



**NSAI**  
Standards

Irish Standard  
I.S. EN 54-12:2015

# Fire detection and fire alarm systems - Part 12: Smoke detectors - Line detectors using an optical beam

**I.S. EN 54-12:2015**

*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 54-12:2015

*Published:*

2015-04-08

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

2015-04-25

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

EUROPEAN STANDARD

EN 54-12

NORME EUROPÉENNE

EUROPÄISCHE NORM

April 2015

ICS 13.220.20

Supersedes EN 54-12:2002

English Version

## Fire detection and fire alarm systems - Part 12: Smoke detectors - Line detectors using an optical beam

Systèmes de détection et d'alarme incendie - Partie 12 :  
DéTECTEURS de fumée - DéTECTEURS linéaires fonctionnant  
suivant le principe de la transmission d'un faisceau d'ondes  
optiques rayonnées

Brandmeldeanlagen - Rauchmelder - Teil 12: Linienförmiger  
Melder nach dem Durchlichtprinzip

This European Standard was approved by CEN on 1 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.



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

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

## Contents

Page

Foreword.....	5
1 Scope .....	7
2 Normative references .....	7
3 Terms and definitions .....	8
4 Requirements .....	9
4.1 Compliance.....	9
4.2 Operational reliability .....	9
4.2.1 Individual alarm indication .....	9
4.2.2 Connection of ancillary devices.....	9
4.2.3 Manufacturer's adjustments.....	9
4.2.4 On-site adjustment of response value .....	9
4.2.5 Protection against ingress of foreign bodies .....	10
4.2.6 Monitoring of detachable detectors and connections .....	10
4.2.7 Requirements for software controlled detectors (when provided) .....	10
4.3 Nominal activation conditions/sensitivity .....	11
4.3.1 Reproducibility.....	11
4.3.2 Repeatability.....	11
4.3.3 Tolerance to beam misalignment.....	11
4.3.4 Rapid changes in attenuation.....	12
4.3.5 Response to slowly developing fires.....	12
4.3.6 Optical path length dependence .....	12
4.3.7 Stray light .....	12
4.4 Tolerance to supply voltage - Variation in supply parameters .....	12
4.5 Performance parameters under fire conditions - Fire sensitivity.....	12
4.6 Durability of nominal activation conditions/sensitivity .....	12
4.6.1 Temperature resistance .....	12
4.6.2 Humidity resistance.....	13
4.6.3 Vibration resistance .....	13
4.6.4 Electrical stability - Electromagnetic Compatibility (EMC), Immunity tests (operational) .....	13
4.6.5 Corrosion resistance - Sulphur dioxide (SO <sub>2</sub> ) corrosion (endurance) .....	13
5 Testing, assessment and sampling methods .....	13
5.1 General.....	13
5.1.1 Atmospheric conditions for tests .....	13
5.1.2 Operating conditions for tests .....	14
5.1.3 Mounting arrangements .....	14
5.1.4 Tolerances .....	14
5.1.5 Measurement of response value .....	14
5.1.6 Provision for tests .....	15
5.1.7 Test schedule .....	15
5.2 Operational reliability .....	16
5.2.1 Individual alarm indication .....	16
5.2.2 Connection of ancillary devices.....	16
5.2.3 Manufacturer's adjustments.....	16
5.2.4 On-site adjustment of response value .....	16
5.2.5 Protection against ingress of foreign bodies .....	17
5.2.6 Monitoring of detachable detectors and connections .....	17
5.2.7 Additional requirements for software controlled detectors .....	17
5.3 Normal activation conditions/sensitivity.....	17
5.3.1 Reproducibility.....	17

5.3.2	Repeatability .....	17
5.3.3	Tolerance to beam misalignment .....	18
5.3.4	Rapid changes in attenuation .....	19
5.3.5	Response to slowly developing fires .....	19
5.3.6	Optical path length dependence .....	19
5.3.7	Stray light .....	20
5.4	Tolerance to supply voltage — Variation of supply parameters .....	21
5.4.1	Object of the test .....	21
5.4.2	Test procedure .....	21
5.4.3	Test requirements .....	21
5.5	Performance parameters under fire conditions .....	21
5.5.1	Fire sensitivity .....	21
5.6	Durability of nominal activation conditions/sensitivity .....	23
5.6.1	Temperature resistance .....	23
5.6.2	Humidity resistance .....	25
5.6.3	Vibration resistance .....	27
5.6.4	Electrical stability - Electromagnetic compatibility (EMC), immunity tests (operational) .....	29
5.6.5	Corrosion resistance — Sulphur dioxide (SO <sub>2</sub> ) corrosion (endurance) .....	30
6	Assessment and verification of constancy of performance (AVCP) .....	30
6.1	General .....	30
6.2	Type testing .....	31
6.2.1	General .....	31
6.2.2	Test samples, testing and compliance criteria .....	32
6.2.3	Test reports .....	32
6.3	Factory production control (FPC) .....	32
6.3.1	General .....	32
6.3.2	Requirements .....	33
6.3.3	Product specific requirements .....	35
6.3.4	Initial inspection of factory and FPC .....	36
6.3.5	Continuous surveillance of FPC .....	36
6.3.6	Procedure for modifications .....	36
6.3.7	One-off products, pre-production products, (e.g. prototypes) and products produced in very low quantities .....	37
7	Classification and designation .....	37
8	Marking, labelling and packaging .....	37
Annex A	(normative) Bench for response value measurements .....	39
A.1	Technical characteristics of the attenuators .....	39
A.2	Measuring bench .....	40
Annex B	(normative) Fire test room .....	41
Annex C	(normative) Smouldering (pyrolysis) wood fire (TF2) .....	43
C.1	Fuel .....	43
C.2	Hotplate .....	43
C.3	Arrangement .....	43
C.4	Heating rate .....	44
C.5	End of test condition .....	44
C.6	Test validity criteria .....	44
Annex D	(normative) Glowing smouldering cotton fire (TF3) .....	46
D.1	Fuel .....	46
D.2	Arrangement .....	46
D.3	Ignition .....	46
D.4	End of test condition .....	47
D.5	Test validity criteria .....	47
Annex E	(normative) Flaming plastics (polyurethane) fire (TF4) .....	49

