SLOVENSKI STANDARD
SIST EN 12628:2000

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Potapljaški pribor - Kombinirane naprave za uravnavanje plovnosti in reševanje - Funkcijske in varnostne zahteve, preskusne metode

Diving accessories - Combined buoyancy and rescue devices - Functional and safety requirements, test methods

Tauch-Zubehör - Kombinierte Tarier- und Rettungsmittel - Funktionelle und sicherheitstechnische Anforderungen - Prüfverfahren

Accessoires de plongée - Bouées d'équilibrage et de sauvetage combinées - Exigences fonctionnelles et de sécurité, méthodes d'essai

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Diving accessories - Combined buoyancy and rescue devices - Functional and safety requirements, test methods

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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 Central Secretariat has the same status as the official versions.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
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Contents

Foreword

This European Standard has been prepared by Technical Committee CEN/TC 136 "Sports, playground and other recreational equipment", 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of an identical text or by endorsement, at the latest by January 2000, and conflicting national standards shall be withdrawn at the latest by January 2000.

This European Standard 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 standard.

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, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

1 Scope

This standard specifies functional and safety requirements and test methods applicable to combined buoyancy and rescue devices.

This standard is applicable to combined buoyancy and rescue devices for use by divers as defined in 3.1.

This standard does not apply to buoyancy compensators, which are dealt with in EN 1809.

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.

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

EN 394 : 1993
Lifejackets and personal buoyancy aids – Additional items

EN 1809 : 1997
Diving accessories – Buoyancy compensators – Functional and safety requirements, test methods

SS 019102*)
Colour atlas – NCS Natural Colour System

IEC 50(845) : 1987
International Electrotechnical Vocabulary; Chapter 845: Lighting

3 Definitions

For the purposes of this standard the following definitions apply:

3.1 combined buoyancy and rescue device (CBRD): Inflatable type device that provides the diver with means for controlling buoyancy and hold him in a head-up position at the surface with freeboard as stated even if he is unconscious.

3.2 buoyancy compensator: Inflatable type device that provides the diver with means for controlling buoyancy. [EN 1809 : 1997]

3.3 buoyancy: The upward force exerted upon the immersed volume of a body. [EN 1809: 1997]

3.4 maximum buoyancy: The maximum lifting force of a CBRD as determined in accordance with 5.4 of this standard. [EN 1809 : 1997]

3.5 SCUBA: Acronym for self contained underwater breathing apparatus as described in EN 250. [EN 1809 : 1997]

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*) Available from Standardiseringskommissionen i Sveridge (SIS) PO Box 3295 Tegnérgation 11 S-10266 Stockholm

3.6 oral inflation device: A device that permits inflation of the CBRD by mouth. [EN 1809: 1997]

3.7 mechanical inflation device: A device to inflate the CBRD with a breathing mixture from the SCUBA or an independent source.

3.8 manual deflation device: A manually operated device that permits deflation of the CBRD. [EN 1809 : 1997]

3.9 automatic pressure relief device: A device which automatically prevents overpressurisation of a CBRD. [EN 1809 : 1997]

3.10 harness: The means by which the CBRD is secured to the diver's body. [EN 1809 : 1997]

3.11 fixture: The means by which the cylinder(s) (of the SCUBA) are fixed to the CBRD. [EN 1809 : 1997]

3.12 independent inflation device: An inflation device which is actuated manually to effect a rapid increase in buoyancy independent of the breathing mixture from the SCUBA. [EN 1809 : 1997]

3.13 cylinder(s): High pressure containers which can supply breathing mixture for divers. [EN 1809 : 1997]

3.14 breathing mixture: Air or a gas mixture indicated by the manufacturer having an oxygen partial pressure higher than 0,16 bar and a percentage of oxygen not higher than 40 % by volume.

