.1.2 Cold (operational)

The detector shall function correctly at low ambient temperatures when tested according to 5.6.1.2.

Where the detector cannot operate below 0 °C:

a) the manufacturer's information shall clearly state that the detector will not operate below 0 °C and that special precautions have to be taken against the temperature falling below 0 °C.

b) the detector shall generate an appropriate fault warning which shall be tested as specified in 5.6.1.2.4.

4.6.2 Humidity resistance

4.6.2.1 Damp heat, steady state (operational)

The detector shall function correctly at high relative humidity (without condensation) when tested according to 5.6.2.1.

4.6.2.2 Damp heat, steady state (endurance)

The detector shall be capable of withstanding long-term exposure to a high level of continuous humidity when tested according to 5.6.2.2.

4.6.3 Corrosion resistance

4.6.3.1 SO_2 corrosion (endurance)

The detector shall function correctly when submitted to the corrosive effects of Sulfur Dioxide when tested according to 5.6.3.1..

4.6.4 Shock and vibration resistance

4.6.4.1 Shock (operational)

The detector shall function correctly when submitted to mechanical shocks which are likely to occur in the service environment when tested according to 5.6.4.1.

4.6.4.2 Impact (operational)

The detector shall function correctly when submitted to mechanical impacts which it may sustain in the normal service environment when tested according to 5.6.4.2.

4.6.4.3 Vibration, sinusoidal (operational)

The detector shall function correctly when submitted to vibration at levels appropriate to its normal service environment when tested according to 5.6.4.3.

4.6.4.4 Vibration, sinusoidal (endurance)

The detector shall be capable of withstanding long exposure to vibration at levels appropriate to the service environment when tested according to 5.6.4.4.

4.6.5 Electrical stability

4.6.5.1 EMC, immunity (operational)

The detector shall operate shall operate correctly when submitted to electromagnetic interference when tested according to 5.6.5.1.