BS EN 1809:2014

BSI Standards Publication

Diving equipment — Buoyancy compensators — Functional and safety requirements, test methods

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National foreword

This British Standard is the UK implementation of EN 1809:2014. It supersedes BS EN 1809:1998 which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee PH/4/7, Underwater breathing apparatus.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

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Diving equipment - Buoyancy compensators - Functional and safety requirements, test methods

Equipement de plongée - Bouée d'équilibrage - Exigences fonctionnelles et de sécurité, méthodes d'essai

Tauch-Zubehör - Tariermittel - Funktionelle und sicherheitstechnische Anforderungen, Prüfverfahren

This European Standard was approved by CEN on 14 May 2014.

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. 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 CEN member.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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Foreword

This document (EN 1809:2014) has been prepared by Technical Committee CEN/TC 136 “Sports, playground and other recreational facilities and 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of an identical text or by endorsement, at the latest by December 2014, and conflicting national standards shall be withdrawn at the latest by December 2014.

This document will supersede EN 1809:1997.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

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 on personal protective equipment (PPE) 89/686/EEC.

For relationship with EU Directive on personal protective equipment (PPE) 89/686/EEC, see informative Annex ZA, which is an integral part of this document.

In comparison with the previous edition EN 1809:1997, the following significant changes have been made:

a) updating of definitions;

b) updating of test methods;

c) introduction of pass/fail criteria for practical performance test;

d) update of marking and instructions for use.

According to the CEN-CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

1 Scope

This European Standard specifies functional, safety requirements and test methods applicable to inflatable type buoyancy compensating devices intended to provide divers with means for controlling buoyancy and if applicable, means for carrying the breathing equipment and/or carrying the weights.

This European Standard is not applicable to other kinds of personal equipment such as life preservers, personal flotation or rescue devices including combined buoyancy and rescue devices.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

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

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1
buoyancy compensator
BC
inflatable type device that provides the diver with a means for controlling buoyancy

3.2
buoyancy
upward force exerted upon the immersed volume of a body

3.3
maximum buoyancy
maximum upward force of a fully inflated BC

3.4
breathing apparatus
system for providing the user with breathable gas

Note 1 to entry: The breathing apparatus may be, e.g. open circuit according to EN 250, re-breathers according to EN 14143 or umbilical supplied according to EN 15333-1 and EN 15333-2.

3.5
oral inflation device
device that permits inflation of the BC by mouth

3.6
compressed gas inflation device
device to inflate the BC with breathable gas mixture from the breathing apparatus or an independent source

3.7
deflation device
device that permits deflation of the BC

Note 1 to entry: This device may be either manually or automatically operated.

3.8
pressure relief device
device that automatically prevents over pressurisation of the BC

3.9
harness
means by which the BC is secured to the user's body

3.10
carrying system
carrying frame or holding device for breathing equipment with the possibility to mount the harness (if applicable)

3.11
auxiliary inflation device
inflation device that is actuated to effect a rapid increase in buoyancy independent of the supply of breathable gas mixture from the breathing apparatus

3.12
cylinder
container for breathable gas mixture under high pressure

3.13
breathable mixture
breathing gas capable of supporting human life under appropriate diving conditions

3.14
rated pressure
maximum rated pressure as indicated in the instructions for use of the BC as maximum working pressure for the inflation device

3.15
medium pressure
pressure between the pressure reducer and the demand valve

3.16
bladder
bag or bags containing the gas providing the buoyancy

4 Requirements

4.1 General

The BC shall not give evidence of any risk of injury of the diver, nor shall impair the operability of any of its components or that of a breathing apparatus.

The BC shall be equipped with several devices permitting respectively oral and compressed gas inflation, manual deflation, automatic pressure relief, drainage of entrapped water, and with a harness for securing it to the user's body.

Testing is in accordance with 5.2 and 5.13.

If the BC has more than one bladder, then each bladder, together with the associated inflation and deflation device, shall comply with the requirements of this standard.

4.2 Mandatory features

4.2.1 Oral inflation device

Parts of the device that come into contact with the user's mouth shall be free of sharp edges and corners.

