SVENSK STANDARD
SS-EN 54-29:2015

Fastställd/Approved: 2015-04-12
Publicerad/Published: 2015-04-14
Utgåva/Edition: 1
Språk/Language: engelska/English
ICS: 13.220.20

SWEDISH STANDARDS INSTITUTE

Brand och räddning – Branddetekterings- och brandlarmsystem –
Del 29: Flersensordetektorer av punkttyp med kombination av sensorer för rök och värme

Fire detection and fire alarm systems –
Part 29: Multi-sensor fire detectors – Point detectors using a combination of smoke and heat sensors

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The European Standard EN 54-29:2015 has the status of a Swedish Standard. This document contains the official English version of EN 54-29:2015.

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Denna standard är framtagen av kommittén för Branddetektorer, brandlarmsystem, SIS/TK 360/AG 2.

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EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 54-29

April 2015

ICS 13.220.20

English Version

Fire detection and fire alarm systems - Part 29: Multi-sensor fire detectors - Point detectors using a combination of smoke and heat sensors

Systèmes de détection et d'alarme incendie - Partie 29 : Détecteurs d'incendie multi-capteurs - Détecteurs ponctuels utilisant une combinaison de capteurs de fumée et de chaleur

Brandmeldeanlagen - Teil 29: Mehrfachsensor-Brandmelder - Punktförmige Melder mit kombinierten Rauch- und Wärmesensoren

This European Standard was approved by CEN on 15 February 2015.

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 CEN-CENELEC 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 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.

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COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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Foreword

This document (EN 54-29:2015) 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 October 2015, and conflicting national standards shall be withdrawn at the latest by January 2017.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports the basic requirements of Regulation (EU) 305/2011.

For relationship with EU Regulations, 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: Technical Specification: Guidelines for planning, design, installation, commissioning, use and maintenance*

— *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: Resettable 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: Point detectors using a combination of smoke and heat sensors*

— *Part 30: Point detectors using a combination of carbon monoxide and heat sensors*

— *Part 31: Point detectors using a combination of smoke, carbon monoxide and optionally heat sensors*

— *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 http://www.cen.eu/Pages/default.aspx.

According to the CEN-CENELEC Internal Regulations, the national standards organisations of the following countries are bound to implement this European Standard: 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 the United Kingdom.

Introduction

Multi-sensor fire detectors combining smoke and heat sensors complying with this document are general purpose fire detectors. Multi-sensor fire detectors can be used to achieve

— a high stability against deceptive phenomena,

— a response to a broad range of fires.

Compared to the standards for single phenomenon detectors, additional environmental tests were included to demonstrate a higher stability.

The response to a broad range of fires is shown by including the test fires TF1 and TF8 in addition to the test fires TF2 to TF5 which are used for detectors complying with EN 54-7.

The performance of single sensor components of a multi-sensor fire detector need not comply with the standards for single phenomena fire detectors (EN 54-5, EN 54-7) however the combined performance does need to meet the requirements of this standard.

1 Scope

This European Standard specifies requirements, test methods and performance criteria for point-type multi-sensor fire detectors for use in fire detection systems installed in buildings (see EN 54-1:2011), incorporating in one mechanical enclosure at least one optical or ionization smoke sensor and at least one heat sensor. The overall fire detection performance is determined utilizing the combination of the detected phenomena.

This European Standard provides for the assessment and verification of constancy of performance (AVCP) of point detectors using a combination of smoke and heat sensors to this European Standard.

Point detectors using a combination of smoke and heat sensors having special characteristics suitable for the detection of specific fire risks are not covered by this European Standard. The performance requirements for any additional functions are beyond the scope of this European Standard (e.g. additional features or enhanced functionality for which this European Standard does not define a test or assessment method).

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 European 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 54-5:2000, *Fire detection and fire alarm systems - Part 5: Heat detectors - Point detectors*

EN 54-5:2000/A1:2002, *Fire detection and fire alarm systems - Part 5: Heat detectors - Point detectors*

EN 50130-4:2011, *Alarm systems - Part 4: Electromagnetic compatibility - Product family standard: Immunity requirements for components of fire, intruder, hold up, CCTV, access control and social alarm systems*

EN 60068-1:1994, *Environmental testing - Part 1: General and guidance (IEC 60068-1:1988)*

EN 60068-2-1:2007, *Environmental testing - Part 2-1: Tests - Test A: Cold (IEC 60068-2-1:2007)*

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

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

EN 60068-2-30:2005, *Environmental testing - Part 2-30: Tests - Test Db: Damp heat, cyclic (12 h + 12 h cycle) (IEC 60068-2-30:2005)*

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

EN 60068-2-78:2013, *Environmental testing - Part 2-78: Tests - Test Cab: Damp heat, steady state (IEC 60068-2-78:2012)*

ISO 209:2007, *Aluminium and aluminium alloys — Chemical composition*

3 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
non-volatile memory
memory element which does not require the presence of an energy source for the retention of its content

3.2
site specific data
alterable data required for the detector to operate in a defined detector configuration

3.3
smoke response value
aerosol density in the proximity of a test specimen at the moment that it generates a reference signal in a smoke tunnel

3.4
heat response value
temperature in the proximity of a test specimen at the moment that it generates a reference signal in a heat tunnel

3.5
sensor
transducer, which is assigned to be receptive to one fire phenomenon and converts its information into an electrical output

4 Requirements

4.1 General

In order to comply with this standard, the detector shall meet the requirements of Clause 4, which shall be verified by visual inspection, engineering assessment or shall be tested as described in Clause 5 and shall meet the requirements of the tests.

