BRITISH STANDARD

BS EN 399:1994

Incorporating Amendment No. 1 and implementing Amendment No. 2, not published separately

Lifejackets and personal buoyancy aids — Lifejackets — 275 N

The European Standard EN 399:1993, together with its amendment A1, has the status of a British Standard

ICS 97.220.40

National foreword

This British Standard is the English language version of EN 399:1993, incorporating A1:1998.

The UK participation in its preparation was entrusted to Technical Subcommittee PH/3/6, Buoyancy garments, which has the responsibility to:

— aid enquirers to understand the text;

— present to the responsible European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;

— monitor related international and European developments and promulgate them in the UK.

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

Cross-references

The British Standards which implement international or European publications referred to in this document may be found in the BSI Standards Catalogue under the section entitled "International Standards Correspondence Index", or by using the "Find" facility of the BSI Standards Electronic Catalogue.

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English version

Lifejackets and personal buoyancy aids — Lifejackets — 275 N

(includes amendment A1:1998)

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This European Standard was approved by CEN on 1993-11-22. Amendment A1 was approved on 20 February 1998. 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 Central Secretariat or to any CEN member.

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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CEN

European Committee for Standardization
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Europäisches Komitee für Normung

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Foreword

This European Standard was prepared by CEN/TC 162, Protective clothing including hand and arm protection and lifejackets, the Secretariat of which is held by DIN.

This European Standard has been prepared under a mandate given to CEN by the Commission of the European Communities (and the Secretariat of the European Free Trade Associations, 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 May 1994, and conflicting national standards shall be withdrawn at the latest by May 1994.

In accordance with the CEN/CENELEC Internal Regulations, the 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.

Foreword of amendment A1

This amendment EN 399:1993/A1:1998 to the EN 399:1993 has been prepared by Technical Committee CEN/TC 162, Protective clothing including hand and arm protection and lifejackets, the Secretariat of which is held by DIN.

This Amendment to the European Standard EN 399:1993 shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by September 1998 and conflicting national standards shall be withdrawn at the latest by September 1998.

This Amendment to the European Standard EN 399:1993 has been prepared under a mandate given to CEN by the European Commission and the Free Trade Association, and supports essential requirements of EU Directive(s).

The purpose of Amendment 1 to EN 399 is to modify the existing text of clause **2**, **4.9**, **4.9.1**, **6.4**, **6.6**, **6.7.8**, **6.8.6**, **8**, annex A, annex E, annex H.

As a result of the 8th meeting of TC 162 WG 6 in Berlin 1993-06-02/04 and confirmed at the 9th meeting in Oslo 1994-02-02/04, all members state unaminously that the set of Standards EN 393, EN 396 and EN 399 require some modifications and interpretations. Further inquiries of manufacturers and testhouses proved that certain parts require comments and modifications.

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.

Contents

Introduction

This standard has been prepared to meet the needs of persons engaged in activities in or near water. Lifejackets manufactured and maintained to this standard will give a reasonable assurance of safety from drowning to a person who, for whatever reason, is no longer capable of helping himself fully, and is subject to conditions which normally impair the performance of lifejackets of lesser buoyancy. It is not intended to replace the standard agreed by the International Maritime Organization, or those specified for use in aircraft by the Federal Aviation Authority, the Civil Aviation Authority, and other aviation regulatory bodies, rather to apply to those people who would not be required to comply with those standards.

This standard allows for the buoyancy of a lifejacket to be provided by a variety of materials, some of which may require preparation before entering the water (e.g. inflation of chambers by gas from a cylinder). However, this broad group of buoyant devices is divided into two main types, those which require the user to initiate the buoyancy provision (by gas inflation), and those which provide full buoyancy without any user intervention (those inflated by a fully automatic method), as well as combinations thereof. In contrast to the standard for lifejackets of 150 N buoyancy, orally inflated lifejackets and those which depend solely on inherent buoyancy are not permitted. However, lifejackets containing buoyancy produced by both inherently buoyant materials and gas inflation are acceptable under this standard. Automatically-operated lifejackets are those suited to persons likely to enter the water unexpectedly, whereas manually-operated lifejackets should only be used if it is certain that the wearer will have sufficient time to produce full buoyancy. In every circumstance, the user should ensure that the correct operation of the lifejacket is suited to the specific application. The compliance of a lifejacket with this standard does not imply that it is suitable for all circumstances. The requirement for regular maintenance is another factor of paramount importance in the choice and application of specific lifejackets.

This standard is intended to serve as a guide to manufacturers, purchasers and users of such safety equipment in ensuring that the equipment provides an effective standard of performance in use. Equally essential is the need for the designer to encourage the wearing of the equipment by making it comfortable and attractive for continuous wear on or near water, rather than for it to be stowed in a locker for emergency use.

The primary aims in wearing a lifejacket are:

a) to support the wearer in reasonable safety in the water, particularly if that person is unable to swim, is exhausted, injured, or otherwise incapacitated. In the case of automatically-operated lifejackets, to perform in this way without any intervention on the part of the wearer, except in initially donning the lifejacket;

b) to enable the wearer to propel himself in the water without it being an encumbrance;

c) to support the wearer, enabling his efforts to be expended in recovery rather than in remaining afloat;

d) to assist the recovery of the wearer.

A lifejacket should provide a sufficient degree of buoyancy in a garment which is light in weight, not unnecessarily bulky, and allows freedom of movement. It should be secure in wear, providing positive support in the water, allowing the wearer to swim or actively assist himself or others. The amount of buoyancy specified, and its distribution, should ensure that the wearer is supported with his mouth and nose clear of the water, and at a correct attitude with the trunk inclined backwards.

Certain circumstances may alter this performance, such as extreme weather conditions, or the wearing of garments which provide (intentionally or otherwise) additional buoyancy, such as immersion suits. Users, owners and employers should ensure that any additional garments or equipment to be worn in conjunction with the lifejacket do not impair its performance. Similarly, certain lifejackets may not perform as well in extremes of temperature, although fully approved under this standard. Lifejackets may also be affected by other conditions of use, such as chemical exposure and welding, and may require additional protection to meet the specific requirements. If the user intends taking a lifejacket into such conditions, then he should satisfy himself that it will not be adversely affected. The standard also allows the lifejacket to be an integral part of a safety harness designed to comply with the European standard. Lifejackets may also be made an integral part of a more substantial garment, for example to provide thermal protection during immersion, in which case the complete assembly as worn is required to comply with this standard. This standard is specifically intended to make allowance for these other factors which may adversely affect the performance of lifejackets of a lesser buoyancy. However, it still does not guarantee safe performance in every circumstance, although it does provide a much greater safety margin.

In compiling the standards required of a lifejacket, consideration has also been given to the potential length of service which the user might expect. Whilst a lifejacket which complies with the specification should be of substantial construction and material, its potential length of service depends mainly on the conditions of use and storage which are the responsibility of the owner, user and/or employer. Furthermore, whilst the performance tests included are believed to assess

relevant aspects of performance in real life use, they are not intended to be accurate simulations of it. For example, the fact that a device passes the self-righting tests described herein does not guarantee that it will in every case self-right an unconscious user wearing waterproof clothing, although the buoyancy requirement should ensure that this occurs in the great majority of cases.

European standards exist for a range of four types of buoyancy garments, of which this standard defines just one. The four are each intended as being suitable for different activities in different risk situations, and include:

a) 275 N lifejackets — these have a buoyancy of no less than 275 N for the average adult and are intended for use offshore in extreme conditions, when heavy protective clothing is being used, or loads such as toolbelts are being carried (EN 399).

b) 150 N lifejackets — these have a buoyancy of no less than 150 N for the average adult and are intended for use offshore or when foul weather clothing is being used (EN 396).

c) 100 N lifejackets — these have a buoyancy of no less than 100 N for the average adult and are intended for use in relatively sheltered waters (EN 395).

d) 50 N buoyancy aids — these have a buoyancy of no less than 50 N for the average adult and are intended for use in sheltered waters when help is close at hand and the user is a swimmer, in circumstances where more bulky or buoyant devices would impair the user's activity or actually endanger him (EN 393).

It is essential that owners, users and employers choose garments which meet the correct standards for the circumstances in which they may be used, and those selling them should make clear to prospective purchasers to which category each product belongs, alternative garments in other categories, and the limitations to normal use of each of the four categories, prior to the purchase. Similarly, those framing legislation regarding the wearing of these garments should consider carefully which type is most appropriate for the foreseeable conditions of use, allowing for the more severe circumstances which often pertain in emergencies.

1 Scope

This standard specifies the requirements for construction, performance, sizing, marking and test methods for lifejackets of 275 N nominal buoyancy excluding the IMO lifejacket and those specified for use in aircraft (by the Federal Aviation Authority, Civil Aviation Authority and other aviation regulatory bodies).

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 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 393	*Lifejackets and personal buoyancy aids — Buoyancy aids — 50 N*
EN 394	*Lifejackets and personal buoyancy aids — Additional items*
EN 395	*Lifejackets and personal buoyancy aids — Lifejackets — 100 N*
EN 396	*Lifejackets and personal buoyancy aids — Lifejackets — 150 N*
EN 22768-1	*General tolerances — Part 1: Tolerances for linear and angular dimensions without individual tolerance indications* (ISO 2768-1:1989)
ISO 105-B04 : 1988	*Textiles — Tests for colour fastness — Part B04 : Colour fastness to weathering: Xenon arc*
ISO 105-E02 : 1989	*Textiles — Tests for colour fastness — Part E02 : Colour fastness to sea water*
ISO 105-X12 : 1987	*Textiles — Tests for colour fastness — Part X12 : Colour fastness to rubbing*
ISO 188 :982	*Rubber, vulcanized — Accelerated ageing or heat-resistance tests*
ISO 1421 : 1977	*Fabrics coated with rubber or plastics — Determination of breaking strength and elongation at break*
ISO 2411 : 1991	*Rubber- or plastics-coated fabrics — Determination of coating adhesion*
ISO 3801 : 1977	*Textiles — Woven fabrics — Determination of mass per unit length and mass per unit area*
ISO 4674 : 1977	*Fabrics coated with rubber or plastic — Determination of tear resistance*
ISO 5081 : 1977	*Textiles — Woven fabrics — Determination of breaking strength and elongation (strip method)*
ISO 5082 : 1982	*Textiles — Woven fabrics — Determination of breaking strength — Grab method*

ISO 7854 : 1984	*Rubber- or plastics-coated fabrics — Determination of resistance to damage by flexing (dynamic method)*
ISO 9227 : 1990	*Corrosion tests in artificial atmospheres — Salt spray tests*
AATC Method 30 : 1981	*Fungicides, evaluation on textiles: mildew and rot-resistance of textiles*

3 Definitions

For the purposes of this standard, the definitions of EN 394:1993 and EN 396:1993 apply.