When tested in accordance with 5.13, the oral inflation device shall be assessed as readily accessible to the mouth and either hand in any stage of inflation of the BC. It shall be operable even when wearing protective gloves (three fingers, (6 ± 1) mm, double-lined).

The oral inflation device shall allow the BC to be easily inflated by mouth when tested in accordance with 5.13.

The oral inflation device shall withstand a pulling force of 150 N for (10 ± 1) s without damage and remain functional.

Testing is in accordance with 5.10.

4.2.2 Compressed gas inflation device

This comprises a medium pressure hose and a valve that shall be actuated subsequent to one positive, manual operation such as pressing a button, or by an automatic control system.

Gas supply shall be capable of simple isolation or able to be disconnected between the hose and the inflation device by a quick connect coupling. If a quick connection coupling is fitted, the preferred configuration for the male part of the inflation device is as shown in Figure 1, where only the relevant dimensions are specified. If the configuration of the connection used is different from the preferred one, it shall not be possible to connect the female connection to the preferred male connector. It shall be possible to isolate or disconnect the gas supply with either hand when wearing protective gloves (three fingers, 6 mm ± 1 mm, double-lined).

Testing is in accordance with 5.13.

Dimensions in millimetres

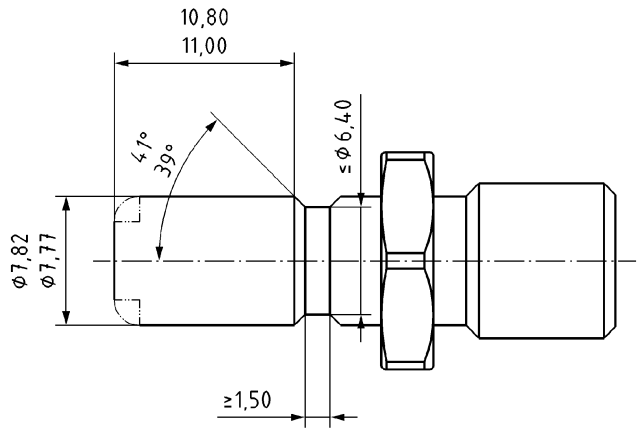


Figure 1 — Quick release male connector

The inflation device shall remain functional with a medium pressure twice its rated working pressure or at least (20 ± 1) bar.

The inflation device shall withstand a medium pressure of at least 30 bar for 60 s.

Testing is in accordance with 5.6.2.

The medium pressure hoses assembly shall comply with the appropriate requirements of EN 250.

If the medium pressure hose is provided with a quick connect coupling, the hose connected to the male part of the quick connect coupling shall have a minimum air flow of 250 l/min STPD, when connected to a constant 10 bar supply.

Testing is in accordance with 5.12.

The maximum buoyancy, determined in accordance with 5.5, shall be built up at a rate greater than 15 N/s at a minimum medium pressure according to manufacturer's instructions and in no case higher than 6 bar.

Testing is in accordance with 5.6.1.

4.2.3 Deflation device

4.2.3.1 The BC shall have at least one manually operated deflation device.

Testing is in accordance with 5.13.

4.2.3.2 If deflation devices are manually operated, they shall be activated by one positive manual operation, such as pressing a button or pulling a cord. They shall be operable even when wearing protective gloves (three fingers, (6 ± 1) mm, double-lined). At least one device shall be readily accessible at any stage of operation of the BC.

Testing is in accordance with 5.13.

4.2.3.3 The flow capacity of at least one deflation device shall be greater than the maximum flow that may be achieved by any individual inflation device.

Testing is in accordance with 5.7.1.

4.2.3.4 The deflation device shall allow a loss of buoyancy, at a rate greater than 20 N/s.

Testing is in accordance with 5.7.2.

4.2.3.5 If the manual deflation device is operated by means of a pulling system, it shall withstand a tensile force of 150 N for 10 s and remain functional when tested in accordance with 5.7.3.

4.2.4 Pressure relief device

The pressure relief device shall prevent damage to the BC through over-pressurization.

When tested in accordance with 5.8, the pressure inside the BC shall not exceed 50 % of its burst pressure.