4.2 Nominal activation conditions/sensitivity

4.2.1 Individual alarm indication

The 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 when assessed as described in 5.2.1.

NOTE The alarm condition is reset manually at the control and indicating equipment (see EN 54–2:1997 as amended by EN 54–2:1997/A1:2006).

4.2.2 Response to slowly developing fires

The detector may incorporate provision for “drift compensation”, for example to compensate for sensor drift due to the build up of dirt in the detector, If such drift compensation is included, then it shall not lead to a significant reduction in the detector's sensitivity to slowly developing fires when assessed as specified in 5.2.2.

4.2.3 Repeatability of smoke response

The detector shall have stable behaviour with respect to its sensitivity to smoke after a number of alarm conditions. To confirm this, the detector shall be assessed in accordance with 5.2.3.

4.2.4 Directional dependence of smoke response

The sensitivity of the detector to smoke shall not be unduly dependent on the direction of airflow around it. To confirm this, the detector shall be assessed in accordance with 5.2.4.

4.2.5 Directional dependence of heat response

The heat sensitivity of the detector shall not be unduly dependent on the direction of airflow around it. To confirm this, the detector shall be assessed in accordance with 5.2.5.

4.2.6 Lower limit of heat response

The detector shall not be more sensitive to heat alone, without the presence of smoke, than is permitted in EN 54-5:2000 as amended by EN 54-5:2000/A1:2002. To confirm this, the detector shall be assessed in accordance with 5.2.6.

4.2.7 Reproducibility of smoke response

The sensitivity of the detector to smoke shall not vary unduly from specimen to specimen. To confirm this, the detector shall be assessed in accordance with 5.2.7.

4.2.8 Reproducibility of heat response

The heat sensitivity of the detector shall not vary unduly from specimen to specimen. To confirm this, the detector shall be assessed in accordance with 5.2.8.

4.2.9 Air movement

The sensitivity of the detector shall not be unduly affected by the rate of the airflow and that it is not unduly prone to false alarms in draughts or in short gusts. To confirm this, the detector shall be assessed in accordance with 5.2.9.

4.2.10 Dazzling

The sensitivity of the detector shall not be unduly influenced by the close proximity of artificial light sources. To confirm this, the detector shall be assessed in accordance with 5.2.10. This test is only applicable to detectors using optical smoke sensors, as ionization chamber detectors are considered unlikely to be influenced.

4.3 Operational reliability

4.3.1 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.

4.3.2 Monitoring of detachable detectors

For detachable detectors, 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.

4.3.3 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.

4.3.4 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.

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

4.3.5 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 smoke 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.

4.3.6 Software controlled detectors

4.3.6.1 General

For detectors which rely on software control in order to fulfil the requirements of this standard, the requirements of 4.3.6.2, 4.3.6.3 and 4.3.6.4 shall be met.

4.3.6.2 Software documentation

4.3.6.2.1 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.

4.3.6.2.2 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;

   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).

4.3.6.3 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.

4.3.6.4 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.

4.4 Tolerance to supply parameters

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 assessed in accordance with 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 assessed in accordance with 5.5.1.

4.6 Durability of nominal activation conditions/sensitivity

4.6.1 Temperature resistance

4.6.1.1 Dry heat (operational)

The detector shall function correctly at high ambient temperatures. To confirm this, the detector shall be assessed in accordance with 5.6.1.1.

4.6.1.2 Cold (operational)

The detector shall function correctly at low ambient temperatures. To confirm this, the detector shall be assessed in accordance with 5.6.1.2.

4.6.2 Humidity resistance

4.6.2.1 Damp heat, cyclic (operational)

The detector shall function correctly at a high level of relative humidity with short period of condensation. To confirm this, the detector shall be assessed in accordance with 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. To confirm this, the detector shall be assessed in accordance with 5.6.2.2.

4.6.3 Shock and vibration resistance

4.6.3.1 Shock (operational)

The detector shall function correctly when submitted to mechanical shocks which are likely to occur in the service environment. To confirm this, the detector shall be assessed in accordance with 5.6.3.1.

4.6.3.2 Impact (operational)

The detector shall function correctly when submitted to mechanical impacts which it may sustain in the normal service environment. To confirm this, the detector shall be assessed in accordance with 5.6.3.2.

4.6.3.3 Vibration, sinusoidal (operational)

The detector shall function correctly when submitted to vibration at levels appropriate to its normal service environment. To confirm this, the detector shall be assessed in accordance with 5.6.3.3.

4.6.3.4 Vibration, sinusoidal (endurance)

The detector shall be capable of withstanding long exposure to vibration at levels appropriate to the service environment. To confirm this, the detector shall be assessed in accordance with 5.6.3.4.

4.6.4 Electrical stability

4.6.4.1 EMC, immunity (operational)

The detector shall operate correctly when submitted to electromagnetic interference. To confirm this, the detector shall be assessed in accordance with 5.6.4.1.

4.6.5 Resistance to chemical agents

4.6.5.1 SO_2 corrosion (endurance)

The detector shall be capable of withstanding the corrosive effects of sulphur dioxide as an atmospheric pollutant. To confirm this, the detector shall be assessed in accordance with 5.6.5.1.

5 Test and assessment and sampling 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 60068-1:1994 as follows:

— temperature: (15 to 35) °C;

— relative humidity: (25 to 75) %;

— air pressure: (86 to 106) kPa.

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 a 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 an alarm or fault signal to be recognized. 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 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, for each test the method evaluated to be most unfavourable shall be chosen.