3.15 rated intermediate pressure: The maximum rated intermediate pressure as indicated in the instructions for use of the CBRD as maximum working pressure for the mechanical inflator. [EN 1809 : 1997]

3.16 freeboard: The distance from the lower corner of the mouth to the water surface.

3.17 floating position: A head-up position at the surface with freeboard and an angle of the body trunk as stated even if the diver is unconscious.

4 Requirements

4.1 General

When tested in accordance with 5.7 and 5.12, the CBRD shall not give evidence of any risk of injury of the diver, nor shall impair the operability of any component or that of the SCUBA. The CBRD shall be equipped with several devices permitting respectively oral and mechanical inflation, manual deflation, automatic pressure relief, drainage of entrapped water, with a harness for securing it to the body. It shall be so designed that the diver is supported in a safe floating position when coming up to the surface of the water, shall have easily visible colours and be provided with a signalling mouth whistle.

The CBRD can be fixed on the cylinders of a SCUBA or used as the relevant body harness, can be equipped with hoses for oral inflation or for deflation, with independent inflation devices.

4.2 Mandatory features

4.2.1 Oral inflation device

When tested in accordance with 5.12, the oral inflation device shall be assessed as readily accessible to the mouth and either hand in any stage of inflation of the CBRD. It shall be operable even when wearing protective gloves (3-finger, (6±1) mm, double-lined). When tested in accordance with 5.5, the oral inflation device shall show a differential pressure drop of not more than 35 mbar.

Parts of the device which come into contact with the user's mouth shall be smoothly finished.

4.2.2 Mechanical inflation device

4.2.2.1 The mechanical inflation device shall be actuated subsequent to one positive, manual operation such as pressing a button.

4.2.2.2 If the mechanical inflation device comprises a medium pressure hose and a valve, it shall be subjected to a pressure test and the medium pressure hose(s) shall comply with the appropriate requirements of EN 250.

Testing in accordance with 5.5.3.

The coupling between the valve and the hose shall be rapidly detachable with one hand, even when wearing protective gloves (3-finger, (6±1) mm, double-lined).

Testing in accordance with 5.12.

The maximum buoyancy determined in accordance with 5.4, shall be built up within not more than 20 s at maximum flow and feeding pressure of not more than 7 bar; testing in accordance with 5.5.2.

4.2.2.3 If the mechanical inflation device is directly fed from a secondary high pressure source, this shall comply with the following requirements:

a) the source shall have a minimum capacity of 200 l STPD (Standard Temperature Pressure Dry) and only contain a breathing mixture;

b) the operating valve shall be accessible and operable by one hand even when wearing protective gloves (3-fingers, (6±1) mm, double-lined); testing in accordance with 5.12;

c) at atmospheric pressure, the CBRD shall inflate the maximum buoyancy determined according to 5.4 within 20 s after operating the device; testing in accordance with 5.5.2;

d) cylinder(s), valves and hoses shall comply with the appropriate national or European regulations and shall be approved with respect to the rated working pressure;

e) it shall be fixed such that it cannot be loosened unintentionally; testing in accordance with 5.7 and 5.12.

The independent gas source shall be equipped with at least one of the following safety devices:

f) pressure gauge

g) active warning device

The safety device shall clearly indicate to the diver that the available gas supply is at least 100 l STPD.

Testing in accordance with 5.12.

4.2.3 Independent inflation device

4.2.3.1 The CBRD shall be equipped with an independent inflation device which shall comply with the requirements of 4.2.3.2 to 4.2.3.7.

4.2.3.2 The independent inflation shall have a minimum capacity of 100 l STPD.

4.2.3.3 The independent inflation device shall contain a breathing mixture.

4.2.3.4 The device actuating the release of gas shall be accessible and operable even when wearing protective gloves (3 fingers, (6±1) mm, double-lined).

Testing in accordance with 5.12.

4.2.3.5 When tested at atmospheric pressure according to 5.10, the CBRD shall inflate to 100 % of the maximum buoyancy given in 7.2 e) after operating the independent inflation device.

