



NSAI
Standards

Irish Standard
I.S. EN 54-31:2014+A1:2016

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

I.S. EN 54-31:2014+A1:2016

Incorporating amendments/corrigenda/National Annexes issued since publication:

The National Standards Authority of Ireland (NSAI) produces the following categories of formal documents:

I.S. xxx: Irish Standard — national specification based on the consensus of an expert panel and subject to public consultation.

S.R. xxx: Standard Recommendation — recommendation based on the consensus of an expert panel and subject to public consultation.

SWiFT xxx: A rapidly developed recommendatory document based on the consensus of the participants of an NSAI workshop.

This document replaces/revises/consolidates the NSAI adoption of the document(s) indicated on the CEN/CENELEC cover/Foreword and the following National document(s):

NOTE: The date of any NSAI previous adoption may not match the date of its original CEN/CENELEC document.

This document is based on:

EN 54-31:2014+A1:2016

Published:

2016-04-27

This document was published under the authority of the NSAI and comes into effect on:

2016-05-15

ICS number:

13.220.20

NOTE: If blank see CEN/CENELEC cover page

NSAI
1 Swift Square,
Northwood, Santry
Dublin 9

T +353 1 807 3800
F +353 1 807 3838
E standards@nsai.ie
W NSAI.ie

Sales:
T +353 1 857 6730
F +353 1 857 6729
W standards.ie

Údarás um Chaighdeáin Náisiúnta na hÉireann

National Foreword

I.S. EN 54-31:2014+A1:2016 is the adopted Irish version of the European Document EN 54-31:2014+A1:2016, 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

This document does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

Compliance with this document does not of itself confer immunity from legal obligations.

In line with international standards practice the decimal point is shown as a comma (,) throughout this document.

This page is intentionally left blank

EUROPEAN STANDARD

EN 54-31:2014+A1

NORME EUROPÉENNE

EUROPÄISCHE NORM

April 2016

ICS 13.220.20

Supersedes EN 54-31:2014

English Version

Fire detection and fire alarm systems - 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 and includes Amendment 1 approved by CEN on 31 January 2016.

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.



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

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

Contents	Page
European foreword.....	6
Introduction	8
1 Scope.....	9
2 Normative references.....	9
3 Terms and definitions	10
4 Requirements	10
4.1 General.....	10
4.2 Categorization	10
4.3 Nominal activation conditions/sensitivity	11
4.3.1 Individual alarm indication.....	11
4.3.2 Response to slowly developing fires, aging and contamination	11
4.3.3 Rate sensitive CO response.....	11
4.3.4 Repeatability of smoke response	12
4.3.5 Directional dependence of smoke response	12
4.3.6 Repeatability of CO response.....	12
4.3.7 Directional dependence of CO response.....	12
4.3.8 Directional dependence of heat response.....	12
4.3.9 Lower limit of heat response	12
4.3.10 Reproducibility of smoke response.....	12
4.3.11 Reproducibility of CO response	12
4.3.12 Reproducibility of heat response	12
4.3.13 Air movement.....	12
4.3.14 Dazzling	12
4.4 Operational reliability.....	13
4.4.1 Connection of ancillary devices	13
4.4.2 Monitoring of detachable detectors	13
4.4.3 Manufacturer's adjustments	13
4.4.4 On-site adjustment of response behaviour.....	13
4.4.5 Protection against the ingress of foreign bodies	13
4.4.6 Software controlled detectors.....	13
4.4.7 Long term stability.....	15
4.5 Tolerance to supply parameters - Variation in supply parameters	15
4.6 Performance parameters under fire conditions - Fire sensitivity	15
4.7 Durability of nominal activation conditions/sensitivity	15
4.7.1 Temperature resistance	15
4.7.2 Humidity resistance	15
4.7.3 Shock and vibration resistance.....	16
4.7.4 Electrical stability - EMC, immunity (operational)	16
4.7.5 Resistance to chemical agents.....	16
4.8 Detector sensitivity to single fire phenomena.....	17
4.8.1 Sensitivity to smoke	17
4.8.2 Sensitivity to carbon monoxide	17
4.8.3 Sensitivity to heat.....	17
5 Testing, assessment and sampling methods	17