The BC shall have a minimum burst pressure of 0,5 bar above atmospheric pressure.

4.2.5 Means for 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 BC and in any case not more than 0,8 kg.

4.2.6 Harness

This feature, which incorporates strapping or other means of attachment, shall perform its function of securing the BC 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 BC is donned in accordance with the manufacturer's instructions.

Testing is in accordance with 5.13.

4.3 Optional features

4.3.1 Influence on mandatory features

If the BC is equipped with optional features, these shall be assessed as not compromising the effectiveness of the mandatory features during the practical performance test in accordance with 5.13.

4.3.2 Carrying system

If a breathing apparatus is attached to the BC, it shall not become loose, in or out of water, when tested in accordance with 5.13.

4.3.3 Body harness

If the BC is used as the body harness of a carrying system of a breathing apparatus, it shall comply with the appropriate requirements of EN 250.

4.3.4 Auxiliary breathing system

If the BC is provided with an open circuit demand auxiliary breathing system, the auxiliary breathing system shall comply with the appropriate requirements of EN 250.

The system shall use a different quick connector to that specified in 4.2.2.

4.3.5 Auxiliary inflation devices

4.3.5.1 If the BC is equipped with an auxiliary inflation device, this shall comply with the requirements of 4.3.5.2 to 4.3.5.5.

4.3.5.2 The auxiliary inflation device shall contain a breathable mixture.

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

Testing is in accordance with 5.13.

4.3.5.4 At atmospheric pressure, the BC shall inflate to its maximum buoyancy given in 5.5 at a rate greater than 50 N/s after operating the auxiliary device when tested in accordance with 5.11.

4.3.5.5 The auxiliary inflation device shall be fixed such that it cannot be loosened or actuated unintentionally, when tested in accordance with 5.13.

4.3.6 Ballasting integrated device

The ballast integrated device(s) shall not be detached unintentionally.

The part of the ballast that is proposed by the manufacturer as detachable in an emergency situation shall be easily accessible and quickly detached when wearing protective gloves (three fingers, (6 ± 1) mm, double-lined) at all inflation states of the bladder(s).

Testing is in accordance with 5.2 and 5.13.

4.4 Long-term usability

After submission to the high temperature, low temperature and sea water conditioning defined in 5.3.2 to 5.3.4 and then tested in accordance with 5.6, the BC sample shall remain in a serviceable condition; show no signs

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 breathing apparatus.

Testing is in accordance with 5.2.

After submission to the wearing resistance test defined in 5.3.5 and the subsequent check of the mechanical inflation device for leakage, the maximum allowed leakage of air into the body of the BC shall be 0,5 l/min at room temperature.

On immersion, there shall be no constant bubbling indicating outside leakage.

4.5 Resistance to hydrostatic pressure

After submission to the hydrostatic pressure test defined in 5.4, the BC shall remain functional. The ingress of water in the BC during the test shall not exceed 1 l.

5 Test methods

5.1 General

5.1.1 Testing condition

If the same model of BC is in different sizes, one sample of each size shall be submitted to visual inspection and to buoyancy test in accordance with 5.2 and 5.5.

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.

Submission to all of the following tests shall occur after the BC sample has been tested in accordance with 5.3.

5.1.2 Nominal value and tolerances

Unless otherwise specified, the values stated in this standard are expressed as nominal values. Unless otherwise specified, values shall be subject to a tolerance of ± 5 %. Unless otherwise specified, the room temperature for testing shall be (24 ± 8) °C and at a relative humidity of a least 50 %. The temperature limits with no specified tolerance shall be subject to an accuracy of ± 3 °C.

5.2 Visual inspection

Visual inspection shall be conducted at normal visual acuity by the responsible expert(s) to test the BC. The visual inspection shall verify that the BC complies with the manufacturer's technical documentation and shall include a verification of the marking and the information supplied by the manufacturer.

5.3 Wearing and environmental resistance tests

5.3.1 Order of test procedures

Carry out the following resistance tests in the order of 5.3.2, 5.3.3 and 5.3.4 before subjecting the same sample to test in accordance with 5.13.2.

5.3.2 High temperature resistance

Place the un-inflated BC 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 BC 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.

