SLOVENSKI STANDARD
SIST EN 250:1996

01-april-1996

Oprema za dihanje - Potapljaški dihalni aparat z odprtim krogom na stisnjen zrak - Zahteve, preskušanje, označevanje

Respiratory equipment - Open-circuit self-contained compressed air diving apparatus - Requirements, testing, marking

Atemgeräte - Autonome Leichttauchgeräte mit Druckluft - Anforderungen, Prüfung, Kennzeichnung

Appareils respiratoires - Appareils de plongée autonomes à air comprimé et a circuit ouvert - Exigences, essais, marquage

Ta slovenski standard je istoveten z: **EN 250:1993**

ICS:

13.340.30	Varovalne dihalne naprave	Respiratory protective devices

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EUROPEAN STANDARD

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English version

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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 CEN member.

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CEN

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

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Foreword

This European Standard has been prepared by the Technical Committee CEN/TC 79 "Respiratory protective devices" of which the secretariat is held by DIN.

The text has been submitted to the formal vote and has been approved by CEN as a European Standard.

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

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of an identical text or by endorsement, at the latest by September 1993, and conflicting national standards shall be withdrawn at the latest by September 1993.

In accordance with the CEN/CENELEC Internal Regulations, following countries are bound to implement this European Standard: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

Introduction

A given self-contained open-circuit compressed air underwater breathing apparatus can only be approved when the individual components satisfy the requirements of the test specification which may be a complete standard or part of a standard, and practical performance tests have been carried out 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 air underwater breathing apparatus.

The object of the requirements and tests set out in this European Standard is to ensure a minimum level of safe operation for underwater breathing apparatus to a maximum depth of 50 m.

Laboratory and practical performance tests are included for the assessment of compliance with the requirements.

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.

ISO 263	ISO inch screw threads - General plan and selection screw, bolts and nuts - Diameter range 0,06 to 6 in
EN 132	Respiratory protective devices; Definitions
EN 135	Respiratory protective devices; List of equivalent terms
EN 144-1	Respiratory protective devices; Gas cylinder valves; Thread connection for insert connector
EN 148-1	Respiratory protective devices; Threads for facepieces; Standard thread connection
EN 148-2	Respiratory protective devices; Threads for facepieces; Centre thread connection
EN 148-3	Respiratory protective devices; Threads for facepieces; Thread connection M 45 x 3

DIN 477 Part 1:1990 Gas cylinder valves rated for test pressures up to max. 300 bar; Types, sizes, connections, screw-threads

3 Definitions and description

For the purpose of this European Standard the following definitions apply. They are taken from EN 132 as far as possible:

a) Self-contained, open-circuit compressed air underwater breathing apparatus

A self-contained, open-circuit compressed air underwater breathing apparatus is an apparatus which has a portable supply of compressed air carried by the diver, allowing him to breathe under water. Abbreviation: SCUBA.

The SCUBA, when ready to use, consists of a number of independent elements which comply with the requirements of this standard and are functionally compatible with each other. When connected together, the complete SCUBA is designed to enable the wearer to breathe air on demand from a high pressure cylinder (or cylinders) via a demand regulator connected to a facepiece. The exhaled air passes, without recirculation, from the demand regulator via the exhalation valve to ambient water.

b) High pressure

High pressure is the pressure inside the air cylinder(s) and between the air cylinder(s) and the pressure reducer.

c) Medium pressure

Medium (intermediate) pressure is the pressure between the pressure reducer and the demand valve.

d) Low pressure

Low pressure is the pressure within the facepiece, approximately ambient pressure.

e) Rated working pressure

The rated working pressure is the maximum working pressure of the respective components.

f) Reference pressure

The reference pressure is the equilibrium pressure which exists in the facepiece when there is no respiratory gas flow.

g) Respiratory pressure

The respiratory pressure is the differential pressure in the facepiece relative to the reference pressure measured during inhalation and exhalation.

h) Opening negative pressure (cracking pressure)

The opening negative pressure is the respiratory pressure during inhalation required to open the inhalation valve.

i) Displaced (tidal) volume

The displaced volume is the volume of breathing gas displaced by the breathing simulator during one half cycle (inhalation or exhalation) measured in litres.

k) Breathing frequency

The breathing frequency is the setting of the breathing simulator measured in cycles per minute.

l) Respiratory minute volume (RMV) or ventilation rate ($\dot{V}$)

The RMV or $\dot{V}$ is the product of the tidal volume and breathing frequency measured in litres per minute.

m) Pressure volume loop

The pressure volume loop is the diagram generated during one breathing cycle by plotting the respiratory pressure against the displaced volume.

n) Work of breathing

The work of breathing is the work expended during one breathing cycle measured in J/l. This work is, in general, proportional to the area bounded by the pressure volume loop. Work associated with positive pressures during inhalation does not count towards the total work of breathing.

o) **Facepiece**

A facepiece is a device for connecting the apparatus to the wearer. It may be a mouthpiece assembly or a full face mask or a diving helmet.

p) **Mouthpiece assembly**

A mouthpiece assembly is a device usually held by the teeth, sealing against the lips and through which air is inhaled and exhaled.

q) **Full face mask**

A full face mask is a facepiece covering mouth, nose, eyes and chin and may be fitted with either a mouthpiece or an inner mask.

r) **Diving helmet**

A diving helmet is a facepiece covering the whole head and may be fitted with either a mouthpiece or an inner mask.

s) **Dead space**

The dead space is the volume of the cavity formed between the mouth and the inhalation and exhalation parts.