5.1	General	17
5.1.1	Atmospheric conditions for tests.....	17
5.1.2	Operating conditions for tests	17
5.1.3	Mounting arrangements.....	18
5.1.4	Tolerances.....	18
5.1.5	Measurement of smoke response value	18
5.1.6	Measurement of CO response value.....	19
5.1.7	Measurement of heat response value	20
5.1.8	Provision for tests	20
5.1.9	Test schedule.....	21
5.2	Nominal activation conditions/sensitivity	22
5.2.1	Individual alarm indication	22
5.2.2	Response to slowly developing fires, aging and contamination.....	22
5.2.3	Rate sensitive CO response	23
5.2.4	Repeatability of smoke response.....	23
5.2.5	Directional dependence of smoke response.....	24
5.2.6	Repeatability of CO response	24
5.2.7	Directional dependence of CO response	25
5.2.8	Directional dependence of heat response	25
5.2.9	Lower limit of heat sensitivity	26
5.2.10	Reproducibility of smoke response	26
5.2.11	Reproducibility of CO response.....	27
5.2.12	Reproducibility of heat response.....	27
5.2.13	Air movement.....	27
5.2.14	Dazzling.....	28
5.3	Operational reliability	29
5.3.1	Connection of ancillary devices.....	29
5.3.2	Monitoring of detachable detectors.....	29
5.3.3	Manufacturer's adjustments.....	29
5.3.4	On-site adjustment of behaviour	29
5.3.5	Protection against the ingress of foreign bodies.....	29
5.3.6	Software controlled devices	29
5.3.7	Long term stability	29
5.4	Tolerance to supply parameters	30
5.4.1	Variation in supply parameters	30
5.5	Performance parameters under fire conditions	31
5.5.1	Fire sensitivity	31
5.6	Durability of nominal activation conditions/sensitivity.....	33
5.6.1	Temperature resistance.....	33
5.6.2	Humidity resistance.....	36
5.6.3	Shock and vibration resistance	41
5.6.4	Electrical stability.....	46
5.6.5	Resistance to chemical agents.....	47
5.7	Non-response to single fire phenomena	50
5.7.1	Sensitivity to smoke.....	50
5.7.2	Sensitivity to carbon monoxide.....	51
5.7.3	Sensitivity to heat	51
6	Classification and designation	52
7	Marking, Labelling and Packaging.....	52
Annex A	(normative) Smoke tunnel for smoke response values	54
Annex B	(normative) Test aerosol for smoke response value measurements	55

EN 54-31:2014+A1:2016 (E)

Annex C (normative) Smoke measuring instruments	56
C.1 Obscuration meter	56
C.2 Measuring ionization chamber (MIC)	56
Annex D (normative) Gas test chamber for CO response threshold value and cross-sensitivity to chemical agents	60
Annex E (normative) Heat tunnel for heat response value	61
Annex F (normative) Measuring instruments for CO	62
F.1 General	62
F.2 CO measuring instrument	62
Annex G (informative) Establishing exposure levels of chemical agents	63
G.1 General	63
G.2 Establishing concentration of chemical agents for test gases 1 to 9 of 5.6.5.3	63
G.3 Verification of test chamber leakage	63
G.4 Establishing concentration of ozone	63
Annex H (normative) Apparatus for dazzling test	64
Annex I (informative) Apparatus for impact test	66
Annex J (normative) Fire test room	68
Annex K (normative) Open wood fire (TF1)	70
K.1 Fuel	70
K.2 Arrangement	70
K.3 Method of ignition	70
K.4 Variables	70
K.5 End-of-test condition	70
K.6 Test validity criteria	70
Annex L (normative) Smouldering (pyrolysis) wood fire (TF2)	74
L.1 Fuel	74
L.2 Hotplate	74
L.3 Arrangement	74
L.4 Heating rate	74
L.5 End-of-test condition	74
L.6 Test validity criteria	74
Annex M (normative) Glowing smouldering cotton fire (TF3)	79
M.1 Fuel	79
M.2 Arrangement	79
M.3 Ignition	80
M.4 End-of-test condition	81
M.5 Test validity criteria	81
Annex N (normative) Open plastics (polyurethane) fire (TF4)	84
N.1 Fuel	84
N.2 Conditioning	84
N.3 Arrangement	84
N.4 Ignition	84
N.5 Method of ignition	84
N.6 End-of-test condition	84
N.7 Test validity criteria	84
Annex O (normative) Liquid (heptane) fire (TF5)	87
O.1 Fuel	87

O.2	Arrangement	87
O.3	Ignition	87
O.4	End-of-test condition	87
O.5	Test validity criteria	87
Annex P (normative)	Low temperature black smoke (decalene) liquid fire (TF8)	90
P.1	Fuel	90
P.2	Arrangement	90
P.3	Ignition	90
P.4	End-of-test condition	90
P.5	Test validity criteria	90
Annex Q (informative)	Information concerning the construction of the smoke tunnel	93
Annex R (informative)	Information concerning the construction of the gas test chamber	96
Annex S (informative)	Construction of the heat tunnel	98
Annex T (informative)	Information concerning test procedures and requirements for response to slowly developing fires, aging and contamination	101
Annex U (informative)	Information concerning the construction of the measuring ionization chamber	105
Bibliography	107

EN 54-31:2014+A1:2016 (E)**European foreword**

This document (EN 54-31:2014+A1:2016) 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 2016, 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.

This document includes Amendment 1 approved by CEN on 2016-01-31.

This document supersedes EN 54-31:2014.

The start and finish of text introduced or altered by amendment is indicated in the text by tags **A1** **A1**.

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.

EN 54-31:2014+A1:2016 (E)

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.

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.

A1 *deleted text* **A1**

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*

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)*

This is a free preview. Purchase the entire publication at the link below:

[Product Page](#)

-
- [Looking for additional Standards? Visit Intertek Inform Infostore](#)
 - [Learn about LexConnect, All Jurisdictions, Standards referenced in Australian legislation](#)
-