5.3.3 Low temperature resistance

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

5.3.4 Sea water resistance

Submerge the un-inflated BC fixed to the maximum breathing apparatus size and type (if applicable) and maximum integrated weight ballast (if applicable) as defined in the manufacturer's instructions manual in natural sea water or artificial sea water (see Annex A) of between 15 °C and 25 °C for a minimum of 8 h. Without cleaning in fresh water, the BC shall stay in air for at least 16 h at 15 °C to 25 °C and a relative humidity of not more than 75 %. Apply four complete cycles.

5.3.5 Wearing resistance

Completely submerge the BC in water, connect the medium pressure hose to an air-supply, delivering air at the rated 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 BC has dropped to less than 10 % of its maximum buoyancy. Repeat this cycle 1 500 times.

Then check the whole BC, still connected to the medium pressure hose, for leakage for 5 min.

5.4 Hydrostatic pressure test

Test the un-inflated BC for normal operation immediately after passing through the following hydrostatic pressure cycle:

a) with the BC immersed in water, equipped with the medium pressure hose, the medium pressure hose at its open end capped pressure tight, increase the absolute hydrostatic pressure at a rate of 2 bar/min to 6 bar; if an auxiliary gas source is provided, this shall be connected to the BC during this test;

b) hold for 1 h, then decrease pressure at a rate of 2 bar/min until atmospheric pressure is reached.

5.5 Buoyancy test

Determine the maximum buoyancy of the BC fixed to the maximum breathing apparatus size and type (if applicable) as defined in the manufacturer's instructions manual with all body harness or attachment systems fastened and fully adjusted tight as follows:

a) conduct tests for buoyancy on a BC when attached to the breathing apparatus in a water tank which can be secured against a change of water level as well as a disturbance of the test sample;

b) ballast a test basket made of wire mesh or equivalent material and of sufficient size to hold the fully inflated test sample without compressing it, with sufficient weight to completely submerge test basket and test sample;

c) suspend the test basket and fully deflated test sample from a weighing device that will allow the combined submerged weight of the test basket and the test sample to be determined within ± 5 N;

d) with the submerged, maximal inflated (until operation of the safety valve) test sample, observe the combined weight of the test sample and the test basket;

e) calculate the maximum buoyancy of the test sample by determining the difference between the weights measured in c) and d).

5.6 Inflator tests

5.6.1 Inflation test with inflation device

The maximum buoyancy shall be determined in accordance with 5.5.

Measure the time to fully inflate the BC in order to determine the rate of inflation.

5.6.2 Pressure resistance test of compressed gas inflation device

The inflation device with the hose supplied by the manufacturer shall be connected to an air supply, which gives a medium pressure of 20 bar. The inflation device shall be activated 50 times, where each activation period is 5 s, followed by a rest period of 5 s. The inflation device and hose shall be submerged in water for the duration of the test.

The inflation device with the hose supplied by the manufacturer shall be connected to an air supply which gives a medium pressure of (30^{+3}_{-0}) bar for 60 s. The inflation device and hose shall be submerged in water for the duration of the test.

5.7 Deflation device test

5.7.1 Testing of sufficiently quick outflow of gas

Put the complete, un-inflated BC in an upright position into the test basket as explained in 5.5. Add weights to equate with 20 % of the BC's maximum buoyancy to the test basket, which shall be suspended from a weighing device.

The test shall be conducted at the working pressure as stated by the manufacturer and in no case lower than 10 bar.

Then operate the mechanical inflation device and the deflation device, located in the upper part of the BC, simultaneously for (60 ± 10) s. The test basket with the BC shall remain in the low position.

5.7.2 Testing of sufficiently complete deflation

Put the complete, inflated BC in an upright position into the test basket as explained in 5.5. Add weights to equate with 10 % of the BC's maximum buoyancy to the test basket, which shall be suspended from a weighing device. Then operate the deflation device fully and measure the time until the test basket starts to descend. The measured time shall also be used to determine the rate of deflation.

5.7.3 Testing of tensile strength

Test the tensile strength of the pulling system of the manual deflation device when installed in the BC by applying a tensile force of 150 N for 10 s, in the intended direction of actuation.