4 Requirements

4.1 General

The lifejacket may incorporate additional items compliant with EN 394, none of which shall impair its performance with respect to the requirements of this standard.

4.2 Materials and components

4.2.1 Materials and components shall not be damaged by storage at temperatures of −30 °C to +60 °C when tested according to **6.1**, nor shall they be damaged by salt water with oil on the surface, when tested according to **6.2**.

4.2.2 Resistance to rot and illumination shall be tested according to the methods of AATCC Method 30:1981, and ISO 105-B04:1988. Illumination shall take place to Class 5–6 with 1/2 unit tolerance. Materials which are screened by some form of cover when in normal use shall not undergo illumination testing. Following exposure to rot or illumination, the tensile strength shall be measured using the grab method given in ISO 5082, using specimens of at least 60 mm width and with at least 100 mm of material on each side of the test point, with 4 similar seams for each type of seam.

4.3 Textile and fabric materials and components

4.3.1 Textiles shall be rot proof to **4.2.2** and of sufficient strength to withstand all tests in clause **6** without sustaining damage. After testing of resistance to rot and/or illumination according to **4.2.2**, cloth, seams (joints), and fastening devices (including zip fasteners) shall have a tensile strength of at least 300 N per 25 mm, when tested according to the method of ISO 5082.

4.3.2 Coated fabrics used in the construction of inflatable buoyancy chambers shall comply with the following requirements.

a) Coating adhesion shall be tested in accordance with ISO 2411:1991 using the method described at **5.2.2.1** at 100 mm/min, and shall be not less than 50 N per 50 mm width.

b) Coating adhesion shall also be tested when wet following ageing according to ISO 188, with an exposure of (336,0 ± 0,5) h in fresh water at (70,0 ± 1,0) °C, following which the method at ISO 2411:1991 **5.2.2.1** shall be applied at 100 mm/min, and shall not be less than 40 N per 50 mm width;

c) Tear strength shall be tested in accordance with ISO 4674:1977 using method A1, and shall not be less than 35 N.

d) Resistance to flex cracking shall be tested in accordance with ISO 7854:1984 method A using 9000 flex cycles, following which there shall be no visible cracking or deterioration.

e) Breaking strength shall be tested in accordance with ISO 1421:1977 using the CRE or CRT methods following conditioning of (24,0 ± 0,5) h at room temperature, and shall be not less than 200 N per 50 mm width when tested.

f) Breaking strength shall be tested in accordance with ISO 1421:1977 using the CRE or CRT methods following conditioning of (24,0 ± 0,5) h immersion in fresh water at room temperature, and shall be not less than 200 N per 50 mm width when tested.

g) Elongation at break shall be tested in accordance with ISO 1421:1977 using the CRE or CRT methods following conditioning of (24,0 ± 0,5) h at room temperature, and shall be not more than 60 %.

h) Elongation at break shall be tested in accordance with ISO 1421:1977 using the CRE or CRT methods following conditioning of (24,0 ± 0,5) h immersion in fresh water at room temperature, and shall be not more than 60 %.

4.3.3 The other fabrics used in the construction of covers of inherently buoyant compartments, the retention system, and any other component the failure of which would render the entire item non-conformant with this standard, shall comply with the following requirements.

a) Breaking strength shall be tested to ISO 5081:1977 using the CRE or CRT methods, following (24,0 ± 0,5) h conditioning at room temperature, and shall be not less than 10 N/mm.

b) Elongation at break shall be tested to ISO 5081:1977 using the CRE or CRT methods, following (24,0 ± 0,5) h conditioning at room temperature, and shall be not more than 60 %.

c) Tear resistance shall be tested according to ISO 4674:1977 (method A2, tensile speed (100 ± 10) mm/min, with a pre-tension of 2 N for materials of up to 200 g/m^2, 5 N for materials of over 200 g/m^2 and up to 500 g/m^2, and 10 N for materials of over 500 g/m^2), and shall be not less than 10 N.

4.3.4 Where the mass per unit area of a material is required to be measured, then it shall be measured according to method 5 of ISO 3801:1977.

4.4 Metal components

4.4.1 When tested in accordance with ISO 9227:1990 for a period of 96 h, metal components shall not be significantly affected by corrosion. This shall be tested by a functional test.

4.4.2 No component shall affect a magnetic compass of a type commonly used in small boats by more than 1 degree, when placed at a distance of 500 mm from it.

4.5 Oral inflation tubes

4.5.1 The lifejacket shall have a simple and rapid method of deflation, which shall also be used for oral inflation. This oral inflation tube shall be free from burrs and shall incorporate an effective non-return valve.

4.5.2 A lifejacket shall have a minimum air flow through the oral inflation tube of 85 l/min, and the non-return valve shall open initially at an applied air pressure of between 1,0 kPa and 3,0 kPa, when tested according to **6.3**.

4.5.3 If an oral inflation tube protrudes from the surface of the device, and the non-return valve either protrudes from the tube when in normal use or the valve can be separated from the tube, then it shall be tested according to **6.4**. It shall not be removed by a force of $(90\ ^{+1}_{0})$ N.

4.6 Inflation operating head

An external inflation operating head shall withstand a force of 220 N applied to it as described in **6.5** without any evidence of fracture, leakage of gas from the buoyancy chamber, or other damage.

4.7 Gas cylinder

4.7.1 A cylinder shall be seamless and of a type which is not rechargeable following release of its contents.

4.7.2 A cylinder excluding the sealing disk shall be capable of withstanding an internal pressure of 54 MPa without bursting.

4.7.3 The material from which a cylinder is made shall resist corrosion in a marine environment or shall be suitably protected to resist corrosion.

4.7.4 A charged cylinder shall not, when conditioned for $(96{,}0 \pm 0{,}5)$ h at a temperature of $(65\ ^{+2}_{0})$ °C, lose gas or suffer any permanent change, except that a slight deformation of the cap which does not impair normal performance is permitted.

4.7.5 If filled with carbon dioxide, the maximum acceptable nominal mass in grams of carbon dioxide shall be no more than 75 % of the volume in ml of the cylinder.

4.8 Types of buoyancy

4.8.1 At least the minimum amount of buoyancy required by this standard shall be provided by the inflation of chambers with gas provided in cylinders, or a combination of inherently buoyant material and the inflation of chambers with gas. The use of chambers permanently inflated with gas, or filled with inherently buoyant material which does not comply with this standard, shall not be permitted.

4.8.2 If a lifejacket contains inherently buoyant material which is divided itself into more than 150 separable pieces (for example, granules), then the inherently buoyant material shall be retained in at least six separate compartments in the device, each compartment being of approximately equal size, so as to reduce the risk of physical damage to a part of the device resulting in severe loss of buoyancy.

4.8.3 If the manufacturer makes the claim that the lifejacket is partially inherently buoyant, then it shall provide by its inherent buoyancy alone at least the buoyancy required of an equivalently sized device under EN 393.

4.8.4 In the case of a lifejacket dependent upon inflatable chambers for reaching the buoyancy specified, in whole or in part, and manufactured for use by children of under 30 kg in body weight, the lifejacket shall either be automatically inflated or shall additionally function as an inherently buoyant lifejacket to EN 395.

4.9 Inflatable buoyancy chambers

4.9.1 Inflatable buoyancy chambers shall be capable of withstanding an internal pressure of 40 kPa without damage or permanent deformation within a temperature range of −5 °C to 30 °C. An inflatable section shall also be tested to an internal pressure of air at 3,5 kPa for 12 h, during which it shall lose no more than 0,25 kPa pressure.

In the follow up of this procedure an inflation test with 40 KPa is required at −5 °C and at +30 °C, furthermore an inflation with 3,5 KPa under standard atmosphere. All datas to be reported.

4.10 Inherently buoyant material

4.10.1 Any inherently buoyant material used to provide buoyancy shall be capable of withstanding compression and movement in normal wear without sustaining permanent loss of buoyancy. The maximum loss of buoyancy when three valid samples are tested according to the method at annex H shall not exceed 10 % in any foam or granular material providing inherent buoyancy.

4.10.2 Any inherently buoyant material used to provide buoyancy shall be shown to have thermal stability under the conditions of the test described in **6.6**, in which the maximum loss of volume in any sample shall not exceed 5 %.

4.11 Total buoyancy provided

4.11.1 For the purpose of assessment to this standard, items of different size are to be accompanied by stated minimum and maximum weight range equivalents, which shall be in reasonable accord with the marked size ranges (which may actually be set using other dimensions such as height and girth as desired). However, the primary means of indicating the device's size as regards fit shall be one which is appropriate and meaningful to the prospective user, for instance the statement of weight and girth ranges, as required by **8.1**d).

4.11.2 The minimum amount of buoyancy provided shall be calculated according to Table 1.

Table 1 — Minimum buoyancy

Wearer's weight kg	Minimum buoyancy N
up to 20	90
over 20 to 30	120
over 30 to 40	140
over 40 to 50	170
over 50 to 60	200
over 60 to 70	230
over 70	275

4.11.3 If a lifejacket is intended for two or more weight classes, the buoyancy shall be at least that stipulated for the heaviest class.

