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Brand och räddning – Branddetekterings- och brandlarmsystem –
Del 30: Kombinerade kolmonoxid- och värmedetektorer av punkttyp

Fire detection and fire alarm systems –
Part 30: Multi-sensor fire detectors – Point detectors using a combination of carbon monoxide and heat sensors

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The European Standard EN 54-30:2015 has the status of a Swedish Standard. This document contains the official English version of EN 54-30:2015.

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EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

EN 54-30

April 2015

ICS 13.220.20

English Version

Fire detection and fire alarm systems - Part 30: Multi-sensor fire detectors - Point detectors using a combination of carbon monoxide and heat sensors

Système de détection et d'alarme incendie - Partie 30: Détecteurs d'incendie multicapteur - Détecteurs ponctuels utilisant une combinaison de capteurs de monoxide de carbone et de température

Brandmeldeanlagen - Teil 30: Mehrfachsensor-Brandmelder - Punktförmige Melder mit kombinierten CO- und Wärmesensoren

This European Standard was approved by CEN on 25 January 2015.

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Foreword

This document (EN 54-30:2015) 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of an identical text or by endorsement, at the latest by October 2015, and conflicting national standards shall be withdrawn at the latest by April 2019.

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 essential 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 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* [CEN Technical Specification];

— *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* [currently at acceptance stage];

— *Part 23: Fire alarm devices — Visual alarms devices*;

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— *Part 24: Components of voice alarm systems — Loudspeakers*;

— *Part 25: Components using radio links*;

— *Part 26: Carbon monoxide detectors — Point detectors*;

— *Part 27: Duct smoke detectors*;

— *Part 28: Non-resettable line type heat detectors* [currently at drafting stage];

— *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* [the present document];

— *Part 31: Multi-sensor fire detectors — Point detectors using a combination of smoke, carbon monoxide and optionally heat sensors*;

— *Part 32: Planning, design, installation, commissioning, use and maintenance of voice alarm systems* [currently at acceptance stage].

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

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, for example due to dust, steam and cooking vapours. Detectors based on the use of CO sensors alone, are covered by EN 54-26.

Some fires may not produce a sufficient amount of CO to trigger an alarm condition from a detector conforming to EN 54-26. These are typically free-burning, open, well-ventilated fires. The inclusion of heat sensing combined with CO sensing can increase the sensitivity of such a detector to these types of fires.

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.

Test Fires TF2, TF3, TF4 and TF5 from EN 54-7 have been included to verify the detection performance. TF4 and TF5 specifically demonstrate the influence of the heat sensor(s). For these Test Fires, the CO level and, where applicable, the temperature is used as test validity criteria.

Detectors may have modes of operation, in which only one fire phenomenon is evaluated. This standard does not include tests for additional alarm outputs corresponding to the sensing of only one fire phenomenon. Reference should be made to other parts of EN 54, which may cover such modes of operation or outputs.

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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 and around buildings (see EN 54-1:2011), incorporating in one mechanical enclosure at least one carbon monoxide sensor and at least one heat sensor and where the overall fire detection performance is determined utilizing the combination of the detected phenomena.

This European Standard provides for the assessment and verification of consistency of performance (AVCP) of multi-sensor fire detectors using a combination of carbon monoxide and heat sensors to this EN.

Multi-sensor fire detectors using carbon monoxide 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 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[1)], *Fire detection and fire alarm systems — Part 5: Heat detectors - Point detectors*

EN 54-7:2000[2)], *Fire detection and fire alarm systems — Part 7: Smoke detectors — Point detectors using scattered light, transmitted light or ionization*

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 60068-1:2014, *Environmental testing — Part 1: General and guidance (IEC 60068-1:2013)*

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 60068-2-6:2007)*

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

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

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1) This document is currently impacted by the stand-alone amendment EN 54-5:2000/A1:2002.

2) This document is currently impacted by the stand-alone amendments EN 54-7:2000/A1:2002 and EN 54-7:2000/A2:2006.

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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, *Wrought aluminium and aluminium alloys — Chemical composition and forms of products — Part 1: Chemical composition*

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
CO response value
CO concentration in the proximity of the specimen at the moment that it generates an alarm signal

Note 1 to entry: When tested as described in 5.1.5.

Note 2 to entry: The response value may depend on signal processing in the detector and in the control and indicating equipment.

3.1.2
rate-sensitive
behaviour of a detector that depends on the rate of change of CO concentration

3.2 Abbreviations

EMC electromagnetic compatibility

4 Requirements

4.1 General

In order to conform to 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 Nominal activation conditions/sensitivity

4.2.1 Individual alarm indication

Each detector shall be provided with an integral red visual indicator, by which the individual detector that released the 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.