5.8 Pressure relief test

Connect the inflation device to a source delivering its rated pressure as stated in the instructions for use. Then actuate the inflation device until the pressure relief device opens and record the pressure within the BC bladder.

5.9 Drainage test

Before the test, the volume of water entrapped shall be (1,0 ± 0,1) l.

Then drain the BC according to the instructions of use.

Determine the weight of the remaining water.

5.10 Test of oral inflation device

Suspend the BC such that the device hangs freely. Apply a pulling force of 150 N to the oral inflation device fixed to the BC for (10 ± 1) s.

5.11 Test of auxiliary inflation devices

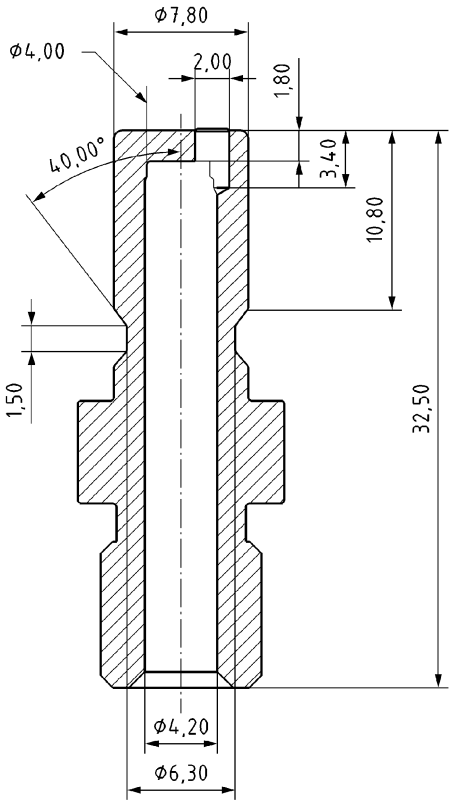
The maximum buoyancy shall be determined in accordance with 5.5.

For auxiliary devices comprising gas cylinders with hand-operated valve(s), measure the time to fully inflate the BC in order to determine the rate of inflation.

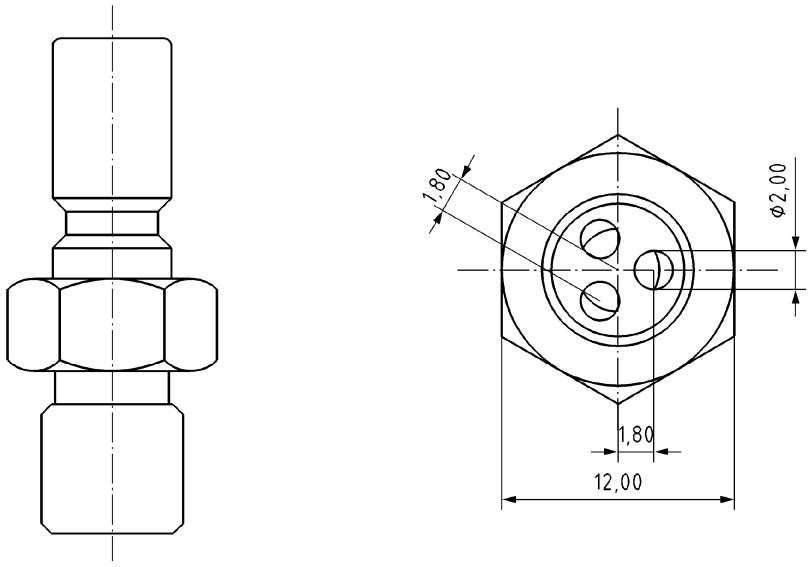
5.12 Flow capacity of medium pressure hose and connector

If the preferred male connector is used, the flow capacity of medium pressure hose and connector shall be determined using the male test connection shown in Figure 2.

Dimensions in millimetres



a)



b) c)

Figure 2 — Test male connection

If a connector different from the preferred one is used, the flow capacity of medium pressure hose and connector shall be determined using the male connector provided with the inflation device.