4.11.4 The buoyancy of the lifejacket shall be tested according to annex B. The difference between the measurements 24 h apart shall not exceed 5 % of the original buoyancy. The buoyancy measured in any test carried out for the purpose of ascertaining conformance with this standard shall not be less than that claimed on the marking of the lifejacket, nor that required by **4.11.2**.

4.11.5 Where the lifejacket is also fitted with additional buoyancy to that required by **4.11.2**, it shall be manufactured from materials which are not detrimental to the performance of those used in compliance with this standard.

4.11.6 The total buoyancy measured shall for all tests be sufficient that, when diminished by the greater of the two percentage losses determined for any inherently buoyant material as determined at **4.10**, it shall still meet the requirements of the respective category in **4.11.2**. For example, if for a given device which requires a minimum buoyancy for its size of 50 N (according to **4.11.2**), the lowest buoyancy measured under **4.11.4** is 53 N, and the tests according to **4.10.1** return a maximum loss of 4 % and according to **4.10.2** a maximum loss of 3 %, then the minimum acceptable buoyancy would be 50 N + (4 % of 50 N), which equals 52 N.

4.12 Colour

4.12.1 The colour of the exposed portions of the lifejacket when deployed shall be in the range from yellow to red, excluding components such as webbing, zips and other fittings. The colour shall be checked against colour samples from the NCS Colour Atlas, and comparisons shall be made in daylight. The exposed portions shall, after illumination according to **4.2.2**, have easily visible colours within the tolerance range defined by the following ranges:

0070 –
1070 – in tones
0080 – Y 30R – Y 80R
1080 –
0090 –

and

0070 –
0080 – in tones
0090 – Y – Y 20R

and the corresponding fluorescent colours in the same tolerance ranges.

4.12.2 The colour of the lifejacket shall be resistant to rubbing, wet and dry, when tested according to ISO 105-X12:1987 to at least class 3, and to salt water when tested according to ISO 105-E02:1989 to at least class 4.

4.13 Retroreflective material

4.13.1 There shall be affixed to the surface of the lifejacket at least 400 cm^2 area of material which is retroreflective of light and complies with the specification at annex D. This material shall be placed on surfaces which are normally above the water when the lifejacket is in use.

4.13.2 If the lifejacket is sized for a child or small adult, and cannot provide sufficient surface area above water, then it shall be permitted to affix only 300 cm^2, or even 200 cm^2, provided that the highest possible value shall be used for the available surface area.

4.14 Whistle

The lifejacket shall be provided with a whistle which is not adversely affected by water or humidity, and shall be firmly attached to the lifejacket by means of a lanyard, and housed in a loop or small pocket on the lifejacket.

4.15 Becket

4.15.1 There shall be affixed to the lifejacket a lifting becket, which shall be constructed of a rot-resistant material and which is suitable for gripping by hand or affixing lifting devices.

4.15.2 It shall withstand a load of 2600 N for adult sizes, and 1500 N for children's sizes, when tested according to the method at **A.5**, following which there shall be no evidence of damage which might impair the function of either the becket or the lifejacket.

4.15.3 The becket shall be positioned over the centre of the chest, anterior to lines from each axilla to midway between the lower end of the sternum and the umbilicus, and within 100 mm of the midline.

4.15.4 The minimum length of the loop of the becket shall be 100 mm, as measured from the attachment of the loop to its furthest point from the point of attachment.

4.15.5 The minimum width of the becket shall be 20 mm.

4.15.6 The colour shall be distinctive from that of the lifejacket.

4.15.7 The becket shall be conspicuous when the wearer is floating normally, but may be enclosed within a cover when the lifejacket is being worn but is not deployed to aid flotation.

4.16 General performance

4.16.1 The device shall not be uncomfortable in design nor weight when worn, nor unnecessarily bulky, when tested according to **6.7**.

4.16.2 It shall not unduly restrict the vision, hearing or breathing of the wearer when tested according to **6.7.4** and **6.7.9**.

4.16.3 It shall not contain nor have attached any component which in normal use is capable of causing injury or discomfort to the wearer or damage due to hazardous attachments. This shall be tested according to **6.7.5** and **6.7.8**.

4.16.4 It shall be possible to swim 10 m whilst wearing the device, tested to **6.7.9**, and to climb a vertical ladder as tested to **6.7.10**.

4.16.5 It shall be simple to maintain in a fully serviceable condition whether in continuous or repeated use or if stowed for long periods in reasonable conditions. It shall be resistant to crushing and compression as tested to **6.9**.

4.16.6 Strength of assembly shall be tested according to annex A for (5,0 ± 0,1) min in both wet and dry conditions. No damage shall result which would result in the device failing to function in accordance with this standard. For the purposes of this test, the means of adjustment to the wearer shall be marked (e.g. at the position of webbing passing through a buckle). The maximum acceptable movement of the mark during each test period shall be 25 mm.

4.16.7 If any form of sprayhood is fitted to cover the face in whole or in part (for example, to protect mouth and nose from water splash), then it shall not result in excessive levels of carbon dioxide forming within it, when tested to **6.10**.

4.17 Donning, adjustment and fit

4.17.1 Donning shall be obvious and simple on the briefest of instructions. It shall be possible without assistance, except in lifejackets intended for use by children. The ease in donning and discarding the lifejacket shall not be unduly affected by adverse conditions in use such as poor light, cold, or wet. When tested according to **6.7.3**, donning shall take no longer than 1 min.

4.17.2 The means of adjustment within the stated size range shall be obvious and easy to carry out to ensure a secure fit. This shall be assessed to **6.7.3**, **6.7.8** and **6.7.9**. Security of fit shall not be dependent upon highly elastic material. If crotch straps or other non-elastic devices for improving the security of fit and retention are provided, and it is possible (without physically damaging the lifejacket) to wear the lifejacket with and without the straps or devices, then all tests in **6.7** shall be performed both with and without the straps or devices in place.

4.17.3 The device shall allow the wearer freedom in action and movement when assessed to **6.7.4**, **6.7.9** and **6.7.10**.

4.17.4 The lifejacket shall not show any tendency for the wearer to slip out of it whilst in use during the tests in **6.7**.

4.18 Inflation system

4.18.1 Lifejackets shall inflate sufficiently within 5 s of operating the inflation mechanism when tested to **6.8.3**. It shall also be possible to top up the inflation when in the water, as tested to **6.7.11**.

4.18.2 The force required to operate the pull toggle on an inflation operating head shall not exceed 120 N, but shall exceed 20 N when tested according to **6.8.4**.

4.18.3 An automatically inflated lifejacket shall be subjected to the spray test described in annex G, during which the inflation mechanism shall not operate. Automatically inflated lifejackets shall also initiate firing in automatic mode within 5 s of testing according to **6.8.6**.

4.19 In-water performance

4.19.1 The lifejacket shall provide lateral and occipital support of the wearer's head so that the mouth of a well relaxed individual is held well clear of a still water surface, with the trunk of the body inclined backwards from the vertical at an angle of between 30° and 90°, when tested as described in **6.7.6**. The freeboard measured using the method described at annex F shall not be less than 100 mm in any subject. When testing small children, see **6.7.1**.

4.19.2 The inflated lifejacket shall automatically turn a well relaxed person into the position required by **4.19.1** within 5 s when that person falls into the water or lies face down in the water, as tested to **6.7.7**.

5 Sampling

5.1 Materials and components

Materials and components common to a range of samples may be presented as one sample of each item.

5.2 Performance tests using human subjects

One lifejacket in each size category shall be tested, by a minimum of five subjects as specified in **5.3**. Most performance tests are subject to influence of natural variation, particularly in the morphometry of individual subjects. It is always possible to find, within the requirements below, subjects who are sufficiently different from the average as to behave unusually. Every effort must therefore be made to ensure that, within the weight ranges stipulated, subjects are close to average in morphometry.

5.3 Subject requirements

At least five subjects shall be used to test each of the manufacturer's size ranges, according to the following restrictions:

Table 2 — Subjects

Size range	Subject requirements
Up to 20 kg	1 subject under 15 kg; 3 subjects 18 kg to 20 kg; at least 1 subject up to 20 kg
Ranges 20 kg to 70 kg	1 subject in the lowest 10 % of the manufacturer's stated size range; 3 subjects in the upper 10 % of the range; at least 1 other subject within the stated range
Less than 20 kg to less than 70 kg	1 subject under 15 kg; 1 subject 18 kg to 20 kg; 2 subjects in the upper 10 % of the range; at least 1 other subject within the stated range
70 kg and over	1 subject 70 kg to 80 kg; 1 subject 80 kg to 90 kg; 1 subject 90 kg to 100 kg; at least 2 other subjects of over 70 kg
Less than 70 kg to 70 kg and over	2 subjects in the lowest 10 % of the manufacturer's stated size range; 1 subject 80 kg to 90 kg; 1 subject 90 kg to 100 kg; at least 1 other subject within the stated range

Example 1

A single lifejacket claimed to be suitable for sizes equivalent to a 40 kg to 60 kg weight range requires 1 subject 40 kg to 44 kg and 3 subjects 54 kg to 60 kg, and at least one other subject to make a total of five.

Example 2

A single lifejacket claimed to be suitable for sizes equivalent to less than 20 kg to 40 kg weight range requires 1 subject under 15 kg, 1 subject 18 kg to 20 kg, 2 subjects 36 kg to 40 kg, and at least one other subject to make a total of five.

Example 3

A single lifejacket claimed to be suitable for sizes equivalent to greater than 50 kg weight range requires 2 subjects 50 kg to 55 kg, 1 subject 80 kg to 90 kg, and 1 subject 90 kg to 100 kg, and at least one other subject to make a total of five.

5.4 Sex and dress

Subjects shall include both males and females, and they shall wear bathing costumes.

5.5 Criteria for passing and failure

All required samples shall pass all objective tests for the entire device to meet the requirements of this standard. However, due to the high variability between subjects and the difficulty in assessing some subjective measures, it is permitted that a device does not completely meet the requirements of a subjective test in a single example and in no more than one test subject. In these circumstances, another example or subject (within the same weight category, if applicable), as appropriate, should be subjected to the same test and before the same test panel as at **6.7.1**. If this additional test is still not clearly passed as required in this standard, then the device shall be deemed to have failed, whilst if it is clearly passed, the test panel may deem that the device has passed the test overall.

6 Test methods

6.1 Temperature cycling

The lifejacket shall be conditioned, in its normal storage state, for (24,0 ± 0,5) h at a temperature of (−30 ± 2) °C, then for (24,0 ± 0,5) h at a temperature of (60 ± 2) °C. It shall be inflated to an internal air pressure of (20,0 ± 0,5) kPa and maintained at that pressure for (10 ± 1) min at the end of each period at the given temperature, and leakage and damage shall be assessed by visual and aural examination.

6.2 Oil and water resistance

The uninflated lifejacket shall be immersed completely in a series of three tanks of water, spending (7,0 ± 0,1) h in each, in between each being allowed to dry for (17,0 ± 0,1) h. The first tank shall contain fresh water, the second sea water (salinity approximately 5 % *m/m* NaCl), and the third sea water with a (3 ± 1) mm surface layer of light diesel oil. This cycle shall be repeated a total of four times, following which it shall be assessed for damage and the lifejacket shall be inflated and then assessed by visual and aural examination. If the lifejacket is automatically inflated, the mechanism producing automatic activation shall be removed prior to this test, and it shall be inflated using the manual mechanism on completion.

6.3 Oral inflation tube flow

The oral inflation tube shall be removed and connected in parallel with a water manometer. Air shall be provided under pressure to the end normally used for inflation, and the other end connected to an air flow meter capable of measuring flows of the order of 0,17 m^3/min. The inflation tube shall be mounted vertically. The air supply shall be turned on and the pressure of the supply gradually increased until the oral inflation valve opens, the pressure of which recorded on the manometer shall be taken as the initial opening pressure. The air supply shall then be increased until a reading of (7,0 ± 0,1) kPa is recorded on the water manometer. When steady conditions supervene, the reading on the air flow meter is taken as the flow through the tube.

6.4 Security of protruding oral inflation valve

Following the conditioning of the lifejacket at (−10 ± 2) °C for (48,0 ± 0,5) h, the stiction (initial sticking friction) between the oral inflation valve tube and valves which rely entirely on friction only for retention, shall then be broken by rotating the valve within the tube using pliers. Then, a force of (90 ± 1) N shall be applied to the valve in an attempt to extract it from the inflation tube, within 20 s of removal from the conditioning temperature. The security of the valve shall be observed. This test shall then be repeated following conditioning of the lifejacket at (20 ± 2) °C for (24,0 ± 0,5) h.

6.5 Security of operating head

The fully inflated lifejacket shall be mounted on a manikin, and a steady force of (220 ± 10) N applied to the operating head as near as possible to the point where it enters the buoyancy chamber. This load shall be maintained for (5,0 ± 0,1) min, during which the direction and angle in which it is applied shall be continuously varied. The lifejacket shall be examined for signs of deflation.

6.6 Thermal stability of buoyancy material

Three test specimens of dimensions (200 ± 2) mm by (200 ± 2) mm of a thickness of (20 ± 2) mm shall be conditioned initially in air at (23 ± 2) °C and (50 ± 5) % relative humidity for at least 24 h before carrying out the test. If the buoyancy material is of a granular form, or consists of sheets thinner than 20 mm, then either a number of layers shall be used to achieve a minimum total thickness of 20 mm, or a minimum volume of material of 1 l shall be tested, as appropriate. Each specimen shall then be weighed in air, and undergo measurements described in annex C. After measurement in water the specimens shall be conditioned in air at (23 ± 2) °C and a relative humidity of (50 ± 5) % for (24 ± 0,1) h. They shall then be placed on a flat surface in an oven maintained at an even temperature of (60 ± 1) °C with air circulating at the rate of 3 to 10 changes per hour, for a period of (7,0 ± 0,1) h. Only test specimens from the same device shall be conditioned in one oven at a time. Following removal from the oven, specimens shall be laid on a flat surface for (17,0 ± 0,1) h at (23 ± 2) °C and (50 ± 2) % relative humidity. They shall then be exposed in a similar container to an even temperature of (−30 ± 1) °C for a period of (7,0 ± 0,1) h, then removed and laid on the flat surface for (17,0 ± 0,1) h at room temperature as before. This cycle of exposure to alternating high and low temperatures shall be repeated until the samples have been exposed to each temperature for ten periods. The measurements of annex C shall then be repeated, and the percentage volume change calculated.

6.7 Performance tests

6.7.1 The lifejacket shall be tested by the subjects selected according to clause **5**, in front of an assessment panel experienced in assessing lifejackets, and consisting of not less than three persons, in a swimming pool containing fresh water, treated as necessary for hygienic purposes, as follows. The tests may be modified according to the age of child subjects so as to ensure their complete safety and cooperation. When assessing children's sizes, the panel shall make greater use of subjective indicators, as self-righting and jumping are often hazardous and meaningless measures when applied to small children; however, the position in the water and support afforded are much more useful indicators in this case than e.g. freeboard measurement.

6.7.2 Where the lifejacket forms an integral part of a safety harness or other garment tested to a European or international standard, the performance shall be tested in conjunction with the safety harness or other garment.

6.7.3 After reading instructions printed on the lifejacket the test subject shall don and securely adjust the lifejacket within 1 min. The lifejacket shall then be removed. If the lifejacket is an integral part of another garment, then this test shall only apply to its donning and doffing for its function as a lifejacket.

6.7.4 The subject shall assess comfort in wear, and the lifejacket shall be demonstrated to allow adequate head and limb movement, and that it shall not interfere with hearing or breathing.

6.7.5 There shall be no hard protrusions nor sharp edges.

6.7.6 The lifejacket shall then be donned and inflated, in which condition it shall remain for the rest of the performance tests below. The test subject, initially with arms at his sides, shall stand sideways to the water and fall or step into the water from the side of the pool, which shall be no more than 50 cm above water level. The panel shall observe that the lifejacket brings the wearer to the surface and permits the subject to maintain a backwards inclined attitude without having to carry out any movement other than postural adjustment.

6.7.7 The test subject shall then carry out the following two tests of self-righting.

a) The test subject, with arms at his sides, shall lie in the water and turn or be turned until face down. The subject shall then relax body and arms fully. The lifejacket shall be seen to bring the wearer face up within 5 s of relaxation without him having to carry out any voluntary movement, which time shall be measured as that between the subject relaxing fully in the face down position, and the mouth and nose being brought clear of the water surface.

b) The test subject shall then carry out the following sequence of actions:

1) swim three very gentle strokes so as to make hardly any progress through the water, using breast stroke;

2) calmly move his arms to his sides so that they are along the length of his body and held against it;

3) calmly bring his legs together so that they are in line with his body;

4) stretch his body out straight, but not held rigidly so;

5) hold his breath in full expiration and relax his neck muscles so that his head falls down onto his chest.

The subject shall then remain passive but maintain this alignment of the body whilst the panel measures the time taken from (5) until such time as the mouth and nose are brought finally clear of the water and the subject can breathe normally again. This time shall not exceed 5 s, after which the test shall be terminated even if unsuccessful.

6.7.8 The test subject shall jump into the water from a height of (3 000 ± 100) mm without displacement of, or damage to, the lifejacket, or injury to the test subject.

For the purposes of this test, the subject shall brace arms on the lifejacket as recommended by the manufacturer (or, failing any such recommendations, as is standard practice). Any elastic used to improve the fit of the garment shall be cut prior to the test.

6.7.9 The test subject shall demonstrate his ability to swim at least 10 m without undue restriction. Observations shall be made by the panel during the swimming on the security of the lifejacket, comfort in wear, and freedom of movement. The stability test at **6.7.7** shall then be repeated.

6.7.10 It shall be demonstrated that whilst wearing the device, the test subject can climb out of the water by a vertical ladder which extends at least 2000 mm above and at least 500 mm below the waterline.

6.7.11 The wearer shall demonstrate that the inflation of the lifejacket can be topped up by mouth while in the water.

6.8 Inflation tests

6.8.1 Where necessary, the following tests shall be carried out using normal air.

6.8.2 There shall be no test of timed oral inflation of lifejackets under this standard.

6.8.3 Lifejackets shall achieve sufficient buoyancy to comply with this standard, including correct distribution through the chambers, within 5 s of the inflation mechanism being activated when held at a temperature of 15 °C to 25 °C. This shall be assessed visually, except that in cases of doubt the procedure described in annex B shall be modified to use a load cell to record mass against time on a chart recorder, and the operating head of the lifejacket adapted so that it can be fired whilst it is immersed. The chart shall be started prior to firing, and the time measured between operation of the inflation mechanism and achievement of the buoyancy prescribed according to **4.11.2**.

6.8.4 The lifejacket shall be placed securely on a manikin and a force of $(20\ ^{0}_{-2})$ N applied in the correct direction to the pull toggle to fire the operating head. The head shall not fire, but shall fire correctly when a force of $(120\ ^{+2}_{0})$ N is applied in the same manner.

6.8.5 Gas-inflated lifejackets shall be inflated to an internal pressure of air of 3,5 kPa in an ambient temperature of (20 ± 5) °C. Following this, the operating head shall be fired manually, using a fully charged gas cylinder, according to the manufacturer's recommendations. The buoyancy chambers shall be then be examined for visible signs of damage.

6.8.6 Automatically inflated lifejackets shall first be conditioned by exposing them for $(5{,}0 \pm 0{,}1)$ h to an air temperature of (0 ± 1) °C. Then, without any period in warmer air, they shall be plunged rapidly, with operating-head first, to a depth of (300 ± 50) mm beneath the surface of fresh water at a temperature of $(0\ ^{+2}_{0})$ °C.

