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Electrical equipment for the detection and  
measurement of oxygen - Performance requirements  
and test methods

## EESTI STANDARDI EESSÕNA

## NATIONAL FOREWORD

See Eesti standard EVS-EN 50104:2019 sisaldab Euroopa standardi EN 50104:2019 ingliskeelset teksti.	This Estonian standard EVS-EN 50104:2019 consists of the English text of the European standard EN 50104:2019.
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## English Version

**Electrical equipment for the detection and measurement of  
oxygen - Performance requirements and test methods**

Appareils électriques de détection et de mesure de  
l'oxygène - Exigences d'aptitude à la fonction et méthodes  
d'essai

Elektrische Geräte für die Detektion und Messung von  
Sauerstoff - Anforderungen an das Betriebsverhalten und  
Prüfverfahren

This European Standard was approved by CENELEC on 2019-08-26. 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  
Europäisches Komitee für Elektrotechnische Normung

**CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels**

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## European foreword

This document (EN 50104:2019) has been prepared by CLC/TC 31, “*Electrical apparatus for potentially explosive atmospheres*”.

The following dates are fixed:

- latest date by which this document has (dop) 2020-08-26  
to be implemented at national level by  
publication of an identical national  
standard or by endorsement
- latest date by which the national (dow) 2022-08-26  
standards conflicting with this document  
have to be withdrawn

This document supersedes EN 50104:2010 and all of its amendments and corrigenda (if any).

The State of the Art is included in Annex A “Significant changes between this edition and EN 50104:2010” which lists all changes to EN 50104:2010.

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

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(s), see informative Annex ZZ, which is an integral part of this document.

## 1 Scope

This document specifies general requirements for design, testing and performance, and describes the test methods that apply to portable, transportable and fixed equipment for the measurement of the oxygen concentration in gas mixtures indicating up to 25 % (v/v). The equipment, or parts thereof, may be intended for use in explosive atmospheres (see 4.1) and in mines susceptible to firedamp.

This document applies to equipment intended for monitoring oxygen deficiency and enrichment.

EXAMPLE Monitoring oxygen deficiency and/or enrichment includes:

- protection of human health and safety in potentially oxygen deficient atmospheres;
- fire protection by monitoring areas with reduced oxygen concentration;
- fire protection by monitoring oxygen concentrations exceeding that of normal ambient air.

This document also applies to equipment with an oxygen measuring function for explosion protection in the case of monitoring inertisation.

NOTE 1 Inertisation is an explosion protection technique where a potentially explosive atmosphere is purged with inert gas.

NOTE 2 Commonly used oxygen sensors in commercial equipment for industrial application are:

- electrochemical sensors (aqueous and solid electrolytes);
- paramagnetic sensors;
- zirconium dioxide sensors;
- tunable diode laser absorption spectroscopy sensors (TDLAS).

This document is applicable to equipment intended to measure reliably the oxygen concentration, to provide an indication, alarm or other output function, the purpose of which is to give a warning of a potential hazard and, in some cases, to initiate automatic or manual protective action(s), whenever the level exceeds or falls below an alarm set point.

This document is applicable to equipment, including integral sampling systems of aspirated equipment, intended to be used for commercial, industrial and non-residential safety applications.

This document does not apply to external sampling systems, or to equipment of laboratory or scientific type, or to medical equipment, or to equipment used only for process monitoring and/or control purposes. For equipment used for sensing the presence of multiple gases, this document applies only to the measurement of oxygen.

This document is also applicable to equipment using optical principles (e.g. TDLAS), where the optical transmitter and receiver or the optical transceiver (i.e. combined transmitter and receiver) and a suitable reflector are not located in a common enclosure. However, in this case it will be necessary to modify the test conditions described in Clause 5.3 and to introduce supplementary tests to Clause 5.4 of this document. Such supplementary tests will include alignment, beam block fault, long range operation. Guidance to appropriate modification of the test conditions and supplementary tests can be taken from EN 60079-29-4. Modifications of the test conditions as well as modified and supplementary tests are expected to be agreed between the manufacturer and test laboratory and identified and described in the test report.

## 2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 50270, *Electromagnetic compatibility - Electrical apparatus for the detection and measurement of combustible gases, toxic gases or oxygen*

EN 50271, *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*

EN 60068-2-6, *Environmental testing - Part 2-6: Tests - Test Fc: Vibration (sinusoidal)*

EN 60079-29-2, *Explosive atmospheres - Part 29-2: Gas detectors - Selection, installation, use and maintenance of detectors for flammable gases and oxygen*

### 3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <http://www.iso.org/obp>

#### 3.1 Gas properties

##### 3.1.1

##### **ambient air**

normal atmosphere surrounding the equipment

##### 3.1.2

##### **poison**

<for sensing elements> substance that lead to temporary or permanent change of performance, particularly loss of sensitivity of the sensing element

##### 3.1.3

##### **reference air**

air, under normal ambient conditions, with an oxygen concentration of  $(21 \pm 0,4) \%$  (v/v)

##### 3.1.4

##### **standard test gas**

test gas with a composition specified for each item of equipment to be used for all tests unless otherwise stated

##### 3.1.5

##### **volume fraction**

v/v

quotient of the volume of a specified component and the sum of the volumes of all components of a gas mixture before mixing, all volumes referring to the pressure and the temperature of the gas mixture

Note 1 to entry: The volume fraction and volume concentration take the same value if, at the same state conditions, the sum of the component volumes before mixing and the volume of the mixture are equal. However, because the mixing of two or more gases at the same state conditions is usually accompanied by a slight contraction or, less frequently, a slight expansion, this is not generally the case.

##### 3.1.6

##### **zero test gas**

gas, such as nitrogen, which is free of oxygen, and interfering and contaminating substances

#### 3.2 Types of equipment

##### 3.2.1

##### **alarm-only equipment**

equipment with an alarm but not having an indication of measured value