
Sistemi za odkrivanje in javljanje požara ter alarmiranje - 31. del: Večsenzorski javljalniki požara - Kombinirani točkovni javljalniki požara s senzorji za zaznavanje dima, ogljikovega monoksida in izbrane toplote

Fire detection and fire alarm system - Part 31: Multi-sensor fire detectors - Point detectors using a combination of smoke, carbon monoxide and optionally heat sensors

Brandmeldeanlagen - Teil 31: Mehrfachsensor-Brandmelder-Punktförmige Melder mit Kombinierten Rauch-, CO-und optionalen Wärmesensoren

Systèmes de détection et d'alarme incendie - Partie 31 : Détecteurs d'incendie multicapteurs - Détecteurs ponctuels combinant l'utilisation de capteurs de fumée, de capteurs de monoxyde de carbone et éventuellement de capteurs de chaleur

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Fire detection and fire alarm system - Part 31: Multi-sensor fire detectors - Point detectors using a combination of smoke, carbon monoxide and optionally heat sensors

Systèmes de détection et d'alarme incendie - Partie 31:
DéTECTEURS d'incendie multicapteurs - DéTECTEURS ponctuels
combinant l'utilisation de capteurs de fumée, de capteurs
de monoxyde de carbone et éventuellement de capteurs de
chaleur

Brandmeldeanlagen - Teil 31: Mehrfachsensor-
Brandmelder - Punktförmige Melder mit kombinierten
Rauch-, CO- und optionalen Wärmesensoren

This European Standard was approved by CEN on 25 October 2014.

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EN 54-31:2014 (E)**Foreword**

This document (EN 54-31:2014) has been prepared by Technical Committee CEN/TC 72 "Fire detection and fire alarm systems", the secretariat of which is held by BSI.

This 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of an identical text or by endorsement, at the latest by June 2015 and conflicting national standards shall be withdrawn at the latest by December 2017.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.

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 www.cen.eu.

According to the CEN-CENELEC Internal Regulations, the national standards organizations 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.

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Introduction

Multi-sensor fire detectors using a combination of smoke, carbon monoxide and optionally heat sensors complying with this document are general purpose fire detectors. Multi-sensor 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 requirements were included to demonstrate a higher stability.

Different categories are introduced to distinguish between different detector behaviour and to identify detectors or detector settings including the signal of an optional heat sensor.

For detectors or detector settings of the categories M (without heat sensor) and MT (with heat sensor) requirements apply to demonstrate that the detector is capable of withstanding the presence of a high level of a single fire phenomenon alone without giving a fire alarm.

For detectors or detector settings of the categories N (without heat sensor) and NT (with heat sensor) no requirements apply regarding the release of a fire alarm caused by the exposure to a single fire phenomenon alone.

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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 detector need not comply with the standards for single phenomena fire detectors (EN 54-5, EN 54-7, EN 54-26) 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 and fire alarm systems installed in and around buildings (see EN 54-1:2011), incorporating in one mechanical enclosure at least one optical or ionization smoke sensor and at least one carbon monoxide (CO) sensor and optionally one or more heat sensors, utilizing the combination of the detected phenomena. This European Standard covers only modes of operation, where at least the signals of both smoke and carbon monoxide sensors are continuously evaluated.

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

Point detectors using a combination of smoke, carbon monoxide and optionally heat sensors, which are 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 standard (e.g. additional features or enhanced functionality for which this European Standard does not define a test or assessment method).

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*

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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 60068-2-2:2007, *Environmental testing — Part 2-2: Tests — Test B: Dry heat (IEC 60068-2-2:2007)*

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

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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 elements which do not require the presence of an energy source for the retention of their contents

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 CO response value
CO concentration in the proximity of the specimen at the moment that it generates a reference signal in a gas test chamber

Note 1 to entry: The CO response value may depend on signal processing in the detector and in the control and indicating equipment.

3.6 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 this clause, which shall be verified by visual inspection or engineering assessment or shall be tested as described in Clause 5 and shall meet the requirements of the tests.

4.2 Categorization

The manufacturer shall state the category of the detector or of each setting of the detector, in case the detector has several settings to be tested.

The following four categories can be declared: M, N, MT, NT.

Category M

Category M identifies detectors or detector settings not using a heat sensor. Category M detectors or detector settings are intended to withstand high levels of a single fire phenomenon without giving a fire alarm. The requirements of 4.8.1 and 4.8.2 apply to category M.

Category MT

Category MT identifies detectors or detector settings using a heat sensor. Category MT detectors or detector settings are intended to withstand high levels of a single fire phenomenon without giving a fire alarm. The requirements of 4.8.1, 4.8.2 and 4.8.3 apply to category MT.

Category N

Category N identifies detectors or detector settings not using a heat sensor, Category N detectors or detector settings may give a fire alarm in presence of a single fire phenomenon. The requirements of 4.8 do not apply.

Category NT

Category NT identifies detectors or detector settings using a heat sensor, Category NT detectors or detector settings may give a fire alarm in presence of a single fire phenomenon. The requirements of 4.8 do not apply.

NOTE Additional requirements related to the heat sensor apply for detectors or detector settings of the categories NT and MT. These requirements are defined in 4.3.8, 4.3.9 and 4.3.12.

4.3 Nominal activation conditions/sensitivity

4.3.1 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).

4.3.2 Response to slowly developing fires, aging and contamination

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.

4.3.3 Rate sensitive CO response

The CO response 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 when assessed as specified in 5.2.3.

4.3.4 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 5.2.4.

EN 54-31:2014 (E)**4.3.5 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 5.2.5.

4.3.6 Repeatability of CO response

The detector shall have stable behaviour with respect to its sensitivity to CO after a number of alarm conditions. To confirm this, the detector shall be assessed in accordance with 5.2.6.

4.3.7 Directional dependence of CO response

The sensitivity of the detector to CO shall not be unduly dependent on the direction of airflow around it. To confirm this, the detector shall be assessed in accordance with 5.2.7.

4.3.8 Directional dependence of heat response

If categorized as category MT or NT detector, 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 5.2.8.

4.3.9 Lower limit of heat response

If categorized as category MT or NT detector, the detector shall not be more sensitive to heat alone, without the presence of smoke or CO or both, 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 5.2.9.

4.3.10 Reproducibility of smoke response

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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 5.2.10.

4.3.11 Reproducibility of CO response

The sensitivity of the detector to CO shall not vary unduly from specimen to specimen. To confirm this, the detector shall be assessed in accordance with 5.2.11.

4.3.12 Reproducibility of heat response

If classified as class MT or NT detector, 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 5.2.12.

4.3.13 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 5.2.13.

4.3.14 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 5.2.14. This test is only applicable to detectors using optical smoke sensors, as ionization chamber detectors are considered unlikely to be influenced.

4.4 Operational reliability

4.4.1 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.

4.4.2 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.

4.4.3 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.

4.4.4 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.

4.4.5 Protection against the ingress of foreign bodies

The detector shall be so designed that a sphere of diameter $(1,3 \pm 0,05)$ 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.

4.4.6 Software controlled detectors

4.4.6.1 General

For detectors which rely on software control in order to fulfil the requirements of this standard, the requirements of 4.4.6.2, 4.4.6.3 and 4.4.6.4 shall be met.

4.4.6.2 Software documentation

4.4.6.2.1 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: