INTERNATIONAL STANDARD

**ISO 12402-5**

Second edition
2020-07

# Personal flotation devices —

## Part 5: Buoyancy aids (level 50) — Safety requirements

*Équipements individuels de flottabilité —*

*Partie 5: Aides à la flottabilité (niveau 50) — Exigences de sécurité*



Reference number
ISO 12402-5:2020(E)



ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Email: copyright@iso.org
Website: www.iso.org

Published in Switzerland

# Contents

Page

 

# Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 188, *Small craft*, Subcommittee SC 1, *Personal safety equipment*.

This second edition cancels and replaces the first edition (ISO 12402-5:2006), which has been technically revised. It also incorporates the Amendment ISO 12402-5:2005/Amd. 1:2010.

The main changes compared to the previous edition are as follows:

a) new terms and definitions added;

b) level 50 was modified (see 4.2.1);

c) general requirements were modified (see 5.1);

d) requirements for lifting loops were moved to ISO 12402-8:2020;

e) requirement for different types of buoyancy were modified (see 5.3 and Table 2);

f) requirements on strength were added (see 5.5);

g) requirements on performance were modified (see 5.6).

A list of all parts in the ISO 12402 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

# Introduction

ISO 12402 (all parts):2020 deals with personal floatation devices (PFDs) for persons engaged in activities, whether in relation to their work or their leisure, in or near water. PFDs manufactured, selected, and maintained to this International Standard give a reasonable assurance of safety from drowning to a person who is immersed in water. ISO 12402 (all parts):2020 does not include the following:

— requirements for lifejackets on seagoing ships, which are regulated by the International Maritime Organization (IMO)[1)] under the International Convention for the Safety of Life at Sea (SOLAS);

— throwable devices and flotation cushions.

ISO 12402 (all parts):2020 allows for the buoyancy of a PFD to be provided by a variety of materials or designs, some of which can require preparation before entering the water (e.g. inflation of chambers by gas from a cylinder or blown in orally). PFDs can be divided into the following two main classes:

— those which provide face up in-water support to the user regardless of physical conditions (lifejackets), and

— those which require the user to make swimming and other postural movements to position the user with the face out of the water (buoyancy aids).

Within these main two classes there are a number of levels of support, types of buoyancy, activation methods for inflatable devices, and auxiliary items (such as location aids), which all affect the user's probability of survival. Within the different types of buoyancy allowed, inflatable PFDs either provide full buoyancy without any user intervention other than arming (i.e. PFDs inflated by a fully automatic method) or require the user to initiate the inflation. Hybrid PFDs always provide some buoyancy but rely on the same methods as inflatable PFDs to achieve full buoyancy. With inherently buoyant PFDs, the user only needs to put the PFD on to achieve the performance of its class.

PFDs that do not require intervention (automatically operating PFDs) are suited to activities where persons are likely to enter the water unexpectedly; whereas PFDs requiring intervention (e.g. manually inflated PFDs) are only suitable for use if the user believes there will be sufficient time to produce full buoyancy, if automatic operation would result in entrapment, or if help is close at hand. In every circumstance, the user should ensure that the operation of the PFD is suited to the specific application. The conformity of a PFD to this part of the ISO 12402 series:2020 does not imply that it is suitable for all circumstances. The relative amount of required inspection and maintenance is another factor of paramount importance in the choice and application of specific PFDs.

ISO 12402 (all parts):2020 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 stored in a locker for emergency use. The primary function of a PFD is to support the user in reasonable safety in the water. Within the two classes, alternative attributes make some PFDs better suited to some circumstances than others or make them easier to use and care for than others. Important alternatives provided by ISO 12402 (all parts):2020 are the following:

— to provide higher levels of support (levels 100, 150, or 275) that generally float the user with greater water clearance, when required for increasingly severe conditions; or to provide lighter or less bulky PFDs (levels 50 or 100);

— to provide the kinds of flotation (inherently buoyant foam, hybrid, and inflatable) that accommodate the sometimes conflicting needs of reliability and durability, in-water performance, and continuous wear;

1) The International Maritime Organization (IMO) is an institution with domicile in London issuing regulations which are then published as laws by its Member States.



 

— to provide automatically operating (inherently buoyant or automatically inflated) PFDs that float users without any intervention on their part, except in initially donning the PFD (and regular inspection and rearming of inflatable types), or to provide user control of the inflatable PFDs buoyancy by manual and oral operation; and

— to assist in detection (location aids) and recovery of the user.

