ELEKTRISEADMED PÕLEVGAASIDE, TOKSILISTE GAASIDE VÕI HAPNIKU AVASTAMISEKS JA MÕÕTMISEKS. NÕUDED TARKVARA JA/VÕI DIGITAALTEHNIKAT KASUTAVATELE SEADMETELE JA NENDE SEADMETE KATSETAMINE

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

EESTI STANDARDIKESKUS
ESTONIAN CENTRE FOR STANDARDISATION

EESTI STANDARDI EESSÕNA

NATIONAL FOREWORD

See Eesti standard EVS-EN 50271:2018 sisaldab Euroopa standardi EN 50271:2018 ingliskeelset teksti.	This Estonian standard EVS-EN 50271:2018 consists of the English text of the European standard EN 50271:2018.
Standard on jõustunud sellekohase teate avaldamisega EVS Teatajas.	This standard has been endorsed with a notification published in the official bulletin of the Estonian Centre for Standardisation.
Euroopa standardimisorganisatsioonid on teinud Euroopa standardi rahvuslikele liikmetele kättesaadavaks 15.06.2018.	Date of Availability of the European standard is 15.06.2018.
Standard on kättesaadav Eesti Standardikeskusest.	The standard is available from the Estonian Centre for Standardisation.

Tagasisidet standardi sisu kohta on võimalik edastada, kasutades EVS-i veebilehel asuvat tagasiside vormi või saates e-kirja meiliaadressile standardiosakond@evs.ee.

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EUROPEAN STANDARD

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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 2017-11-06. 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 CEN-CENELEC Management Centre 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 CEN-CENELEC Management Centre has the same status as the official versions.

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European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
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Contents

European foreword

This document (EN 50271:2018) has been prepared by CLC/SC 31-9, “Electrical apparatus for the detection and measurement of combustible gases to be used in industrial and commercial potentially explosive atmospheres”, of CLC/TC 31, “Electrical apparatus for potentially explosive atmospheres”, and by CLC/TC 216 “Gas detectors”.

The following dates are fixed:

- latest date by which this document has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2018-12-15
- latest date by which the national standards conflicting with this document have to be withdrawn (dow) 2021-06-15

This document supersedes EN 50271:2010.

The State of the Art is included in Annex ZY “*Significant changes between this European Standard and* EN 50271:2010” which lists all changes to EN 50271:2010.

This document has been prepared under a mandate given to CENELEC by the European Commission and the European Free Trade Association and covers essential requirements of EU Directive 2014/34/EU.

For the relationship with EU Directive see informative Annex ZZ, which is an integral part of this document.

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 ensured.

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.

This European standard also specifies additional optional requirements for compliance with SIL 1 in low demand mode operation. The following apparatus or gas detection systems are not fully covered by this standard:

– apparatus at SIL 1 when the apparatus or gas detection system contains functionality not covered by EN 50271

– apparatus at SIL 1 high demand mode operation

– apparatus at SIL 2 and SIL 3;

For such apparatus or gas detection systems the European standard EN 50402 should be used instead of EN 50271. EN 50402 includes all requirements of EN 50271.

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.

This European Standard is applicable to fixed, transportable and portable apparatus intended for use in domestic premises as well as commercial and industrial applications and their software-controlled safety related accessories.

This European Standard does not apply to external sampling systems which are not accessories, 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 60079-29-4, 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 1 These European Standards will be mentioned in this European Standard as “metrological standards”.

NOTE 2 The examples above show the state of the standardization 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 the EN 61508 series. It covers part of the phase 10 “realisation” of the overall safety life cycle defined in EN 61508-1.

Additional requirements are specified if compliance with safety integrity level 1 (SIL 1) according to the EN 61508 series is claimed for fixed or transportable apparatus for low demand mode of operation. They can also be applied to portable apparatus which are able to perform an automatic executive action.

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

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 50402:2017, *Electrical apparatus for the detection and measurement of combustible or toxic gases or vapours or of oxygen - Requirements on the functional safety of gas detection systems*

EN 60079-29-1:2016, *Explosive atmospheres - Part 29-1: Gas detectors - Performance requirements of detectors for flammable gases*

EN 61508-1:2010, *Functional safety of electrical/electronic/programmable electronic safety-related systems - Part 1: General requirements*

EN 61508-2:2010, *Functional safety of electrical/electronic/programmable electronic safety-related systems - Part 2: Requirements for electrical/electronic/programmable electronic safety-related systems*

EN 61508-3:2010, *Functional safety of electrical/electronic/programmable electronic safety-related systems - Part 3: Software requirements*

EN 61508-4:2010, *Functional safety of electrical/electronic/programmable electronic safety-related systems - Part 4: Definitions and abbreviations*

EN 61508-5:2010, *Functional safety of electrical/electronic/programmable electronic safety-related systems - Part 5: Examples of methods for the determination of safety integrity levels*

EN 61508-6:2010, *Functional safety of electrical/electronic/programmable electronic safety-related systems - Part 6: Guidelines on the application of IEC 61508-2 and IEC 61508-3*

EN 61508-7:2010, *Functional safety of electrical/electronic/programmable electronic safety-related systems - Part 7: Overview of techniques and measures*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 60079-29-1:2016 and the following apply.

3.1
digital unit
part of an electrical apparatus in which data is processed digitally. Analogue-digital(A/D)-converters and digital-analogue(D/A)-converters as interfaces to analogue units of the apparatus belong to the digital unit

3.2
special state
all states of the apparatus other than those in which monitoring of gas concentration and/or alarming is intended, for example the special states of warm-up, calibration mode or fault condition

[SOURCE: EN 60079-29-1:2016, 3.5.4]

3.3
software
intellectual creation comprising the programs, procedures, rules and associated documentation pertaining to the operation of the digital unit

3.4
failure
termination of the ability of a functional unit to provide a required function or operation of a functional unit in any way other than as required

[SOURCE: EN 61508-4:2010, 3.6.4, mod.]

3.5
parameters
settings by the manufacturer or user which affect the operation of the apparatus, e.g. changing of the alarm set points or measuring ranges. Parameter options are included in the hardware and/or software during design of the apparatus. Changes of parameter settings are not modifications of the software. In the software several different levels of permission to read or to change parameters may exist

3.6
specified range of input values
range of analogue input values corresponding to the digital output range of an A/D-converter or range of digital input values corresponding to the analogue output range of a D/A-converter. The minimum and maximum digital values of the converter are not to be considered to be within the specified range because minima and maxima correspond to stuck-at faults which have to be detected by the apparatus (see 4.1.4)

3.7
defined range of input values
range of input values defined by the manufacturer of the apparatus to be valid; the defined range is a sub-range of the specified range of input values