



**NSAI**  
Standards

Irish Standard  
I.S. EN 50271:2010

# Electrical apparatus for the detection and measurement of combustible gases, toxic gases or oxygen - Requirements and tests for apparatus using software and/or digital technologies

## I.S. EN 50271:2010

*Incorporating amendments/corrigenda 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.

|  |   |   |
|--|---|---|
| <i>This document replaces:</i><br>EN 50271:2001  | <i>This document is based on:</i><br>EN 50271:2010<br>EN 50271:2001                   | <i>Published:</i><br>4 June, 2010<br>29 November, 2001                    |
| This document was published under the authority of the NSAI and comes into effect on:<br><br>18 June, 2010 |   | ICS number:<br>13.320   |
| <b>NSAI</b><br>1 Swift Square,<br>Northwood, Santry<br>Dublin 9  | T +353 1 807 3800<br>F +353 1 807 3838<br>E standards@nsai.ie<br><br>W <b>NSAI.ie</b> | <b>Sales:</b><br>T +353 1 857 6730<br>F +353 1 857 6729<br>W standards.ie |
| Údarás um Chaighdeán Náisiúnta na hÉireann   |   |   |

EUROPEAN STANDARD  
NORME EUROPÉENNE  
EUROPÄISCHE NORM

**EN 50271**

June 2010

ICS 13.320

Supersedes EN 50271:2001

English version

**Electrical apparatus for the detection and measurement of combustible gases, toxic gases or oxygen -  
Requirements and tests for apparatus using software and/or digital technologies**

Appareils électriques de détection  
et de mesure des gaz combustibles,  
des gaz toxiques ou de l'oxygène -  
Exigences et essais pour les appareils  
utilisant un logiciel et/ou des technologies  
numériques

Elektrische Geräte für die Detektion  
und Messung von brennbaren Gasen,  
giftigen Gasen oder Sauerstoff -  
Anforderungen und Prüfungen  
für Warngeräte, die Software  
und/oder Digitaltechnik nutzen

This European Standard was approved by CENELEC on 2010-06-01. CENELEC 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 Central Secretariat or to any CENELEC 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 CENELEC member into its own language and notified to the Central Secretariat has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and the United Kingdom.

# CENELEC

European Committee for Electrotechnical Standardization  
Comité Européen de Normalisation Electrotechnique  
Europäisches Komitee für Elektrotechnische Normung

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

## **Foreword**

This European Standard was prepared by SC 31-9, Electrical apparatus for the detection and measurement of combustible gases to be used in industrial and commercial potentially explosive atmospheres, of Technical Committee CENELEC TC 31, Electrical apparatus for potentially explosive atmospheres. It was submitted to the formal vote and approved by CENELEC as EN 50271 on 2010-06-01.

This document supersedes EN 50271:2001.

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

The State of the Art is included in Annex ZY "*Significant changes between this European Standard and EN 50271:2001*".

The following dates were fixed:

- latest date by which the EN has to be implemented  
at national level by publication of an identical  
national standard or by endorsement (dop) 2011-06-01
- latest date by which the national standards conflicting  
with the EN have to be withdrawn (dow) 2013-06-01

This European Standard has been prepared under a mandate given to CENELEC by the European Commission and the European Free Trade Association and covers essential requirements of EC Directive 94/9/EC. See Annex ZZ.

---

## Contents

|  |               |
|--|---------------|
| <b>Introduction</b> .....  | <b>- 4 -</b>  |
| <b>1 Scope</b> .....   | <b>- 5 -</b>  |
| <b>2 Normative references</b> .....  | <b>- 5 -</b>  |
| <b>3 Terms and definitions</b> .....   | <b>- 7 -</b>  |
| <b>4 Design principles</b> .....   | <b>- 8 -</b>  |
| 4.1 Basic requirements.....  | - 8 -         |
| 4.2 Displays .....   | - 10 -        |
| 4.3 Software.....  | - 10 -        |
| 4.4 Hardware .....   | - 19 -        |
| 4.5 Digital data transmission between components of apparatus.....                                       | - 19 -        |
| 4.6 Test routines .....  | - 20 -        |
| 4.7 Instruction manual .....   | - 21 -        |
| 4.8 Additional requirements for compliance with SIL 1 .....  | - 22 -        |
| <b>5 Test of the digital unit</b> .....  | <b>- 22 -</b> |
| 5.1 General .....  | - 22 -        |
| 5.2 Verification of functional concept.....  | - 23 -        |
| 5.3 Performance test .....   | - 23 -        |
| <b>Annex A (normative) Hardware-software integration test</b> .....                                      | <b>- 25 -</b> |
| A.1 Functional testing/Black-box testing .....   | - 25 -        |
| A.2 Equivalence class test with boundary value analysis.....   | - 25 -        |
| <b>Annex ZY (informative) Significant changes between this European Standard and EN 50271:2001</b> ..... | <b>- 27 -</b> |
| <b>Annex ZZ (informative) Coverage of Essential Requirements of EC Directives</b> .....                  | <b>- 28 -</b> |
| <br><b>Figure</b>  |               |
| Figure 1 – Model of the software development process .....   | - 12 -        |