**EN 54-12:2015 (E)**

<b>E.1</b>	<b>Fuel</b> .....	<b>49</b>
<b>E.2</b>	<b>Arrangement</b> .....	<b>49</b>
<b>E.3</b>	<b>Ignition</b> .....	<b>49</b>
<b>E.4</b>	<b>End of test condition</b> .....	<b>49</b>
<b>E.5</b>	<b>Test validity criteria</b> .....	<b>49</b>
<b>Annex F</b>	<b>(normative) Flaming liquid (n-heptane) fire (TF5)</b> .....	<b>51</b>
<b>F.1</b>	<b>Fuel</b> .....	<b>51</b>
<b>F.2</b>	<b>Arrangement</b> .....	<b>51</b>
<b>F.3</b>	<b>Ignition</b> .....	<b>51</b>
<b>F.4</b>	<b>End of test condition</b> .....	<b>51</b>
<b>F.5</b>	<b>Test validity criteria</b> .....	<b>51</b>
<b>Annex G</b>	<b>(normative) Apparatus for stray light</b> .....	<b>53</b>
<b>G.1</b>	<b>Installation</b> .....	<b>53</b>
<b>G.2</b>	<b>The light source</b> .....	<b>54</b>
<b>Annex H</b>	<b>(informative) Information concerning the requirements for the response to slowly developing fires</b> .....	<b>56</b>
<b>Annex I</b>	<b>(informative) Data supplied with line detectors using an optical beam</b> .....	<b>60</b>
<b>Annex ZA</b>	<b>(informative) Clauses of this European Standard addressing the provisions of the EU Construction Products Regulation</b> .....	<b>61</b>
<b>Bibliography</b>	.....	<b>71</b>

## Foreword

This document (EN 54-12:2015) 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 supersedes EN 54-12:2002.

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 54-12 has been revised so as to align with the second answer to Mandate M/109. It includes new clauses and annexes as follows:

- Clause 6 Assessment and verification of constancy of performance (AVCP);
- Clause 7 Classification and designation;
- Clause 8 Marking, labelling and packaging;
- Annex H (informative) Information concerning the requirements for the response to slowly developing fires;
- Annex I (informative) Data supplied with line detectors using an optical beam.

The main technical changes are as follows:

- The definition of response value has been modified so that it relates the same smoke density for line detectors using an optical beam both with and without a separate reflector.
- Changes to the test conditions and requirements for the Tolerance to beam misalignment test and the Vibration (endurance) test.

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;*

**EN 54-12:2015 (E)**

- *Part 10: Flame detectors — Point detectors;*
- *Part 11: Manual call points;*
- *Part 12: Smoke detectors — Line detectors using an optical light beam [the present document];*
- *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;*
- *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;*
- *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](http://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.



## 1 Scope

This European Standard specifies requirements, test methods and performance criteria for line detectors using an optical beam that detect smoke by utilizing the attenuation and/or changes in attenuation of an optical beam, for use in fire detection and fire alarm systems installed in buildings (see EN 54-1:2011).

This European Standard provides for the assessment and verification of constancy of performance (AVCP) of line detectors using an optical beam to this EN.

This European Standard does not cover:

- line detectors using an optical beam designed to operate with separations between opposed components of less than 1 m;
- line detectors using an optical beam whose optical path length is defined or adjusted by an integral mechanical connection;
- line detectors using an optical beam with special characteristics, which cannot be assessed by the test methods in this European Standard.

NOTE The term “optical” is used to describe that part of the electromagnetic spectrum produced by the transmitter to which the receiver is responsive; this is not restricted to visible wavelengths.

## 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 54-7:2000, *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 60064:1995, *Tungsten filament lamps for domestic and similar general lighting purposes — Performance requirements (IEC 60064:1993, modified)*

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

EN 60068-2-75:2014, *Environmental testing — Part 2-75: Tests — Test Eh: Hammer tests (IEC 60068-2-75:2014)*

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](#)
-