The time from immersion until the initiation of inflation in automatic mode has to be reported. It shall not exceed 5 s.

6.9 Crushing and compression tests

The uninflated lifejacket shall be subjected to the test described in annex J. Following this, the lifejacket shall be inflated for inspection. The lifejacket shall be examined for visible signs of damage which could make the lifejacket incapable of further repeated use.

6.10 Sprayhood

If any form of hood or sprayhood is fitted to cover the face in whole or in part (for example, to protect mouth and nose from water splash), then it shall be demonstrated, by analysing samples of gas using a fast-response carbon dioxide analyser, that in calm air and calm water, using a minimum of 6 subjects over test periods of at least 5 min each, that the carbon dioxide level within the hood does not exceed 5 % at any place at any time, and when measured at a distance of (50 ± 5) mm from the nares does not average more than 2,5 % in any one minute. The gas analyser used shall be capable of indicating continuous measurements of the percentage of carbon dioxide gas within a continuously flowing sample, with a time constant short enough to give accurate measures of end-tidal carbon dioxide levels.

7 Explanatory leaflet

Each lifejacket shall be supplied with an explanatory leaflet, and written in at least the official language(s) of the member state of destination, containing at least the following items:

a) items given at **8.1**a), and f) (in full);

b) the recommendation that the wearer should try out the lifejacket in water to ascertain its performance before use;

c) full donning and use instructions;

d) details of the recommended limitations to use, including sea conditions, temperature limits, and any other pertinent information;

e) description of any spare parts and their replacement, and instructions for servicing and maintenance, and packing (if applicable);

f) the names and addresses of manufacturer's agents within at least the member state of destination;

g) compatibility with safety harnesses and other clothing and equipment as relevant;

h) such other general advice on the care and use of lifejackets as the manufacturers see fit.

8 Marking

8.1 Lifejacket

8.1.1 *Consumer information on the device*

The lifejacket shall be permanently and legibly marked with the following (which shall be given at least in the official language(s) of the member state of destination). Information shall be given as pictograms, or as text combined with pictograms, or, if defined pictograms do not exist, as text alone:

a) identification of the manufacturer;

b) title of the lifejacket according to annex K, and whether manually or automatically operated;

c) on inflatable lifejackets, the statement that it is not a lifejacket until fully inflated;

d) size range of the lifejacket e.g. range of chest or waist girth and mass of wearer;

e) minimum buoyancy provided and amount of inflatable buoyancy if provided;

f) storage, care, cleaning and maintenance instructions in brief;

g) simple donning and adjustment instructions;

h) simple instructions for use;

i) if inflated by gas, the correct size and charge of the cylinder;

j) the manufacturer's model designation, serial number, and quarter (or month) and year of manufacture. Months are to be given as Arabic numerals (1 to 12), and quarters as Roman numerals (I to IV) in order starting from 1st January;

k) the numbers of the European standards to which it conforms;

l) pictograms or words indicating other risks catered for or not provided for;

m) the text "Do not use as a cushion";

n) if intended for a child of less than 40 kg body weight, the text "Teach the child to float in this lifejacket";

o) the expected servicing interval assuming average use, and a space for servicing dates to be marked;

p) compatibility with safety harnesses and other clothing and equipment as relevant;

q) the text "Full performance may not be achieved using certain clothing or in other circumstances. Refer to the leaflet."

Any label bearing this information shall be permanently affixed to the lifejacket, shall be resistant to salt water to the same requirement as in **4.12.2**, and stand at least 10 washes carried out in accordance with the manufacturer's recommendations. Neither shall the label shrink so as to affect the appearance or performance of the lifejacket or its own legibility.

8.1.2 *Consumer information at point of sale*

For satisfying the requirements concerning consumer information there are two options available: A plain text version and a pictogram version.

The information shall be clearly visible and legible when the device is presented ready for sale, either by ensuring visibility of a marking on the jacket itself or by additional labelling on the packaging. If the presentation of information is divided in various sections they shall be given such that the consumer can perceive all sections together.

8.1.2.1 *Plain text version*

Lifejacket Buoyancy Aid	EN 395 / EN 396 / EN 399 EN 393	(1)
Standard Application	Type	(2)
Offshore, extreme conditions Heavy protective clothing	275	(3)
Offshore Foul weather clothing	150	(4)
Sheltered waters	100	(5)
Swimmers only, sheltered waters Help at hand Not a lifejacket	50	(6)
MANUFACTURER:		(7)
LIFEJACKETS / BUOYANCY AIDS ONLY REDUCE THE RISK OF DROWNING THEY DO NOT GUARANTEE RESCUE		(8)

Figure 1 — Label specification

If the plain text is chosen, the table as shown in Figure 1 shall be laid out according to that figure and shall be of minimum dimensions 7,5 cm × 7,5 cm. Colours may vary, but shall be always contrasing to the background. Information completing row 7, "MANUFACTURER", may be given by plain text data or by representing suppliers logo. The table shown in Figure 1 may form the left hand side of a complete label presenting all stipulated data (see Figure 2).

Lifejacket EN 395 / EN 396 / EN 399 Buoyancy Aid EN 393	CE	Special features			Effective for unconscious persons, emergency light, integrated splash screen			
		Application			Offshore use, Yachtsmen & mariners			
Standard Application	Type	Fully automatic	Manual operation	Only oral inflation	Inflatable buoyancy	Inherent buoyancy	Integrated harness	May not be used with harness
Offshore extreme conditions, heavy protective clothing	275	x			320		x	
Offshore, foul weather clothing	150							
Sheltered waters	100							
Swimmers only, sheltered waters Help at hand Not a lifejacket	50							

MANUFACTURER:	Fit	Size	Chest cm	Mass kg	Minimum buoyancy N
	X	large	112 to 127	≥ 70	50/100/150/275
LIFEJACKETS / BUOYANCY AIDS ONLY REDUCE THE RISK OF DROWNING THEY DO NOT GUARANTEE RESCUE		medium	99 to 112	60 to 70	45/ 80/130/230
		small	86 to 99	50 to 60	40/ 70/110/200
		child	76 to 86	40 to 50	40/ 60/ 90/170
		child	66 to 76	30 to 40	35/ 50/ 75/140
		child	50 to 66	20 to 30	-/ 40/ 60/120
		child	34 to 50	up to 20	-/ 30/ 45/ 90

Figure 2 — Example of consumer information label (combination of Figure 1 and data list in table configuration)

The data list below includes all variable data enabling the consumer to be informed about performance and size of the device. All data shown as contents of the list may be given in the way as shown in Figure 2 or by any other format and layout satisfying the requirements under **8.1.2**.

8.1.2.2 *Data list*

The following information shall be given, if applicable:

a) it has to be stated whether the flotation device is a lifejacket or a buoyancy aid. For designation the generic terms specified in annex K shall be used;

b) statement of the relevant standard and type

The minimum height of letters and figures for a) and b) shall be 5 mm;

c) "SPECIAL FEATURES"*);

d) "SPECIAL APPLICATION"**);

whether the lifejacket or buoyancy aid is:

e) fully automatic inflatable;

f) manually inflatable;

g) only orally inflatable;

whether the buoyancy is provided by:

h) inherent buoyant material;

i) gas, air (see also e to g);

j) inherently buoyant material and gas or air;

amount of buoyancy:

k) in total;

l) as parts of inherent and inflatable buoyancy;

whether a lifebelt:

m) is integrated in the device;

n) can be worn on the body with the flotation device above;

size of the device:

o) by ticking in the relevant size of a given size table (see Figure 2); or

p) by giving the relevant body dimension of the intended user (body height, chest circumference or body weight or an adequate combination of these).

If the recommended diagram as shown in Figure 2 is applied, data on this diagram which are applicable to the device shall be clearly marked to indicate their presence, or the appropriate figures inserted, as exemplified in Figure 2.

8.1.2.3 *Pictogram version*

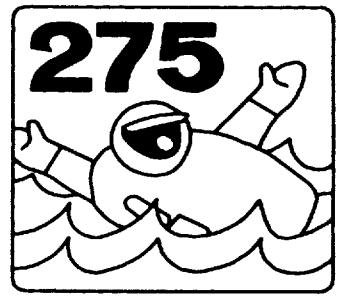


Figure 3 — Pictogram

The section "STANDARD APPLICATION", rows 2 to 6 of Figure 1, may be replaced by the pictogram shown in Figure 3. The minimum dimensions of this pictogram shall be 5 cm × 5 cm. The remaining contents of rows 1, 7 and 8 of Figure 1 shall be presented according to the requirements under **8.1.2**.

The designation of the relevant standard may be added to the pictogram. If colours are used, either for improving the contrast of the table (Figures 1 and 2) or the contrast of the pictogram (Figure 3), it is recommended to use the colour:

— pink to red for buoyancy aids	/ type 50
— yellow to light brown for lifejackets	/ type 100
— a tone of green for lifejackets	/ type 150
— a tone of blue for lifejackets	/ type 275

For a period of introduction and transition of .. years the pictogram shall be presented together with at least the text given in rows 3 to 6 of Figure 1.

8.2 Gas cylinders

Gas cylinders shall be marked indelibly with at least the following:

a) minimum gross weight of cylinder in g;

b) nominal gas charge contained within the cylinder in g;

c) the chemical formula of the gas contained (e.g. CO_2).

*) Special features are given if the device offers more than the equipment and performance required by the standard, e.g.: integrated spray hood, performance under extreme conditions, etc.

**) Description of special appliances, e.g.: applicable for working place conditions including stresses, like arising from welding, metal grinding or "not applicable for leisure use", etc.

Annex A (normative)
Vertical and horizontal load tests

A.1 Principle

Subject the lifejacket to tension via the integral waistbelt or harness, by means of a specified load. Perform a vertical load test consecutively to a horizontal load test on the same lifejacket sample.

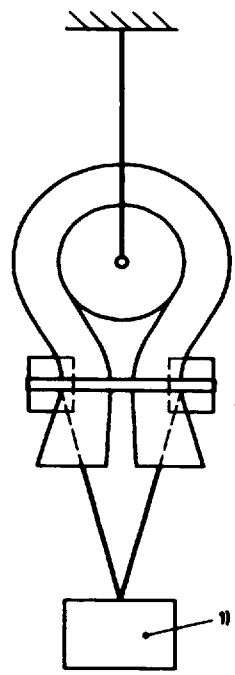
A.2 Apparatus

The apparatus consists of a horizontally suspended upper cylinder, of diameter (50 ± 5) mm for the lifejacket wearer sizes up to 30 kg, or of diameter (125 ± 10) mm for lifejacket wearer sizes of 30 kg and above, to which the lifejacket is fitted. The length of the test cylinder shall be sufficient to accommodate the full width of the portion of the lifejacket under test.

For the vertical load test shown in Figures A.1 and A.3 the lower apparatus shall have the dimensions as indicated in Figures A.5 and A.6. The diameter of the tube shown in Figure A.6 for lifejacket wearer sizes up to 30 kg shall be (50 ± 5) mm or shall be (125 ± 10) mm for wearer sizes of 30 kg and above. For these vertical load tests a test load shall be applied to the attachment positions indicated by means of webbing (25 ± 5) mm in width. The total test load for all sizes shall be (750 ± 5) N.

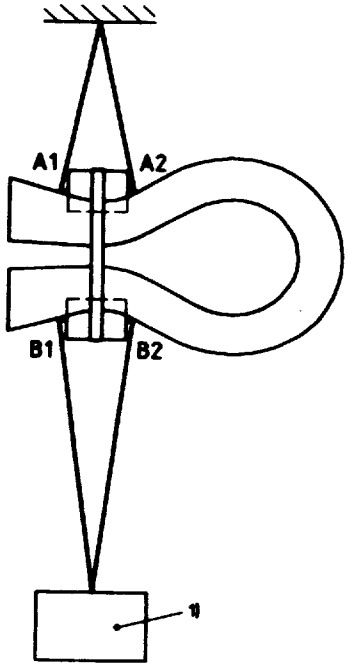
For the horizontal load test shown in Figures A.2 and A.4 an additional lower test cylinder of similar size to the upper cylinder shall be placed in the lifejacket in the position indicated. The axes of the upper and lower cylinders shall be regarded as the datum positions A1A2 and B1B2 respectively, shown in Figures A.2 and A.4.

For the horizontal load test shown in Figures A.2 and A.4, a pre-load is required. The total pre-load shall be (20 ± 2) N.



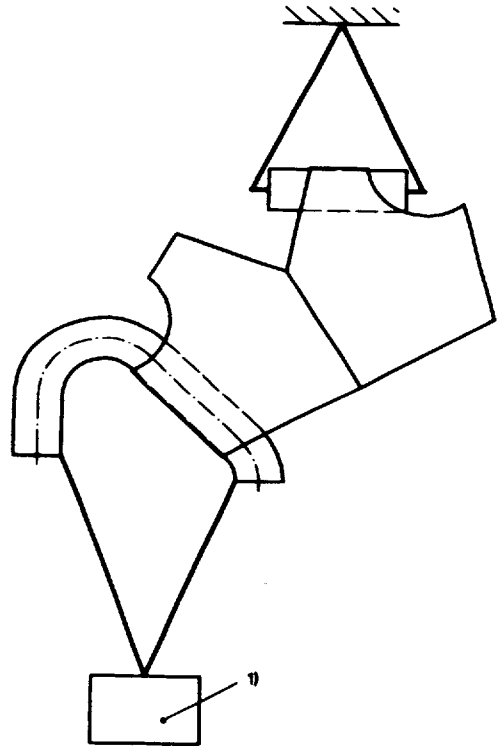
1) Test load

Figure A.1 — Halter type buoyancy aid – Vertical load test



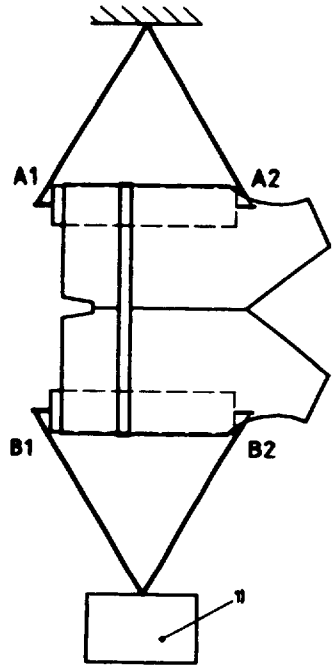
1) Test load

Figure A.2 — Halter type buoyancy aid – Horizontal load test



1) Test load

Figure A.3 — Vest type buoyancy aid – Vertical load test



1) Test load

Figure A.4 — Vest type buoyancy aid – Horizontal load test

Apply an additional test load. The total load shall either be equivalent to that load exerted by two times the maximum body mass of the lifejacket wearer body weight, or (2 000 ± 5) N in the case of lifejackets designed for wearers of over 70 kg.

A.3 Vertical load test

Fit the lifejacket to the upper test cylinder, in the manner shown in Figure A.1 for halter types or Figure A.3 for vest types.

For halter types adjust the harness to fit the body. For vest types, fasten the lifejacket in such a way that any adjustment devices are in the mid position, in the manner specified by the manufacturer in his instructions. If either is inflatable it shall be fully inflated. Mark the position of any adjustment devices relative to the webbing passing through them.

Attach the load suspension cord to the lifejacket in the appropriate positions shown in Figures A.1 or A.3. Apply the test load steadily without jerking. Maintain the test load for the specified period. Remove the test load and examine the lifejacket for any resultant defects. Measure any adjustment device slippage.

A.4 Horizontal load test

Fit the lifejacket to the upper test (if inflatable fully inflated) to the upper test cylinder, in the manner shown in Figure A.2 for halter types or Figure A.4 for vest types. Fasten the lifejacket such that any adjustment devices are in the same mid position in the manner specified by the manufacturer in his instructions. Mark the positions of any adjustment devices in relation to the webbing passed through them.

Apply the lower test cylinder to the lifejacket in the appropriate positions shown in Figures A.2 and A.4. Add the specified pre-load and adjust the tension in the load suspension cord such that the axes A1A2 and B1B2 of the upper and lower test cylinders are substantially parallel.

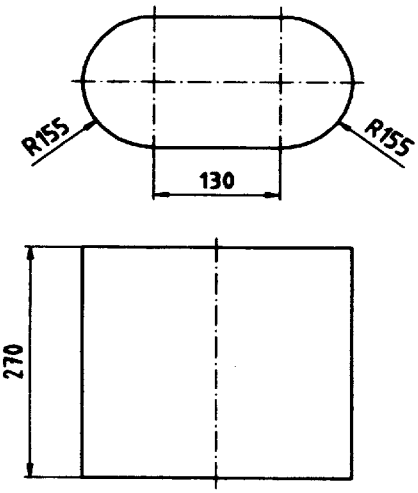
Measure the distance between the axes A1A2 and B1B2 of the upper and lower test cylinders by measuring the distance A1 to B1 and A2 to B2.

Apply the additional test load steadily without jerking until the lifejacket is hanging freely. Maintain the load for the specified period. Re-measure the distance between the test cylinder axes A1A2 and B1B2. Remove the test load and examine the lifejacket for any resultant defects. Measure any adjustment device slippage. Calculate the mean increase in distance between the test cylinder axes A1A2 and B1B2 from the pre-load to total load positions by determining the average of the two increases in distance of A1B1 and A2B2.

A.5 Lifting becket test

If inflatable, the lifejacket shall first be inflated. It shall then be soaked in fresh water for a period of $(1{,}0 \pm 0{,}1)$ h, and placed on a manikin and adjusted according to the donning and adjustment instructions. Then lift the manikin without jerking until it is suspended freely, by means of a cylinder of (50 ± 5) mm diameter passed through the lifting becket. Apply the specified load so as to act at the mid-point of the manikin, and maintain for $(1{,}0 \pm 0{,}1)$ min. No damage to the becket or lifejacket shall result.

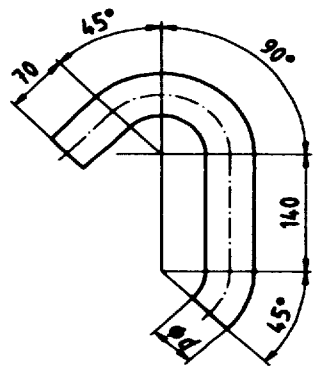
Dimensions in millimetres



General tolerances: EN 22768-v

Figure A.5 — Body for vertical load test

Dimensions in millimetres



General tolerances: EN 22768-v

∅ = 125 ± 10 for adult sizes

∅ = 50 ± 10 for adult sizes

Figure A.6 — Bended type for vertical load test

Annex B (normative)

Measurement of buoyancy — whole device

B.1 Principle

The buoyancy of the device shall be measured using Archimedes' principle, that of weighing in air and water.

B.2 Apparatus

The equipment required consists of a fine mesh net bag attached to a weight, whose mass in kg is greater than 0,1 times the expected buoyancy value in N. Weighing takes place in a bath of water, deep enough to accommodate the device at a depth of 100 mm–150 mm below the surface, and with a calibrated load cell or balance positioned above it.

B.3 Procedure

If the lifejacket contains inflatable buoyancy, then it shall first be inflated through the oral inflation tube to a pressure of $(7{,}0 \pm 0{,}1)$ kPa. The lifejacket shall then be enclosed in the net bag attached to the weight.

This shall be suspended in fresh water at a temperature of 15 °C to 25 °C from the load cell so that the lifejacket is submerged at 100 mm–150 mm below the surface. The immersed weight shall be recorded as *A*.

The assembly shall remain immersed for $(24{,}0 \pm 0{,}5)$ h when the weight shall again be recorded as *B*.

The lifejacket shall finally be removed from the bag and the weight and the net bag again be immersed and the result again recorded as *C*.

