



SLOVENSKI STANDARD
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Respiratory equipment - Open-circuit self-contained diving apparatus for use with compressed Nitrox and oxygen - Requirements, testing, marking

Atemgeräte - Autonome Leichttauchgeräte mit Nitrox-Gasgemisch und Sauerstoff - Anforderungen, Prüfung, Kennzeichnung

Appareil respiratoire - Appareil de plongée autonome a circuit ouvert utilisant du nitrox et de l'oxygene comprimé - Exigences, essais, marquage

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ICS:

13.340.30 Varovalne dihalne naprave Respiratory protective devices

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en

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ICS 13.340.30

English version

Respiratory equipment - Open-circuit self-contained diving apparatus for use with compressed Nitrox and oxygen - Requirements, testing, marking

Appareils respiratoires - Appareils de plongée autonomes à circuit ouvert pour une utilisation au Nitrox et à l'oxygène - Exigences, essai, marquage

Atemgeräte - Autonome Leichttauchgeräte mit Nitrox-Gasgemisch und Sauerstoff - Anforderungen, Prüfung, Kennzeichnung

This European Standard was approved by CEN on 21 November 2002.

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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 CEN member into its own language and notified to the Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Slovak Republic, Spain, Sweden, Switzerland and United Kingdom.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
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Foreword

This document (EN 13949:2003) has been prepared by Technical Committee CEN /TC 79 "Respiratory protective devices", the secretariat of which is held by DIN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by August 2003, and conflicting national standards shall be withdrawn at the latest by August 2003.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s).

For relationship with EU Directive(s), see informative annex ZA, which is an integral part of this document.

If this draft becomes a European Standard, CEN 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.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Slovak Republic, Spain, Sweden, Switzerland and the United Kingdom.

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Introduction

A given self-contained open-circuit compressed Nitrox or oxygen underwater breathing apparatus can only be approved when the individual components satisfy the requirements of the test specification which can be a complete standard or part of a standard, and practical performance tests have been carried out successfully on complete apparatus where specified in the appropriate standard. If for any reason a complete apparatus is not tested then simulation of the apparatus is permitted provided the respiratory characteristics are similar to those of the complete apparatus.

1 Scope

This European Standard applies to self-contained open-circuit compressed Nitrox gas (oxygen content greater than 22 %) or oxygen underwater breathing apparatus (Nitrox-SCUBA).

This European Standard defines additional requirements, exceptions and tests for Nitrox- or oxygen-SCUBA to those already given in EN 250.

The object of the requirements and tests set out in this European Standard is to ensure a minimum level of safe operation for the apparatus.

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2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places 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 (including amendments).

EN 132:1998, *Respiratory protective devices - Definitions of terms and pictograms*

EN 144-1, *Respiratory protective devices - Gas cylinder valves - Part 1: Thread connections for insert connector*

EN 144-3, *Respiratory protective devices - Gas cylinder valves - Part 3: Outlet connections for diving gases Nitrox and oxygen*

EN 250:2000, *Respiratory equipment - Open-circuit self-contained compressed air diving apparatus - Requirements, testing, marking*

3 Terms and Definitions

For the purposes of this European Standard the terms and definitions given in EN 132:1998 together with the following apply:

3.1

open-circuit self-contained compressed Nitrox or oxygen underwater breathing apparatus

apparatus which has a portable supply of compressed Nitrox and Oxygen carried by the diver, allowing him to breathe under water and exhale into the ambient water

The apparatus, when ready to use, consists of a number of compatible sub-assemblies each of which complies with the requirements of this standard. When connected together, the complete apparatus is designed to enable the wearer to breathe Nitrox and Oxygen on demand from high pressure vessel(s) via a demand regulator

connected to a facepiece. The exhaled gases pass, without recirculation, from the demand regulator via the exhalation valve to ambient water.

3.2

Nitrox

breathing gas mixture of nitrogen and more than 22 % oxygen, also referred to as Oxy-Nitrogen

3.3

high pressure

pressure inside the gas pressure vessel(s)

4 Requirements

4.1 General

The apparatus shall fulfil all requirements of EN 250:2000 with the exception of 5.3 and 5.4 of EN 250:2000.

4.2 Materials and design

4.2.1 Oxygen compatibility

The materials and the design of high pressure sub-assemblies excluding the pressure vessel(s) shall be 100% oxygen adiabatic compression resistant.

Testing shall be done in accordance with 5.2.

4.2.2 Oxygen cleanliness

All sub-assemblies shall be cleaned for oxygen use and identified as such.

Testing shall be done in accordance with 5.2.

4.3 Pressure vessel(s)

The pressure vessel(s) shall comply with appropriate national or European regulations and shall be approved and tested with respect to the rated working pressure and the use of pure oxygen.

The pressure vessel(s) shall be marked with the appropriate neck thread designation according to EN 144-1.

The threads for connecting the pressure vessel(s) and the valve(s) shall be M 18 x 1,5 or M 25 x 2 as specified in EN 144-1.

Testing shall be done in accordance with 6.2 of EN 250:2000.