4.2.3.6 The gas release from the independent source shall be controllable.

Testing in accordance with 5.12.

4.2.3.7 An independent inflation device shall be fixed such that it cannot be loosened unintentionally.

Testing in accordance with 5.7 and 5.12.

4.2.4 Manual deflation device

4.2.4.1 This shall be activated subsequent to one positive manual operation, such as pressing a button or pulling a cord. It shall be operable even when wearing protective gloves (3-finger, (6±1) mm, double-lined). It may either be incorporated in the oral inflation device and comply with 4.2.1 and/or a separately operated device. This device (or at least one of these devices) shall be readily accessible to either hand in any stage of inflation of the CBRD.

Testing in accordance with 5.12.

4.2.4.2 At the maximum manually settable position the outflow of gas shall be greater than the maximum possible inflow by either one of the mechanical inflation devices fed with at least 7 bar at a buoyancy of not more than 20 % of the maximum buoyancy.

Testing in accordance with 5.6.1.

4.2.4.3 After operating the manual deflation device until the outflow of gas stops, the residual buoyancy of the CBRD shall be not more than 10 % of the rated maximum buoyancy.

Testing in accordance with 5.6.2.

4.2.4.4 If the manual deflation device is operated by means of a pulling cord, it shall remain operable after testing in accordance with 5.6.3.

4.2.5 Automatic pressure relief device

This shall prevent damage to the CBRD through overpressurisation.

When tested in accordance with 5.8, the pressure inside the CBRD shall not exceed 50 % of the burst pressure of the CBRD if inflated continously with the mechanical inflator at 120 % of its rated maximum feeding pressure and if inflated continously with the independent inflation device and the CBRD shall have a minimum burst pressure of 0,5 bar above atmospheric pressure.

After the last cycle defined in 5.8.2, the CBRD test sample shall remain in serviceable condition and the air leakage shall reduce its maximum buoyancy not more than 20 N during a 1 h±5 min time.

4.2.6 Means of drainage of entrapped water

When tested in accordance with 5.9, the weight of entrapped water shall be less than 2 % of the maximum buoyancy of the CBRD.

4.2.7 Harness

This feature, which incorporates strapping or other means of attachment shall perform its function of securing the CBRD to the body taking into account different body sizes. The means of attachment shall not interfere with the removal of the user's ballast weights when the CBRD is donned in accordance with the manufacturer's instructions.

Testing in accordance with 5.12.

4.2.8 Signalling mouth whistle

The CBRD shall be provided with a non-metallic, securely fastened, bi-tone mouth whistle.

The sound requirements of the signalling mouth whistle shall conform to 4.3 of EN 394 : 1993.

Testing in accordance with 5.12.2.

4.2.9 Means of location of the diver at the surface

The CBRD shall have exposed colour panels above the water surface with a total area of at least 200 cm^2 of orange, red or yellow colour and shall be checked against colour samples from the NCS colour atlas, and comparisons shall be made in daylight. The exposed portions shall have easily visible colours within the tolerance range defined by the following ranges:

0070-
1070-
0080-
1080-
0090- } in tones Y 30R to Y 80R

and

0070-
0080-
0090- } in tones Y to Y 20R

If fluorescent colours are used they shall be red to yellow or pink, luminance factor $\beta \geq 0,25$ (for definition see 845-04-69 of IEC 50(845):1987.

4.3 Optional features

4.3.1 Influence on mandatory features

If CBRDs are equipped with optional features, these shall be assessed as not compromising the effectiveness of the mandatory features during the practical performance test defined in 5.12.

4.3.2 Fixing of the SCUBA

If the CBRD is fixed to the cylinder(s) of a SCUBA, it shall not become loose or loosened, in or out of water, when tested in accordance with 5.7 and 5.12.

4.3.3 Body harness

If the CBRD is used as the body harness of a SCUBA, it shall comply with the appropriate requirements of EN 250.