PFDs provide various degrees of buoyancy in garments that are light in weight and only as bulky and restrictive as needed for their intended use. They need to be secure when worn, in order to provide positive support in the water and to allow users to swim or actively assist themselves or others. The PFD selected ensures that the user is supported with the mouth and nose clear of the water under the expected conditions of use and the user's ability to assist.

Under certain conditions (such as rough water and waves), the use of watertight and multilayer clothing, which provide (intentionally or otherwise) additional buoyancy, or the use of equipment with additional weight (such as tool belts) can alter the performance of the PFD. Users, owners and employers need to ensure that this is taken into account when selecting a PFD. Similarly, it is possible that PFDs do not perform as well in extremes of temperature, although meeting ISO 12402 (all parts):2020 requirements. PFDs can also be affected by other conditions of use, such as chemical exposure and welding, and can require additional protection to meet the specific requirements of use. Taking a PFD into such conditions necessitates the assurance that the PFD will not be adversely affected. ISO 12402 (all parts):2020 also allows a PFD to be an integral part of a safety harness designed to conform to ISO 12401:2009, or an integral part of a garment with other uses, for example to provide thermal protection during immersion, in which case the complete assembly as used is expected to conform to ISO 12402 (all parts):2020.

In compiling the attributes required of a PFD, consideration has also been given to the potential length of service that the user might expect. Whilst a PFD needs to be of substantial construction and material, its potential length of service often depends 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 do not accurately simulate all conditions of use. For example, the fact that a device passes the self-righting tests in swimming attire, as described herein, does not guarantee that it will self-right an unconscious user wearing clothing; neither can it be expected to completely protect the airway of an unconscious person in rough water. Waterproof clothing can trap air and further impair the self-righting action of a lifejacket.

It is essential that owners, users and employers choose those PFDs that meet the correct standards for the circumstances in which they will be used.

The characteristics of the product properties, alternative choices and the limitations to normal use are to be explained to potential buyers by manufacturers and distributors of PFDs prior to purchase.

Similarly, it is advised that regulators regarding the use of these garments consider carefully which class and performance levels are most appropriate for the foreseeable conditions of use, allowing for the higher risk circumstances. These higher risk circumstances should account for the highest probabilities of occurrence of accidental immersion and expected consequences. Requirements and recommendations for the correct selection and application of PFDs are given in ISO 12402-10:2020.

# Personal flotation devices —

# Part 5:
# Buoyancy aids (level 50) — Safety requirements

## 1 Scope

This document specifies the safety requirements for buoyancy aids, performance level 50. It is applicable to buoyancy aids for adults and children with a body mass greater than 25 kg only, used in sheltered waters.

Buoyancy aids require active participation by the user where help and rescue are close at hand.

One-piece and two-piece inherently buoyant floatation suit PFDs are deemed to qualify as special application devices according to ISO 12402-6:2020.

## 2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 12402-6:2020, *Personal flotation devices — Part 6: Special application lifejackets and buoyancy aids — Safety requirements and additional test methods*

ISO 12402-7:2020, *Personal flotation devices — Part 7: Materials and components — Safety requirements and test methods*

ISO 12402-8:2020, *Personal flotation devices — Part 8: Accessories — Safety requirements and test methods*

ISO 12402-9:2020, *Personal flotation devices — Part 9: Evaluation*

ISO 13688:2013, *Protective clothing — General requirements*

## 3 Terms and definitions

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

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

**3.1**
**personal flotation device**
**PFD**
garment or device which, when correctly worn and used in water, provides the user with a specific amount of buoyancy which increases the likelihood of survival

**3.2**
**inherently buoyant**
permanently less dense than water

**3.3**
**automatic inflation**
inflation of the *PFD* (3.1) without the user carrying out any action at the time of water immersion

**3.4**
**manual inflation**
inflation of the *PFD* (3.1) resulting from the user operating a mechanism

**3.5**
**oral inflation**
inflation resulting from the user blowing air into the *PFD* (3.1) by mouth

**3.6**
**vest-type PFD**
*PFD* (3.1) covering the upper trunk of the user like a vest

**3.7**
**emergency position-indicating light**
device which emits light so as to increase the chances of a user being located

**3.8**
**multi-chamber buoyancy system**
*PFD* (3.1) with buoyancy to meet the applicable PFD performance requirement provided by two or more independent chambers

Note 1 to entry: This excludes supplemental inflation chambers.

**3.9**
**deck safety harness**
device that allows a user to be securely attached to a strong point on a vessel or on shore, preventing a fall into the water or, if falling occurs, preventing separation from the vessel or shore

**3.10**
**buddy line**
length of cord which can be tied or otherwise fixed to another person or to that person's *PFD* (3.1) or other objects, so as to keep a user in the vicinity of that person or object with a view to making location and thus rescue easier

**3.11**
**lifting loop**
device which facilitates manual recovery of a person from water

**3.12**
**sprayhood**
cover brought or placed in front of the airways of a user in order to reduce or eliminate the splashing of water from waves or the like onto the airways, and thereby promoting the survival of the user in rough water conditions

**3.13**
**protective cover**
cover that is normally in place over the functional elements of a *PFD* (3.1) in order to protect them from physical damage, or snagging on external objects

Note 1 to entry: The protective cover may be designed to provide additional properties, i.e. to make the PFDs suitable for use when the subject is exposed to additional hazards, e.g. significant abrasion, molten metal splash, flame and fire.

Note 2 to entry: The inflatable chamber of an inflatable PFD is an example of a functional element.

**3.14**
**overpressure relief valve**
valve which may be used in an inflatable system to avoid the likelihood of destruction caused by overpressure

**3.15**
**whistle**
device which, when blown by mouth, produces an audible sound which can aid in the location of the user

**3.16**
**hybrid PFD**
*PFD* (3.1) of combined buoyancy types, i.e. inherent and inflatable

**3.17**
**bunching**
curling or folding of internal buoyant material upon itself, from its original position, within the envelope

**3.18**
**sheltered waters**
water with protection from significant breaking waves, current, or strong winds, where the possibility of being blown or carried away from shore or place of safety is minimal

**3.19**
**offshore**
water that is unprotected and influenced by a variety of threat conditions such as waves, tide, currents, or wind, at sea or on inland waters

**3.20**
**primary means of inflation**
means of inflating an inflation chamber that meets the applicable *PFD* (3.1) performance requirements and that requires the least amount of intervention by the user, generally according to the following order of precedence: automatic (easiest), manual (second), and oral (most difficult)

**3.21**
**primary chamber**
inflation chamber associated with the *primary means of inflation* (3.20) that alone meets the applicable *PFD* (3.1) performance requirements

**3.22**
**back-up chamber**
inflation chamber other than the *primary chamber(s)* (3.21) or *supplemental chamber* (3.23) that, when used alone, provides performance in case the primary chamber fails to function

**3.23**
**supplemental chamber**
inflation chamber other than a *primary chamber* (3.21) or *back-up chamber* (3.22) that is intended for deployment after stabilization in the water, and provides enhanced performance such as higher freeboard, improved head support, additional stability, splash protection, location, detection

**3.24**
**status indicator**
part or parts of an inflation system which provide user feedback to assist in keeping an inflatable *PFD* (3.1) in an armed and ready condition

**3.25**
**adult buoyancy aid**
buoyancy aid intended for users with a body mass greater than 40 kg

**3.26**
**child buoyancy aid**
buoyancy aid intended for users with a body mass greater than 25 kg and less than or equal to 40 kg

**3.27**
**structural parts, materials and components**
parts, materials, or components that are integral to the device and that are essential for its correct function and performance

**3.28**
**ride-up prevention system**
system that helps to secure the *PFD* (3.1) in its functional position on the body and prevents the PFD from riding up the body towards the head

Note 1 to entry: A crotch strap is one example of a ride-up prevention system.

**3.29**
**collar handle**
device on the upper back of a *PFD* (3.1) which facilitates getting hold of the wearer

# 4 Classification of PFDs

## 4.1 Classes

### 4.1.1 Buoyancy aids

A buoyancy aid is a garment or device that, when worn correctly, provides support without significant face-up turning ability and therefore can require an action by the user to position the face clear of the water.

A buoyancy aid provides suitable performance in sheltered waters, and at higher levels of support, it can be suitable for use in other waters.

### 4.1.2 Lifejackets

A lifejacket is a garment or device that, when worn correctly, maintains the user in a face-up flotation position, without additional action, with various levels of performance suitable for sheltered and unsheltered waters.

A lifejacket has a buoyancy distribution sufficient to turn most users to a position where the mouth is clear of the water even when exhausted.

### 4.1.3 Special application PFDs

A special application PFD shall have performance equivalent to a lifejacket or buoyancy aid, but has additional features and requirements related to specific applications for use. These PFDs can require additional action by the user, or can only be suitable for certain activities or user groups according to ISO 12402-6:2020.

## 4.2 Performance levels

### 4.2.1 Level 50

This level is intended for use by those who have help or a means of rescue close at hand, and who are able to swim. This device often has minimal bulk, but requires active participation by the user and cannot be expected to keep the user safe for a long period of time.