B.4 Results

The initial buoyancy is obtained by deducting *A* from *C*.

The final buoyancy is obtained by deducting *B* from *C*.

The buoyancy lost during immersion is obtained by deducting the final buoyancy from the initial buoyancy.

Annex C (normative)

Measurement of buoyancy — material samples

C.1 Each sample of foam shall be weighed in air first, the result being recorded as *A*.

C.2 An empty weighted cage large enough to contain each specimen shall first be weighed whilst completely immersed in fresh water of a temperature of (20 ± 1) °C, the result being recorded as *B*. The weight of this cage shall have been adjusted so as to ensure that the samples of foam are completely immersed.

C.3 Each sample of foam in turn shall then be placed in the cage and fully immersed to a minimum depth of 50 mm below the level of the water surface, and the air adhering to surfaces carefully brushed off. The weight shall then be recorded as *C*.

C.4 The volume, *D*, shall be calculated as being equal to $(B + A) - C$.

C.5 The percentage volume change is the difference between the initial and final *D*, divided by the initial *D*, multiplied by 100.

Annex D (normative)

Specification of retroreflective materials

Technical specification shall be as per IMO SOLAS 83, Chapter III, Resolution A.658(16), Annex 2.

Annex E (normative)

Test for resistance to burning

E.1 Inherent buoyant devices

E.1.1 Keep to hand a fire extinguisher throughout the following test and ventilate thoroughly the room used to conduct it immediately following it.

E.1.2 Keep at least two examples of the adult size lifejacket at room temperature for at least three days prior to the test. Mark a horizontal line passing about 50 mm from the lower edge of the lifejacket using chalk, and one a further 300 mm higher up and parallel to it. Mark ignition points as the centre of circles of 300 mm radius (mark also the arcs of which using chalk) at the following points:

a) half the width of the float;

b) the front edge of the central fastening, if any;

c) the vertical boundaries between floats and corresponding points on the back and sleeves, if any.

If any ignition point would be placed on a cord, clasp or other fitting, then move it 10 mm above that point. Examples of markings are shown in Figure E.2.

E.1.3 The specimen holder shall comply with Figure E.1 shall be made of non-inflammable material. Then fit the lifejacket to it in accordance with the donning instructions. Then place this in a draught-free space in normal air.

E.1.4 Adjust a flame of burning butane gas, generated using a medical number 5 needle (inside diameter 0,3 mm), to produce a 13 mm high flame when held vertically. Apply this to each ignition point in succession, with the needle nozzle horizontal to the specimen, and a distance from the tip of the needle to the ignition point of 10 mm. Hold the flame in that position for a maximum of 30 s or until the sample is seen to burn properly with a flame.

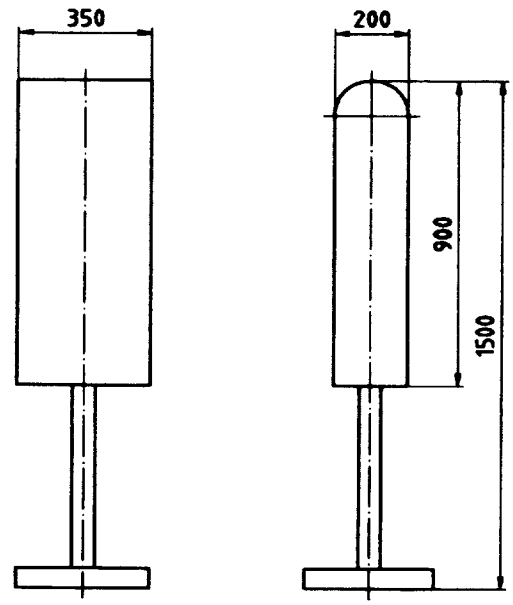
E.2 Inflatable lifejackets

E.2.1 Subject one uninflated adult size lifejacket to the fire test.

E.2.2 Place a test pan 30 cm × 35 cm × 6 cm in an essentially draught-free area. Put water in the bottom of the test pan to a depth of 1 cm followed by enough petrol to make a minimum depth of 4 cm. Ignite the petrol and allow it to burn freely over 30 s.

E.2.3 Then move the lifejacket through the flames in an upright, forward, freehanging position with the lower edge of the device 25 cm above the top edge of the test pan. Secure loose parts, e.g. crotch straps, above the lower edge of the device.

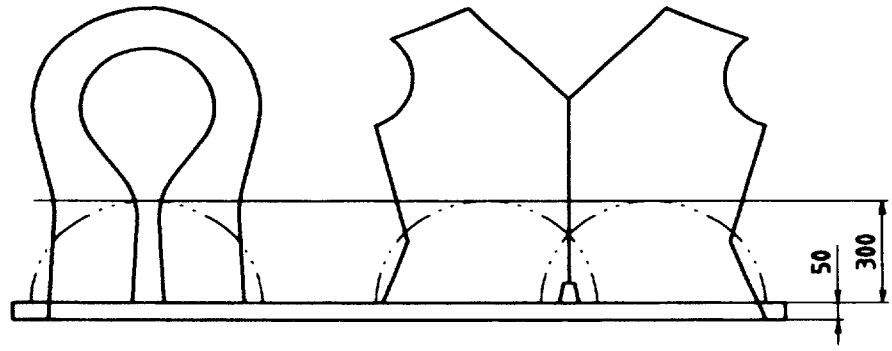
Dimensions in millimetres



General tolerances: EN 22768-v

Figure E.1 — Specimen holder

Dimensions in millimetres



General tolerances: EN 22768-v

Figure E.2 — Example of the positions of ignition points

Annex F (normative)

Test method for the measurement of freeboard

F.1 Principle

The freeboard shall be measured as the difference between the distance from the water surface to a mark floating above it, and the distance from the mouth to that same mark.

F.2 Apparatus

The measuring device, shown in Figure F.1, shall consist of two floats made of closed-cell foam, connected by a rigid bridge at such a height that a test subject wearing a lifejacket in the water has approximately 100 mm clearance between the top of his head and the bridge. On the bridge, one third of the way along from one end, a measuring tape roll or drum (A) shall be placed, in such a way that the tape is free to drop below the bridge as shown. This roll or drum shall contain a locking mechanism to permit the tape to remain at a fixed length protruding. At the free end of the tape, a plastic disk (C) of (100 ± 5) mm diameter shall be fixed in a perpendicular position. There shall also be a measuring mark (B) made along the bottom edge of the bridge.

F.3 Procedure

Two measurements of distance shall be made using the measuring device. The first shall be that between the measuring line and the fresh water surface, which shall be still and calm. The test subject shall then be positioned floating in a relaxed position, inclined backwards, between the two floats of the device. The distance between the measuring line and the lower corner of the mouth of the subject shall then be measured. These two measurements shall be performed twice on each subject, once with the subject having exhaled completely, and once following maximal inspiration.

F.4 Result

The two freeboard measurements shall be added together and divided by 2,0 to give the mean freeboard.

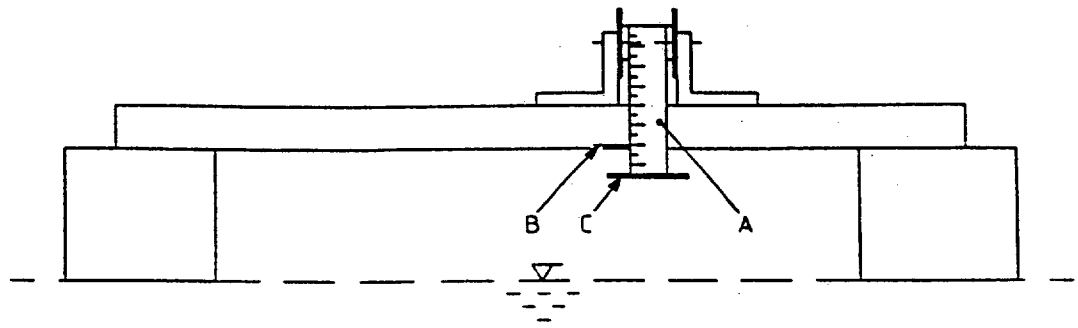


Figure F.1 — Device for measuring freeboard

Annex G (normative)

Test method for resistance to inadvertent inflation

G.1 Principle

The resistance of an automatic inflation device to inadvertent operation shall be assessed by exposing the entire lifejacket to sprays of water for a fixed period.

G.2 Apparatus

The lifejacket shall be fitted correctly to a free-standing rotatable manikin of adult size, with a minimum shoulder height of 1500 mm. The lifejacket shall be deployed in the mode in which it is worn ready for use but not deployed as used in the water (i.e. if it is equipped with a cover which is normally worn closed, then the cover shall be closed for the test), see Figure G.1.

Two spray nozzles shall be installed so as to spray fresh water onto the lifejacket, as shown in Figure G.1. One shall be positioned 500 mm above the highest point of the lifejacket, and points at an angle of 15° from the vertical centreline of the manikin and the bottom line of the lifejacket. The other nozzle shall be installed horizontally at a distance of 500 mm from the bottom line of the lifejacket, and points directly at the lifejacket. These nozzles shall have a spray cone of 30°, each orifice being $(1{,}5 \pm 0{,}1)$ mm in diameter, and the total area of orifices on each shall be (50 ± 5) mm^2, the orifices being evenly spread over the spray nozzle area.

The air temperature shall be (20 ± 3) °C, and water shall be supplied to the sprays at a pressure of 0,3 kPa – 0,4 kPa, a flow of 600 l/h, and a temperature of (12 ± 3) °C.