4.3.4 Strength of hoses for oral inflation or deflation

If the CBRD is equipped with a hose for inflation by mouth or deflation, the device shall withstand without damage or separation from the oral inflator the strength test specified in 5.11.

4.4 Longterm usability

After submission to the high temperature, low temperature and sea water resistance conditioning defined in 5.2.2 to 5.2.4, and then tested according to 5.7, the CBRD shall be assessed as maintained in serviceable condition, show no sign of physical damage such as tears, loose seams, broken or distorted hardware.

The cylinder(s), if any, shall show no dislocation as to impair the operability of the SCUBA.

After submission to the wearing resistance test defined in 5.2.5, and during the subsequent check of the mechanical inflation device, the maximum leakage of air either in the body of the CBRD or to the outside shall not exceed 0,5 l/min at room temperature.

4.5 Resistance to hydrostatic pressure

After submission to the hydrostatic pressure test defined in 5.3, the CBRD shall be assessed as maintained in serviceable condition and the ingress of water during this test shall not exceed 1 l.

4.6 Floating position

The CBRD shall support the user within 10 s after he comes up to the surface of the water the first time so that the mouth and the nose are held clear of the water in a floating position.

The freeboard shall be at least 8 cm irrespective of the position of the head.

The trunk of the body shall be inclined backwards from the vertical at an angle between 0° and 90°.

Testing according to 5.12 and 5.13.

5 Test methods

5.1 General

If the same CBRD is in different sizes, the test house gets one sample of each size for visual inspection, for testing of the buoyancy in accordance with 5.4, for floating position in accordance with 5.13 and for the freeboard in accordance with 5.14.

All buoyancy tests shall be conducted in fresh water, all other tests can be done in fresh or in sea water.

Except as otherwise indicated, the waist belt and shoulder belt shall be securely closed during testing.

The test sample shall remain in a serviceable condition at the conclusion of each test.

5.2 Wearing and environmental resistance tests

5.2.1 Order of test procedures

Carry out the following resistance tests in the order to 5.2.2, 5.2.3 and 5.2.4 before subjecting the same sample to testing in accordance with 5.7.

5.2.2 High temperature resistance

Place the uninflated CBRD in a circulating air oven maintained at (70±3) °C for 16 h±30 min at a relative humidity between 80 % and 95 %. After removal from the circulating air oven, store the CBRD at a temperature between 18 °C and 25 °C and a relative humidity of at least 50 % for at least 3 h. Record any tackiness, blisters or other visible defects after this test.

5.2.3 Low temperature resistance

Place the uninflated CBRD in a cooling chamber and maintain at (-20±3) °C for 3 h±5 min. Then, connect the CBRD's mechanical inflation device to an air-supply delivering air at the maximum rated intermediate pressure, warmed to (-8±2) °C and then immediately inflate it to the cracking pressure of the relief valve.

5.2.4 Sea water resistance

Submerge the uninflated CBRD fixed to a steel cylinder of 15 liters, unless the maximum volume specified by the manufacturer is smaller, according to the instructions for use in natural sea water or artificial sea water (see annex A) of between 15 °C and 25 °C for 8 h±5 min. Without cleaning in fresh water the CBRD shall stay in air for 16 h±30 min at 15 °C to 25 °C and a relative humidity of not more than 75 %. Apply four complete cycles.

5.2.5 Wearing resistance

Completely submerge the CBRD in water, connect the medium pressure hose to an air-supply, delivering air at the maximum rated intermediate pressure indicated in the instructions for use. Operate the mechanical inflation device, until the automatic pressure relief device starts bleeding off. Then operate the manual deflation device until the CBRD has dropped to less than 10 % of its maximum buoyancy. Repeat this cycle 1 500 times.

Then check the mechanical inflation device, still connected to the medium pressure hose, for leakage for 5 min.