



SLOVENSKI STANDARD

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Električne naprave za odkrivanje in merjenje kisika - Zahteve za delovanje in preskusne metode

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

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

Appareils électriques de détection et de mesure de l'oxygène - Règles de performance et méthodes d'essai

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EUROPEAN STANDARD

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English version

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

Appareils électriques de détection
et de mesure de l'oxygène -
Règles de performance
et méthodes d'essai

Elektrische Geräte für die Detektion
und Messung von Sauerstoff -
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This European Standard was approved by CENELEC on 2002-02-01. 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.

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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, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

CENELEC

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

Central Secretariat: rue de Stassart 35, B - 1050 Brussels

Foreword

This third edition of the 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 explosive atmospheres, on the basis of EN 50104:1998.

The text of the draft was submitted to the formal vote and was approved by CENELEC as EN 50104 on 2002-02-01.

This European Standard supersedes EN 50104:1998.

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) 2003-02-01
- latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 2005-02-01

Annexes designated „informative“ are given for information only. In this standard, Annexes A and B are informative.

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1 Scope

This European Standard specifies test methods and performance requirements for portable, transportable and fixed electrical apparatus for the measurement of the oxygen concentration in gas mixtures indicating up to 25 % (v/v).

In the case of inert gas purging (inertization), it applies also to apparatus with an oxygen measuring function for explosion protection.

NOTE The most commonly used oxygen sensors in commercial equipment for industrial application are:

- a) paramagnetic sensors;
- b) electrochemical sensors (aqueous and solid electrolytes).

This European Standard is applicable to oxygen alarm apparatus 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 a preselected alarm concentration.

It is applicable to apparatus, including integral sampling systems of aspirated apparatus, intended to be used for commercial and industrial safety applications.

It does not apply to external sampling systems, or to apparatus of laboratory or scientific type, or to medical equipment, or to apparatus used only for process control purposes.

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2 Normative references

This European Standard incorporates by dated or undated references, provisions from other publications. These normative references are cited at the appropriate place in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

EN 50270	1999	Electromagnetic compatibility - Electrical apparatus for the detection and measurement of combustible gases, toxic gases or oxygen
EN 50271	2001	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	1995	Environmental testing - Part 2: Tests - Test Fc: Vibration (sinusoidal) (IEC 60068-2-6:1995 + corrigendum March 1995)

3 Definitions

For the purposes of this standard, the following definitions apply.

3.1 Gas properties

3.1.1

ambient air

normal atmosphere surrounding the apparatus

3.1.2

poisons (of sensors)

substances which lead to temporary or permanent loss of sensitivity of the sensors

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 apparatus to be used for all tests unless otherwise stated (see 5.3.2)

3.1.5

volume ratio (v/v)

ratio of the volume of a component gas to the volume of the gas mixture under specified conditions of temperature and pressure

3.1.6

zero test gas

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

3.2 Types of instruments

3.2.1

alarm-only apparatus

apparatus having an alarm but not having a meter or other indicating device that would allow measurement of the deviations permitted by the requirements of the appropriate chapters of this European Standard

3.2.2

aspirated apparatus

apparatus that obtains the gas by drawing it to the gas sensor, for example, by means of a hand-operated or electric pump

3.2.3

continuous-duty apparatus

apparatus that is powered for long periods of time, but may have either continuous or intermittent sensing

3.2.4

cyclically operated apparatus

apparatus that senses several measuring points at time intervals

3.2.5

diffusion apparatus

apparatus in which the transfer of gas from the atmosphere to the gas sensor takes place by random molecular movement, i.e. under conditions in which there is not aspirated flow

3.2.6**fixed apparatus**

apparatus that is intended to have all parts permanently installed at a given location

3.2.7**oxygen alarm apparatus**

portable, transportable or fixed apparatus to monitor the oxygen concentration in gas mixtures, which measures autonomously and continuously or cyclically, warns and optionally switches, indicates, registers and stores

3.2.8**portable apparatus**

apparatus that has been designed to be carried readily from place to place and to be used while it is being carried

A portable apparatus is battery powered and includes, but is not limited to

- a) a hand-held apparatus, typically less than 1 kg, suitable for one-handed operation without accessories (such as sampling probes, sample lines) fitted,
- b) personal monitors, similar in size and mass to the hand-held apparatus, that are continuously operating (but not necessarily continuously sensing) while they are attached to the user, and
- c) another apparatus that can be operated by the user while it is carried either by hand, or by a means of a shoulder strap or carrying harness, and which may or may not have a hand-directed probe

