



SLOVENSKI STANDARD SIST EN 50104:2020

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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 - Exigences d'aptitude à la fonction et méthodes d'essai

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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.

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

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EN 50104:2019 (E)

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EN 50104:2019 (E)**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have to be withdrawn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.

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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*

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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

3.2.2

aspirated equipment

equipment that samples the gas by drawing it to the gas sensor

Note 1 to entry: A hand operated or electric pump is often used to draw gas to the sensor.

3.2.3

automatically aspirated equipment

aspirated equipment with an integral pump or separate pump, which is connected directly to the equipment

3.2.4

continuous duty equipment

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

Note 1 to entry: Within this document, all equipment is regarded as continuous duty.

3.2.5

diffusion equipment

equipment in which the transfer of gas from the atmosphere to the sensor takes place without aspirated flow

3.2.6

fixed equipment

equipment fastened to a support, or otherwise secured in a specific location when energized

3.2.7

portable equipment

equipment intended to be carried by a person during operation

Note 1 to entry: Portable equipment is battery powered and includes, but is not limited to

- a) hand-held equipment, typically less than 1 kg, which requires use of only one hand to operate,
- b) personal monitors, similar in size and mass to the hand-held equipment, that are continuously operating (but not necessarily continuously sensing) while they are attached to the user, and
- c) larger equipment that can be operated by the user while it is carried either by hand, by a shoulder strap or carrying harness and which may or may not have a hand directed probe.

3.2.8

transportable equipment

equipment not intended to be carried by a person during operation, nor intended for fixed installation

3.2.9

gas detection transmitter

fixed gas detection equipment that provide a conditioned electronic signal or output indication to a generally accepted industry standard (such as 4-20 mA), intended to be utilized with separate gas detection control units, or signal processing data acquisition, central monitoring and similar systems which typically process information from various locations and sources including, but not limited to, gas detection equipment

3.2.10

gas detection control unit

equipment intended to provide indications on a display, alarm functions, output contacts and/or alarm signal outputs or any combinations when operated with remote sensor(s)

EN 50104:2019 (E)**3.2.11****separate gas detection control unit**

equipment intended to provide indications on a display, alarm functions, output contacts and/or alarm signal outputs or any combination when operated with gas detection transmitter(s)

3.2.12**equipment with integral sensor(s)**

equipment that provides indications on a display, alarm functions, output contacts and/or alarm signal outputs using a sensor which is within or directly mounted to the equipment housing

3.2.13**accessory**

component which can be fitted to the equipment for special purpose

EXAMPLE External gas pump, sampling probe, hoses, collecting cone, weather protection device

3.3 Sensors**3.3.1****sensing element**

part of the sensor which is sensitive to the gas/vapour to be measured

3.3.2**sensor**

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

3.3.3**integral sensor**

sensor which is within or directly assembled to the equipment housing

3.3.4**remote sensor**

sensor which is installed separately, but is electrically connected to a gas detection control unit, gas detection transmitter, or to transportable or portable equipment

3.3.5**measuring principle**

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

3.4 Supply of gas to equipment**3.4.1****sample line**

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

Note 1 to entry: Accessories such as filter or water trap are often included in the sample line.

3.4.2**sampling probe**

separate accessory sample line which is optionally attached to the equipment

Note 1 to entry: It is usually short (e.g. of the order of 1 m) and rigid, although it can be telescopic. In some cases it is connected by a flexible tube to the equipment.

3.4.3

field calibration kit

means of presenting test gas to the equipment for the purpose of calibrating/adjusting or verifying the operation of the equipment

Note 1 to entry: The field calibration kit can be used for verifying the operation of the alarms if the concentration of the test gas is beyond the alarm set-point.

Note 2 to entry: A mask for calibration and test (see 3.4.4) is an example of a field calibration kit.

3.4.4

mask for calibration and test

device that can be attached to the equipment to present a test gas to the sensor in a reproducible manner

3.5 Signals and alarms

3.5.1

alarm set point

setting of the equipment at which the measured concentration will cause the equipment to initiate an indication, alarm or other output function

3.5.2

latching alarm

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

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 equipment is not working satisfactorily

3.5.4

repeatability

closeness of agreement between the results of successive measurements of the same measurand, carried out under the same conditions of measurement, i.e.:

- by the same measurement procedure,
- by the same observer,
- with the same measuring instruments, used under the same conditions,
- in the same laboratory,
- at relatively short intervals of time.

3.5.5

special state

any state of the equipment other than those in which monitoring of gas concentration and/or alarming is the intent

Note 1 to entry: Special state includes warm-up, calibration mode or fault condition.

3.5.6

measured value

calculated oxygen concentration that results from processing the sensor signal

Note 1 to entry: The measured value may be further processed before indication on output or display (e.g. suppression of indication).

EN 50104:2019 (E)**3.5.7****indication**

representation of the measured value on an output or display

Note 1 to entry: The indication may be affected by suppression or filtering of the measured value.

3.6 Times**3.6.1****drift**

variation in the equipment indication with time, at any fixed gas volume fraction under constant ambient conditions

3.6.2**final indication**

indication given by the equipment after stabilisation

3.6.3**stabilisation**

state when three successive readings of an equipment at a constant gas volume fraction, taken at 2 min intervals or twice the respective $t(90)$, whichever is less, indicates no changes greater than ± 1 % of the measuring range

3.6.4**time of response** **$t(x)$**

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

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3.6.5**warm-up time**

time interval, with the equipment in a stated atmosphere, between the time when the equipment is switched on and the time when the indication reaches and remains within the stated tolerances

Note 1 to entry: see Figure 1