## **Introduction**

This European Standard specifies minimum requirements for functional safety of gas detection apparatus using software and/or digital technologies and defines criteria for reliability and avoidance of faults. Functional safety is that part of the overall safety which is related to the measures within the gas detection apparatus to avoid or to handle failures in such a manner that the safety function will be assured.

Gas detection apparatus will fail to function if dangerous failures occur. The aim of this European Standard is to reduce the risk of dangerous equipment failures to levels appropriate to typical applications of such apparatus.

Failure to function will also occur if such apparatus are not selected, installed or maintained in an appropriate manner. In some applications failures of this type will dominate the functional safety achieved. Users of gas detection apparatus will therefore need to ensure that selection, installation and maintenance of such apparatus are carried out appropriately. Guidance for the selection, installation, use and maintenance of gas detection apparatus are set out in EN 60079-29-2 and EN 45544-4, respectively.

This European Standard does not include requirements for operational availability which will need to be considered separately.

Regarding the requirements for the software development process, this European Standard specifies a practical approach to comply with the requirements of EN 61508-3 for SIL 1 without using this generic standard.

It is recommended to apply this European Standard for apparatus used for safety applications with SIL-requirement 1 instead of EN 50402 because EN 50402 is designed for the assessment of more complex gas detection systems with SIL-requirements greater than 1. However, the technical requirements of EN 50271 and EN 50402 are the same for SIL 1.

## 1 Scope

This European Standard specifies minimum requirements and tests for electrical apparatus for the detection and measurement of combustible gases, toxic gases or oxygen using software and/or digital technologies. Additional requirements are specified if compliance with safety integrity level 1 (SIL 1) according to EN 61508 series is required for low demand mode of operation.

NOTE 1 It is recommended to apply this European Standard for apparatus used for safety applications with SIL-requirement 1 instead of EN 50402. However, the technical requirements of EN 50271 and EN 50402 are the same for SIL 1.

NOTE 2 For fixed apparatus used for safety applications with SIL-requirements higher than 1 EN 50402 is applicable.

This European Standard is applicable to fixed, transportable and portable apparatus intended for use in domestic premises as well as commercial and industrial applications.

This European Standard does not apply to external sampling systems, or to apparatus of laboratory or scientific type, or to apparatus used only for process control purposes.

This European Standard supplements the requirements of the European Standards for the detection and measurement of flammable gases and vapours (e.g. EN 60079-29-1, EN 50241-1, EN 50241-2, EN 50194-1, EN 50194-2), toxic gases (e.g. EN 45544 series, EN 50291-1, EN 50291-2) or oxygen (e.g. EN 50104).

NOTE 3 These European Standards will be mentioned in this European Standard as "metrological standards".

NOTE 4 The examples above show the state of the standardisation for gas detection apparatus at the time of publishing this European Standard. There may be other metrological standards for which this European Standard is also applicable.

This European Standard is a product standard which is based on EN 61508 series. It covers part of the phase 9 "realisation" of the overall safety life cycle defined in EN 61508-1.

## 2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

|            |   |
|------------|---|
| EN 45544-1 | Workplace atmospheres – Electrical apparatus used for the direct detection and direct concentration measurement of toxic gases and vapours – Part 1: General requirements and test methods  |
| EN 45544-2 | Workplace atmospheres – Electrical apparatus used for the direct detection and direct concentration measurement of toxic gases and vapours – Part 2: Performance requirements for apparatus used for measuring concentrations in the region of limit values |
| EN 45544-3 | Workplace atmospheres – Electrical apparatus used for the direct detection and direct concentration measurement of toxic gases and vapours – Part 3: Performance requirements for apparatus used for measuring concentrations well above limit values       |
| EN 45544-4 | Workplace atmospheres – Electrical apparatus used for the direct detection and direct concentration measurement of toxic gases and vapours – Part 4: Guide for selection, installation, use and maintenance   |
| EN 50104   | Electrical apparatus for the detection and measurement of oxygen – Performance requirements and test methods  |

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
-