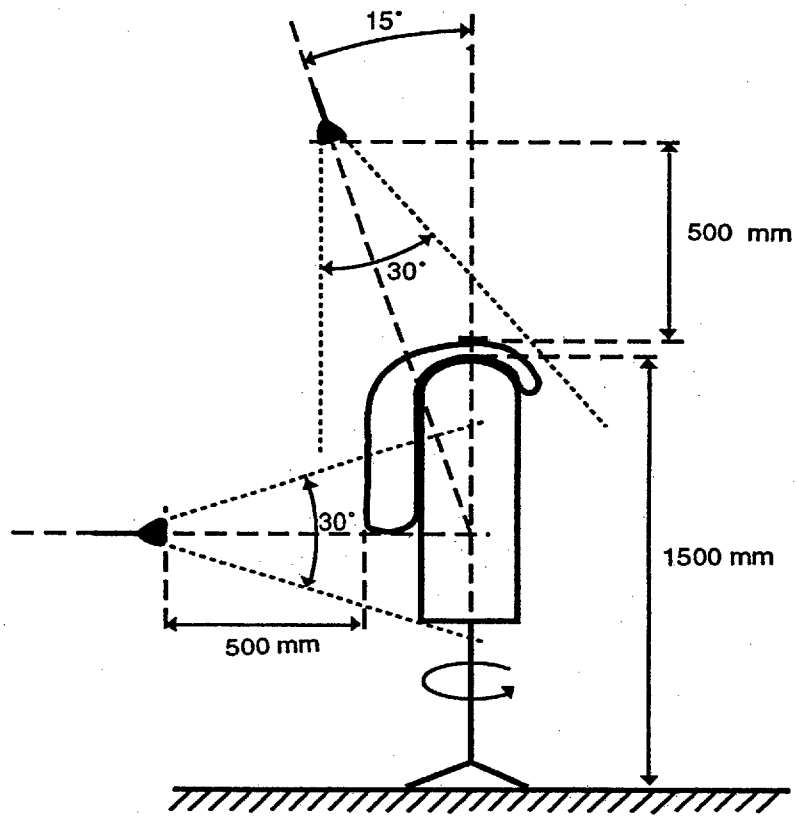


Figure G.1 — Test set-up for test of automatic inflation device

G.3 Procedure

The sprays shall be turned on, and the lifejacket exposed to the following series of spray exposures:

a) 5 min with high spray on the front of the lifejacket;

b) 5 min with high spray on the left side of the lifejacket;

c) 5 min with high spray on the back of the lifejacket;

d) 5 min with high spray on the right side of the lifejacket.

During exposures a), b) and d) the horizontal spray shall be applied for 10 periods of 3 s each to the front, left or right sides (but not the back) as with the high spray.

Annex H (normative)

Test method for the compressibility of inherently buoyant material

H.1 Examine three specimens of each sample of foam of dimensions (100 ± 2) mm by (100 ± 2) mm and of a thickness of (20 ± 2) mm. If the material consists of granules, then fill three cloth sacks with the granules to the same filling density as the lifejacket. Fit them into a metal frame of dimensions of (100 by 100) mm and a height equivalent to the thickness of the buoyancy of the test lifejacket. Prior to the test, they shall have been stored at (23 ± 2) °C and a relative humidity of (50 ± 5) %, for 24 h, in which conditions they shall be tested.

H.2 Each specimen shall be placed in fresh water under a flat metal plate at least 20 % larger than the specimen size and then compressed at a speed of 200 mm/min until a load of 500 kPa has been reached. This lower position shall be set for further compressions. The specimen shall then be completely decompressed, and the cycle of compression repeated a further four times, using the lower set point as the limit of compression.

H.3 The specimen shall then be kept under the metal plate such that it is only just weighted by the plate to remain under water. The load required to achieve this shall be recorded as the original buoyancy A (note that it will almost certainly be necessary to use a different load cell from that required by **H.2**).

H.4 The specimen shall then be dried for 7 days in air at a temperature of (23 ± 1) °C and a relative humidity of (50 ± 5) %. The compression cycle at **H.2** shall then be repeated without water, and for a total of 500 times. If deformation occurs, then the upper set point may need to be reset in order to keep the decompression time equal during the whole period.

H.5 The specimen shall then be returned to the atmosphere at **H.4** for at least three days, and the buoyancy measurement at **H.2** and **H.3** repeated, giving the value B. The loss of buoyancy (as $A - B$) shall then be expressed as a percentage of the original buoyancy (A).

Annex J (normative)

Rotating shock bin method

J.1 The equipment used shall be that shown in Figure J.1, and consists of a box of unusual design made from plywood board, the inside surface of which shall be coated with a hard plastic laminate or similar. The bearing of the bin shall be in the centre of its mass, as shown in the figure, and permits the bin to be rotated freely. This rotation can be effected mechanically, using a motor, or manually.

J.2 The test specimen shall be placed in the bin through a flush panel in one of its faces, which shall then be closed and secured. The bin shall then be rotated for a total of 150 revolutions at a steady rate of 6 revolutions per minute.

J.3 On completion of the rotations, the specimen shall be removed through the panel and examined.

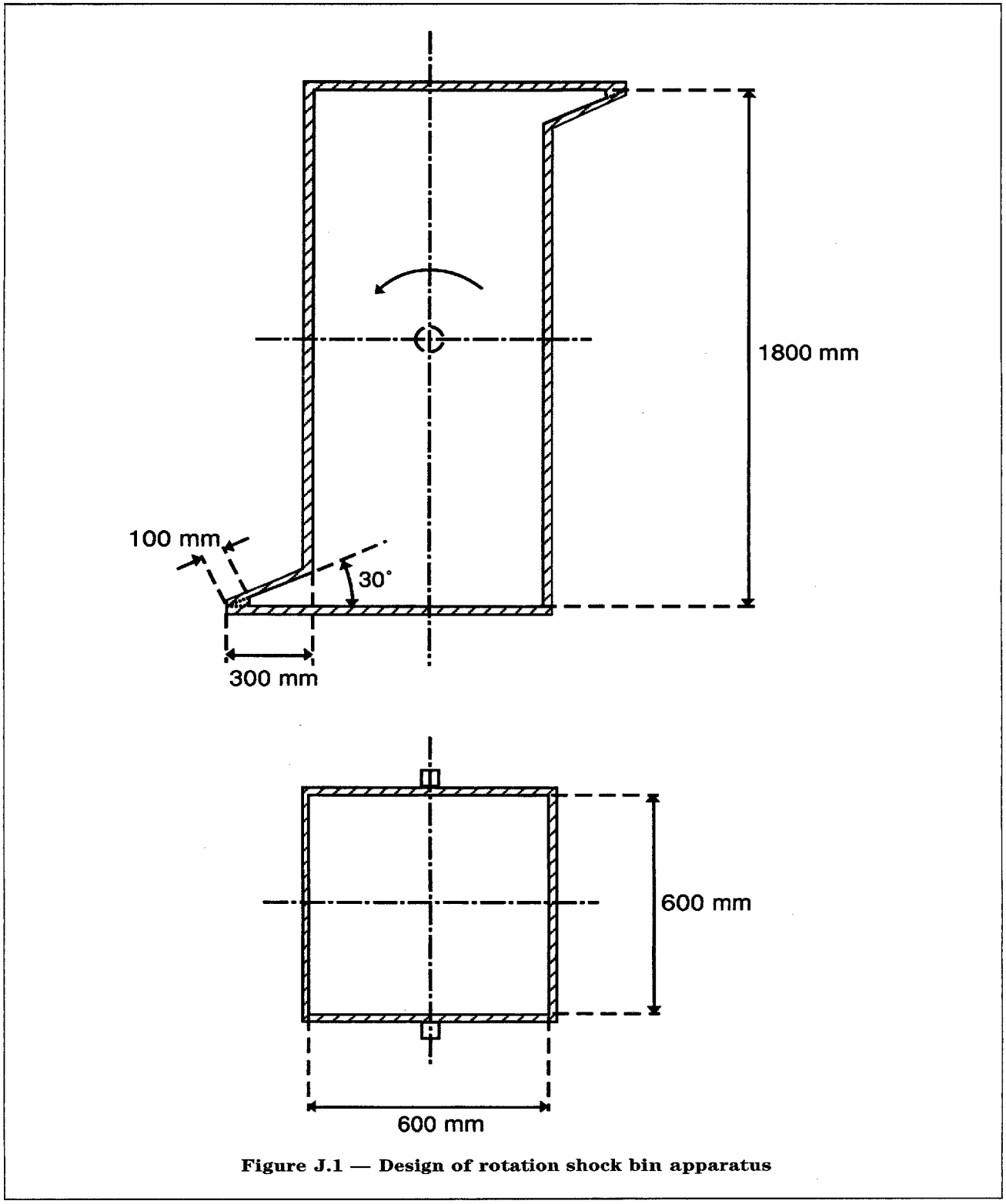


Figure J.1 — Design of rotation shock bin apparatus

Annex K (normative)

Translation of terms

For the purposes of this standard, the naming and marking of any items complying with this standard, and correct usage, the following equivalent terms shall apply:

The generic term (all items covered by this standard):

Danish: Redningsvest 275

Dutch: Reddingvest 275

English: Lifejacket 275

Finnish: Pelastusliivi 275

French: Gilet de Sauvetage 275

German: Rettungsweste 275

Greek:

Icelandic: Björgunarvesti 275

Italian: Giubbotti di salvataggio 275

Norwegian: Redningsvest 275

Portuguese:

Spanish: Chalecos salvavidas 275

Swedish: Raddningsvast 275

Differentiated terms (major types covered by this standard):

Danish: Manuel & Automatisk Redningsvest 275

Dutch: Reddingvest 275 mit vaste stof, of (al dan niet automatisch opblaasbaar)

English: Manually-operated & automatically-operated lifejacket 275

Finnish: Manuaalisesti laukaistava & Automaatisesti toimiva Pelastusliivi 275

French: Gilet de Sauvetage 275 à déclenchement manuel & automatique

German: Rettungsweste 275 (aufblasbar durch Handauslösung & Automatik)

Greek:

Icelandic: Björgunarvesti 275. Tilbúin til notkunar og uppblásin

Italian:

Norwegian: Manuell & Automatisk Redningsvest 275

Portuguese:

Spanish:

Swedish: Manuellt hanterad & Automatisk fungerande Raddningsvast 275

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