5.13 Practical performance test

5.13.1 Test subjects

The test subjects shall be practising regularly with BCs of the type under test. They shall be medically examined and certified as fit to undertake the test procedures. They shall be informed and instructed on the objectives of the test.

Each test diver shall read the information supplied by the manufacturer.

Each test diver shall wear protective gloves (three fingers, (6 ± 1) mm, double-lined).

If the BC is designed for women, the test subjects shall be female. If not, the test shall be performed by three test subjects, whose gender is specified in the manufacturer's instructions for use.

5.13.2 Impact test

Secure the BC to the test subject of appropriate size using the maximum cylinder size and type (if applicable) and maximum integrated weight ballast (if applicable) as defined in the manufacturer’s instructions manual. Inflate the BC to compensate for the weight of the air in the attached cylinder. The subject jumps in the following positions and heights:

— feet first: from a height of (1,5 ± 0,1) m;

— back roll: from a height of 0,2 m to 1 m as specified by the manufacturer.

Only the body harnesses may be readjusted before each trial.

At the conclusion of the test, note if the sample remains in a serviceable condition, shows no signs of physical damage such as tears, loose seams or broken or distorted hardware, and if the cylinder (if any) shows no significant dislocation.

5.13.3 Basic testing

Test the BC while using a breathing apparatus with a size of no less than 15 l, unless the maximum volume specified by the manufacturer is smaller and being correctly weighted using the integrated ballast (if applicable) as defined in the manufacturer's instructions manual. If the manufacturer specifies the use of twin cylinders, the testing shall be done with a twin cylinder.

If the manufacturer specifies a different type of breathing apparatus, the specified apparatus shall be used.

Each test subject shall make at least two dives, at least one of which shall be deeper than 5 m.

During the test, the BC shall be subjectively assessed by the test subject and the test subject's comments on the following points shall be recorded after the test:

a) harness comfort;

b) security of fastenings, couplings and storages, including harness;

c) accessibility and operation of inflation and deflation devices;

d) any other comments reported by the wearer.

5.13.4 Functional testing

a) Donning and doffing of the BC as well as adjustment of all straps without help on land;

b) oral inflating;

c) getting buoyancy;

d) isolation or disconnection of gas supply;

e) accessibility and functionality of the ballast integrated devices, if applicable.

5.13.5 Pass/fail criteria

Where practical performance tests show the apparatus has imperfections related to wearer's acceptance or if during any activity by any test subject, the test subject fails to finalize the selected activity due to the apparatus being not fit for the purpose for which it has been designed, the device shall be deemed to have failed.

The following examples are obvious reasons for concluding that an apparatus is unacceptable and not fit for use:

a) subjects it should fit cannot wear it;

b) it will not stay in place;

c) it compromises a function, e.g. breathing;

d) simple tasks to be performed wearing it are impossible;

e) the subject refuses to continue the assessment due to troubles;

f) the subject reports high levels of discomfort;

g) it prevents the wearing or use of other essential PPE.

5.13.6 Test report

Keep a record with final report of the tests performed with test persons. This record shall contain an assessment of the BC by test persons with regard to the requirements specified in this test.

6 Information supplied by the manufacturer

6.1 Marking

All BCs shall be permanently and clearly marked with at least the following information:

a) name or trademark of the manufacturer, importer or supplier or other means of identification;

b) model and size identification;

c) maximum size of cylinders using a graphical symbol;

d) year of manufacture (may be coded);

e) maximum buoyancy measured according to 5.5 expressed in the next lower multiple of not more than 10 N;

f) if a connector other than the preferred inflation connector is used;

g) the sentence “This is not a lifejacket or a rescue device”;

h) on components where the reliable performance may be affected by ageing, the year of manufacture. If a component is too small to be marked or if it is not practical to mark it, this information shall be given in the instructions for use;

i) on components that are of critical importance to safety, a marking to identify them as such; if a component is too small to be marked or if it is not practical to mark it, this information shall be given in the instructions for use;

j) reference number of this European Standard, i.e. EN 1809.

6.2 Instructions for use

6.2.1 Instructions for use shall accompany every BC at point of sale, enabling qualified and trained persons to use the BC in a safe way and, if applicable, to connect it to the breathing apparatus cylinder(s).