4 Minimum equipment

4.1 The SCUBA shall be equipped with at least the elements stated in a) to f) and include instructions for use mentioned in g):

a) Air cylinder(s)
b) Demand regulator
c) Safety device
d) Carrying frame or holding device for air cylinder(s) with possibility to mount the harness
e) Carrying system
f) Facepiece: mouthpiece assembly or full face mask or diving helmet
g) Instructions for use

4.2 Sub-assemblies

The SCUBA may consist of sub-assemblies.

4.2.1 Package of air cylinders

A package of air cylinders shall consist of one or more air cylinders with carrying frame.

4.2.2 Demand regulator

A demand regulator shall contain a pressure reducer (1st stage) and a demand valve (2nd stage).

4.2.3 Other components

Other components of a SCUBA such as warning device, pressure gauge, body harness and straps may be connected either with the package of air cylinders or with the demand regulator.

5 Requirements

5.1 Design

The SCUBA and sub-assemblies shall be so designed and its components shall be so located that protection is achieved against mechanical damage caused by external influence and that it is possible to perform the required pre-dive functional checks.

The combination of components shall not adversely affect the safe operation and use of apparatus.

In the case of several interconnected cylinders it shall be ensured that pressure equalisation between opened cylinder valves and/or open reserve valves is not impeded.

The SCUBA and sub-assemblies shall not have any projecting parts or corners and edges which may injure the diver.

All parts which have to be actuated by the diver during use shall be accessible and controllable even when wearing protective gloves (3-finger, 6-7 mm, padding on either side). They shall be designed such that their setting cannot be altered inadvertently during use.

Testing in accordance with 6.2 to 6.12.

5.2 Materials

The materials used shall have adequate mechanical strength and feature sufficient resistance to changes caused by the effect of temperature individually and in the assembled, ready-to-use SCUBA.

Materials that may come into contact with the wearer's skin and mouth shall not be known to be likely to cause irritation or any other adverse effects to health.

After testing in accordance with 6.2 and 6.3 the SCUBA shall still be fully functional, thus satisfying the specified require-ments.

5.3 Air cylinder(s)

The air cylinder(s) shall comply with the appropriate national or European regulations and shall be approved with respect to the rated working pressure.

5.4 Cylinder valves

Cylinder valves shall comply with appropriate national or Euro-pean specifications and shall be approved for use at the rated working pressure.

The insert thread shall be M 18 x 1,5 or M 25 x 2 as described in EN 144-1.

Safe connection between the cylinder valve(s) and the demand re-gulator shall be ensured by using one of the following connec-tions:

a) DIN 477: connection 13 (200 bar)
connection 50 (300 bar)

b) Yoke system CGA 850 (232 bar)

c) SMS system (200 bar)

The handwheel, if fitted, shall require at least 2 turns to reach the stop position from the fully open position.

The function of the cylinder valve shall not be impaired by the ingress of water.

The cylinder valve shall be protected against the entrainment of dirt, solid particles and water from inside the cylinder 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 mm^2 and be reliably connected to the protective tube.

The pressure drop measured across the complete cylinder valve assembly with a cylinder pressure of 50 bar shall not exceed 5 bar.

Testing in accordance with 6.2, 6.3, 6.6 and 6.8.

5.5 High pressure parts and connections

Metallic high pressure tubes, valves and couplings shall be tested to prove that they are capable of withstanding a pressure of 50 % above the maximum filling pressure of the cylinder.

Non-metallic parts shall be tested to prove that they are capable of withstanding a pressure of twice the maximum filling pressure of the cylinder.

High pressure outlet(s), if threaded, shall have 7/16-20 UNF in accordance with ISO 263.

It shall not be possible to connect the medium pressure hose assemblies to high pressure outlets.

The threads of other screw connections shall comply with the relevant national standards.

Testing in accordance with 6.2 and 6.4.

5.6 Demand regulator

On the pressure reducer of the demand regulator any adjustable medium pressure stage shall be reliably secured against accidental alteration and adequately sealed so that any unauthorised adjustment can be detected.

5.6.1 Pressure relief system

5.6.1.1 Upstream demand valve

A demand regulator with an upstream demand valve shall have a relief valve fitted which shall pass an air flow of 400 l/min at a medium pressure not exceeding 30 bar.

The inhalation and exhalation respiratory pressure shall not exceed 25 mbar when tested in accordance with 6.5 and 6.5.1.

5.6.1.2 Downstream demand valve

Where the demand valve is of a downstream design, the respiratory pressure requirements of 5.6.1.1 shall be met when tested in accordance with 6.5 and 6.5.2.

5.7 Hoses

5.7.1 Tensile load of high and medium pressure hose assemblies

The unpressurized hose assembly shall be subjected to a tensile load of 1000 N for a test period of 10 - 15 s. The serviceability shall be retained.

Testing in accordance with 6.4.1.

5.7.2 Flexibility of high and medium pressure hose assemblies

The unpressurized hose assembly shall be capable of being bent to an angle of 180 degrees for 8 h. The serviceability shall be retained.

Testing in accordance with 6.4.2.

5.7.3 High pressure hose assemblies proof pressure

The high pressure hose assembly shall withstand twice the rated working pressure.

Testing in accordance with 6.4.3.

5.7.4 High pressure hose assemblies bursting pressure

The high pressure hose assembly shall withstand a pressure of 4 times the rated working pressure without bursting.

Testing in accordance with 6.4.4.

5.7.5 Length and arrangement of medium pressure hose assembly

The medium pressure hose assembly shall neither impede the fit of the facepiece nor hinder the diver.

Testing in accordance with 6.3