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4.2.2 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 a false alarm when assessed as specified in 5.2.2.

4.2.3 Response to slowly developing fires

Carbon monoxide detectors may incorporate provision for "drift compensation", for example to compensate for sensor drift due to the ageing of the CO sensor or the build-up of contaminants in the detector, 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 specified in 5.2.3.

4.2.4 Repeatability of CO response

The detector shall have stable behaviour with respect to its sensitivity to CO after a number of alarm conditions and shall meet the requirements specified in 5.2.4.

4.2.5 Directional dependence of CO response

The sensitivity of the detector to CO shall not be unduly dependent on the direction of airflow around it and shall meet the requirements specified in 5.2.5.

4.2.6 Directional dependence of heat response

The heat sensitivity of the detector shall not be unduly dependent on the direction of airflow around it and shall meet the requirements specified in 5.2.6.

4.2.7 Lower limit of heat response

The detector shall not be more sensitive to heat alone, without the presence of CO, than is permitted in EN 54-5 and shall meet the requirements specified in 5.2.7.

4.2.8 Reproducibility of CO response

The sensitivity of the detector to CO shall not vary unduly from specimen to specimen and shall meet the requirements specified in 5.2.8.

4.2.9 Reproducibility of heat response

The heat sensitivity of the detector shall not vary unduly from specimen to specimen and shall meet the requirements specified in 5.2.9.

4.2.10 Air movement

The sensitivity of the detector to CO shall not be unduly affected by the rate of the airflow and shall meet the requirements specified in 5.2.10.

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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, 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.

4.3.3 Manufacturer's adjustments

It shall be possible to change the manufacturer's settings only 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 behaviour

If there is provision for on-site adjustment of the response behaviour of the detector then:

— for each setting at which the manufacturer claims compliance with this standard, the detector shall conform to 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;

— 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 conform to the standard.

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

4.3.5 Software-controlled detectors

4.3.5.1 General

For detectors which rely on software control in order to fulfil the requirements of this standard, the requirements of 4.3.5.2, 4.3.5.3 and 4.3.5.4 shall be met.

4.3.5.2 Software documentation

4.3.5.2.1 Design overview

Documentation shall be submitted that 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;

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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.

4.3.5.2.2 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).

4.3.5.3 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.

4.3.5.4 The storage of programs and data

The program necessary to conform to 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.

4.3.6 Long-term stability

The detectors shall be stable over long periods of time and shall meet the requirements specified in 5.3.6.3.

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4.4 Tolerance to supply voltage — 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) and shall meet the requirements specified in 5.4.

4.5 Performance parameters under fire conditions — Fire sensitivity

The detector shall have adequate sensitivity to incipient type fires that may occur in buildings and meet the fire test requirements specified in 5.5.

4.6 Durability of nominal activation/sensitivity

4.6.1 Temperature resistance

4.6.1.1 Dry heat (operational)

The detector shall function correctly at high ambient temperatures as specified in 5.6.1.1.

4.6.1.2 Dry heat (endurance)

The detector shall be capable of withstanding long term exposure to high temperature as specified in 5.6.1.2.

4.6.1.3 Cold (operational)

The detector shall function correctly at low ambient temperatures, as specified in 5.6.1.3.

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, as specified in 5.6.2.1.

4.6.2.2 Damp heat, steady-state (operational)

The detector shall function correctly at high relative humidity (without condensation) as specified in 5.6.2.2.

4.6.2.3 Damp heat, steady-state (endurance)

The detector shall be capable of withstanding Long-term exposure to a high level of continuous humidity as specified in 5.6.2.3.

4.6.2.4 Low humidity, steady-state (operational)

The detector shall function correctly at low relative humidity as specified in 5.6.2.4.

4.6.3 Corrosion resistance — SO_2 corrosion (endurance)

The detector shall be capable of withstanding the corrosive effects of sulphur dioxide as an atmospheric pollutant as specified in 5.6.3.

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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 as specified in 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 as specified in 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 as specified in 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 as specified in 5.6.4.4.

4.6.5 Electrical stability — EMC, immunity (operational)

The detector shall operate correctly when submitted to electromagnetic interference as specified in 5.6.5.

4.6.6 Resistance to chemical agents

4.6.6.1 Exposure to high level of carbon monoxide

The detector shall be capable to withstand exposure to high levels of CO which may be encountered during a fire condition and meet the requirements specified in 5.6.6.1.

4.6.6.2 Exposure to chemical agents at environmental concentrations

The detector shall be capable of withstanding the effects of exposure to atmospheric pollutants or chemicals which may be encountered in the service environment as specified in 5.6.6.2.

5 Test and evaluation 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 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.