6.2.2 The instructions for use shall be unambiguous.

6.2.3 The instructions for use shall be in the official language(s) of the country where it is sold.

6.2.4 The instructions for use shall at least contain all information about the BC necessary for trained and qualified persons regarding:

a) fields of application, especially limitations to dimensions, mass and volume of cylinders;

b) assembly procedure;

c) explanation of all warnings printed on the BC;

d) assessment of risk;

e) temperature conditions;

f) checks prior to use;

g) donning, fitting;

h) use:

   1) maximum and minimum working pressure of the mechanical inflation device;

   2) deflation device with the maximum outflow of gas;

i) maintenance;

j) cleaning and disinfection;

k) storage;

l) shelf life (if applicable);

m) inspection intervals;

n) where applicable, the manufacturer shall inform the user that buoyancy compensator is not a breathing system and that gas should not be inhaled from the buoyancy compensator bladder.

Annex A
(informative)

Artificial sea water composition

Solution A:

— 28,0 g NaCl,

— 5,0 g $MgCl_2 \cdot 6\ H_2O$, and

— 2,4 g $CaCl_2 \cdot 6\ H_2O$

are completely dissolved in 885 ml of desalinated water.

Solution B:

— 7,0 g $MgSO_4$ and

— 0,2 g $NaHCO_3$

are completely dissolved in 100 ml of desalinated water.

Solution B is poured into solution A as a thin jet.

After 24 h, the mixture is filtered and adjusted to $7 \leq pH \leq 8$ by adding NaOH-solution.

Annex ZA
(informative)

Relationship between this European Standard and the Essential Requirements of Directive on personal protective equipment (PPE) 89/686/EEC

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 on personal protective equipment (PPE) 89/686/EEC.

Once this European Standard is cited in the Official Journal of the European Union under that Directive and has been implemented as a national standard in at least one Member State, compliance with the clauses of this European Standard as given in Table ZA.1 confers, within the limits of the scope of this European Standard, a presumption of conformity with the Requirements of that Directive and associated EFTA regulations.

Table ZA.1 — Correspondence between this European Standard and EU Directive on personal protective equipment (PPE) 89/686/EEC

Clause(s)/sub-clause(s) of this EN	Essential Requirements (ESR) of EU Directive 89/686/EEC, Annex II	Qualifying remarks/Notes
4.2.1, 4.2.2, 4.2.3, 4.2.6, 4.3.5.3, 4.3.6	1.1.1 Ergonomics	
4.2.3, 4.2.4, 4.2.5, 4.2.6, 4.3.1, 4.3.2, 4.3.6, 4.5	1.2.1 Absence of risks and other “inherent” nuisance factors	
4.2.1	1.2.1.2 Satisfactory surface condition of all PPE parts in contact with the user	
4.2.1, 4.2.2, 4.2.3.2, 4.2.6, 4.3.2, 4.3.3	1.2.1.3 Maximum permissible user impediment	
4.2.6, 4.3.2, 4.3.3	1.3.1 Adaptation to user morphology	
4.2.1, 4.2.2, 4.2.3.5, 4.2.4, 4.4, 4.5	1.3.2 Lightness and design strength	
Clause 6	1.4 Information supplied b)y the manufacturer	
4.2.6, 4.3.2, 4.3.3	2.1 PPE incorporating adjustment systems	
4.4, Clause 6	2.4 PPE subject to ageing	
4.2.2, 4.3.2, 4.3.3, 4.3.4	2.10 PPE for connection to another external complementary device	
6.1	2.12 Identification of PPE	
4.2	3.4.1 Buoyancy aids	
4.1, 4.2, 4.3	3.11 Safety devices for diving equipment	

WARNING — Other requirements and other EU Directives may be applicable to the product(s) falling within the scope of this European Standard.

Bibliography

[1] EN 14143, *Respiratory equipment - Self-contained re-breathing diving apparatus*

[2] EN 15333 (all parts), *Respiratory equipment — Open-circuit umbilical supplied compressed gas diving apparatus*

[3] EN 12021, *Respiratory equipment - Compressed gases for breathing apparatus*

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