3.2.9**spot-reading apparatus**

apparatus intended to operate for periods of only a few minutes or irregular intervals

3.2.10**transportable apparatus**

apparatus not intended to be portable, but which can be moved readily from one place to another

3.3 Sensors**3.3.1****integral sensor**

sensor which is integral to the main body of the apparatus

3.3.2**measuring principle**

type of physical or physico-chemical detection principle and the measurement procedure to determine the measured value

3.3.3**remote sensor**

sensor which is not integral to the main body of the apparatus

3.3.4**sensing element**

part of the sensor which directly picks up the quantity to be measured and which is sensitive to that quantity

3.3.5**sensor**

assembly in which the sensing element is housed and which may also contain associated circuit components

3.4 Supply of gas to instrument

3.4.1

sample line

pipeline by means of which the gas being sampled is conveyed to the sensor

3.4.2

sampling probe

separate sample line which is attached to the apparatus as required, that may or may not be supplied with the apparatus. It is usually short (e.g. in the order of 1 m) and rigid (although it may be telescopic), but it may be connected by a flexible tube to the apparatus

3.5 Signals and alarms

3.5.1

alarm set point

fixed or adjustable setting of the apparatus that is intended to pre-set the level of concentration at which the apparatus will automatically initiate an indication, alarm or other output function

3.5.2

drift

variation in the apparatus indication with time, at any fixed gas concentration level under normal conditions

3.5.3

fault signal

audible, visible or other type of output different from the alarm signal, permitting, directly or indirectly, a warning or indication that the apparatus is not working satisfactorily

3.5.4

final indication

indication given by the apparatus after stabilisation

3.5.5

latching alarm

alarm that, once activated, requires deliberate action to be deactivated

3.5.6

measuring signal

signal of the sensor that is either not amplified or amplified with a constant factor

3.5.7

repeatability

closeness of agreement between the results of successive measurements of the same value of the same quantity carried out by the same method, with the same measuring instruments, by the same observer, in the same laboratory at quite short intervals of time in unchanged conditions

3.5.8

stabilisation

state when three successive readings of an apparatus, taken at 5 min intervals, indicates no changes greater than ± 1 % of the measuring range

3.6 Times

3.6.1

time of response t_x (not applicable to spot-reading apparatus)

time interval, with the apparatus in a warmed-up condition, between the time when an instantaneous variation in volume ratio is produced at the apparatus inlet and the time when the response reaches a stated percentage (x) of the final indication

3.6.2

warm-up time (not applicable to spot-reading apparatus)

time interval, with the apparatus in a stated atmosphere, between the time when the apparatus is switched on and the time when the indication reaches and remains within the stated tolerances (see Figure 1)

4 General requirements

4.1 Introduction

Portable and transportable apparatus, as well as parts of fixed apparatus, that are used in potentially explosive atmospheres shall conform to the appropriate regulations for explosion protection.

Apparatus intended for use in potentially explosive atmospheres shall not be used in oxygen enriched atmospheres if an explosion hazard exists.

4.2 Construction

4.2.1 General

Gas detection apparatus or parts thereof (e.g. remote sensors) specifically intended for use in the presence of corrosive vapours or gases, or which may produce corrosive by-products as a result of the detection process (e.g. catalytic oxidation or other chemical process) shall be constructed of materials known to be resistant to corrosion by such substances.

All apparatus shall be constructed to facilitate regular accuracy checks.

All materials and components used in the construction of the apparatus shall be used within the manufacturer's ratings or limitations unless otherwise specified by appropriate safety standards.

4.2.2 Indicating devices

An indication shall be provided to show that the apparatus is energised.

NOTE The indication may be shown at the central unit.

When the apparatus is intended for the measurement of volume ratios of gases, the indicating or recording device shall permit measurement of the permitted deviations specified in this standard.

For alarm-only apparatus or apparatus where the resolution of the read-out device is inadequate to demonstrate compliance with this standard, the manufacturer shall identify suitable points for connecting indicating or recording devices for the purpose of testing the compliance of the apparatus with this standard.

Where a read-out device is inadequate, it shall be of sufficient quality as not to contradict the results obtained by additional indicating or recording devices.

If the apparatus has more than one measuring range, the range selected shall be clearly identified.

If individual indicating lights are provided, they shall be coloured as follows:

- a) alarms indicating the presence of gas at potentially dangerous levels shall be coloured RED;
- b) equipment fault indicators shall be coloured YELLOW;
- c) power supply indicators shall be coloured GREEN.

In addition to the colour requirements, the indicator lights shall be adequately labelled to show their functions.