4.4 Pressure vessel valve(s)

Pressure vessel valve(s) shall comply with appropriate national or European Regulations and shall be approved and tested for use at the rated working pressure and pure oxygen.

The threads for connecting the pressure vessel(s) and the valve(s) shall be M 18 x 1,5 or M 25 x 2 as specified in EN 144-1.

Safe connection between the pressure vessel valve(s) and the demand regulator shall be ensured by using the connections as defined in EN 144-3.

The valve(s) shall be marked with the neck thread and the outlet thread designation according to EN 144-1 and EN 144-3.

The valve(s) shall be so designed or so located that it cannot be closed inadvertently. This is met e.g. by at least 2 turns from fully open to fully closed position.

The function of the pressure vessel valve(s) shall not be impaired by the ingress of water.

The pressure vessel valve(s) shall be protected against the entrainment of dirt, solid particles and water from inside the pressure vessel(s) for example by means of a protective tube with a length of at least 30 mm and an inside diameter of at least 2,5 mm. If provided, an additional sintered metal filter shall have a surface area of at least 900 mm² and be reliably connected to the protective tube.

Testing shall be done in accordance with 6.2 of EN 250:2000, 6.11 of EN 250:2000 and 5.2.

The pressure drop measured across the complete pressure vessel valve(s) assembly with a pressure vessel pressure of 50 bar shall not exceed 10 bar.

Testing shall be done in accordance with 6.7 of EN 250:2000.

4.5 High pressure gauge hose

The design of the high pressure hose inlet shall mitigate the compressive heat ignition hazard to the hose material. The hose material shall be oxygen compatible.

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5 Testing

5.1 General

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Unless otherwise specified, testing shall be carried out with compressed air in accordance with EN 250.

5.2 Oxygen pressure surge test

This test shall be carried out for all sub-assemblies exposed to the high pressure gas. The test shall be carried out with pure oxygen.

The purpose of the test is to check whether these devices withstand an oxygen pressure surge safely.

The sample devices in the "as received" condition, or lubricated, if a lubricant is used for such a device, shall be tested.

Before the test, the ignition test installation shall be checked for the required pressure rise (for examples of the test installation and pressure cycle specification, see figures 1 and 2). For this purpose the sample device, at the end of the 1 m length of copper tube, is replaced by a reliable pressure gauge.

The maximum pressure at the dead end of the copper tube (measured by pressure gauge and recorded on an oscilloscope) shall be achieved within (20 ± 5) ms (time necessary to reach p_{vt} starting from atmospheric pressure). The test pressure (p_{vt}) shall be 1,20 times of the rated working pressure

Stabilization time at p_{vt} is not fixed but shall be greater than or equal 3 s. Before the next pressure surge the system (sample device and copper tube) shall be depressurised down to atmospheric pressure. Stabilization time at atmospheric pressure is not fixed but shall be greater than or equal 3 s.

The total time of the pressure cycle shall be 30 s, as illustrated in figure 2, total time is the time between the beginning of two consecutive pressure surges.

For calibration purposes, heated oxygen at (60 ± 3) °C shall be used.

The quality of oxygen shall be:

- minimum purity 99,5 % by volume;
- hydrocarbon content $\leq 10 \times 10^{-6}$ ppm.

Each test shall be carried out as follows:

- supply oxygen at a temperature of (60 ± 3) °C, directly into the connection of the device to be tested, by means of a copper tube having an internal diameter of 5 mm and a length of 1 m. The specified material and dimensions of the tube are essential in order to ensure that a well defined energy input into the device to be tested is achieved;
- two test sequences shall be carried out on the pressure vessel valve(s). One in the closed position and one in the open position. The test shall be made in such a way to simulate pressure vessel filling and the pressure vessel connection of shall be sealed with a suitable metallic closure;
- only one test shall be carried out on the other sub-assemblies. The direction of the gas flow shall be the same as in normal use;
- as in normal use;
- oxygen is heated up to (60 ± 3) °C, in the oxygen pre-heater. Inlet of oxygen, to the sample device is controlled by a quick opening valve (see figure 1). The test consists of subjecting the pressure vessel valves to 50 pressure cycles and the other sub-assemblies to 20 cycles, from atmospheric pressure to the device test pressure (p_{vt}) (see figure 2);

After the tests, the sample device shall be dismantled and carefully checked, including close examination of non-metallic components. It shall not show any traces of ignition.

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6 Marking

The apparatus sub-assemblies shall be marked in accordance with EN 250.

Additionally, the following sub-assemblies shall be marked "Nitrox" or "O₂" or "Nitrox/O₂".

- pressure vessel valve(s) body;
- demand regulator;
- safety device(s).

7 Information supplied by the manufacturer

Additional to the requirements given in EN 250 the information supplied by the manufacturer shall contain warnings about:

- the equipment shall be for the exclusive use with Nitrox or oxygen and kept clean any time for oxygen use;
- danger of contamination from agents which may give rise to an oxygen ignition;
- the maximum operating depth and exposure time are dependent on the oxygen content of the gas;
- the advice that after filling with oil-contaminated breathing gas contaminated high and medium pressure parts have to be recleaned by a competent person;