As tested in swimming attire (when fully inflated, if inflatable) the device helps to support the user in a position with the mouth and nose clear of the water. It can support a fully clothed user in this position.

#### 4.2.2 Level 100

This level is intended for use in sheltered or calm water, where users may have to wait for rescue.

As tested in swimming attire (when fully inflated, if inflatable) the device has some turning ability to bring the user into a position with the mouth and nose clear of the water. It is intended to maintain a fully clothed user in this position without active participation.

#### 4.2.3 Level 150

This level is intended for general, offshore, and rough water use.

As tested in swimming attire (when fully inflated, if inflatable) the device is capable of turning an unconscious user into a position with the mouth and nose clear of the water. It is intended to maintain a fully clothed user in this position without active participation.

#### 4.2.4 Level 275

This level is intended primarily for offshore use under severe weather or sea conditions. It is of value to those who are wearing clothing which traps air and adversely affects the self-righting capacity of the lifejacket. It is also intended for a user who requires a high level of buoyancy, for example when carrying heavy objects.

As tested in swimming attire, (when fully inflated, if inflatable) it is capable of turning an unconscious user into a position with the mouth and nose clear of the water. It is intended to maintain a fully clothed user in this position without active participation.

## 5 Requirements

### 5.1 General

A buoyancy aid, performance level 50, shall meet the requirements specified in this clause when tested in accordance with ISO 12402-9:2020.

It shall meet the requirements of ISO 13688:2013, 4.2 (innocuousness), and 4.4 (comfort).

There shall be no damage impairing the performance of the PFD when tested in accordance with ISO 12402-9:2020, 5.5.2. In addition, for an inflatable device, any status indicators shall maintain a positive indication and the gas cylinder shall not become loosened or dislodged.

The interface between the gas cylinder and the inflation system as well as the interface between the inflation system and the lifejacket shall remain secure during use, such that none of the mentioned components can come loose. The buoyancy aid shall remain functional.

#### 5.1.1 Materials and components

Structural parts, materials and components used for the construction of a buoyancy aid shall comply with ISO 12402-7:2020, with the exception of ISO 12402-7:2020, 4.3.3. The structural materials and components shall comply as specified in 5.1.1.1 to 5.1.1.12.

##### 5.1.1.1 Sewing thread

Shall be tested in accordance with and comply with ISO 12402-7:2020, 4.2.

##### 5.1.1.2 Fabric

Shall be tested in accordance with and comply with ISO 12402-7:2020, 4.3.

#### 5.1.1.3 Structural webbing and tie tapes

Shall be tested in accordance with and comply with ISO 12402-7:2020, 4.4.

#### 5.1.1.4 Structural lacing

Shall be tested in accordance with and comply with ISO 12402-7:2020, 4.5.

#### 5.1.1.5 Structural zippers

Shall be tested in accordance with and comply with ISO 12402-7:2020, 4.6.

#### 5.1.1.6 Hardware

Shall be tested in accordance with and comply with ISO 12402-7:2020, 4.7.

#### 5.1.1.7 Foam flotation material

Shall be tested in accordance with and comply with ISO 12402-7:2020, 4.8.

#### 5.1.1.8 Inflation chamber materials

Shall be tested in accordance with and comply with ISO 12402-7:2020, 4.9.

#### 5.1.1.9 Polymeric foam coatings

Shall be tested in accordance with and comply with ISO 12402-7:2020, 4.10.

#### 5.1.1.10 Inflation systems for hybrid and solely inflatable PFDs

Shall be tested in accordance with and comply with ISO 12402-7:2020, 4.11.

#### 5.1.1.11 Gas-filled cylinders

Shall be tested in accordance with and comply with ISO 12402-7:2020, 4.12.

#### 5.1.1.12 Non-structural parts

Non-structural parts, materials and components shall not hinder compliance with the standard.

### 5.1.2 Means of inflation

Inflatable buoyancy aids complying with this part of the ISO 12402 series:2020 shall have either automatic or manual inflation as their primary means of inflation. If automatic, they shall also have manual secondary means of inflation and each chamber shall have at least oral means of inflation. If the inflation systems are located on separate inflation chambers, see 5.7.

### 5.1.3 Body strap and lacing ends requirements

The free end of any body strap and lacing necessary for the performance of the buoyancy aid shall be provided with a means, such that the strap (lacing) does not disengage from the hardware when tested in accordance with ISO 12402-9:2020, 5.5.8. Duplicate combinations of hardware-webbing constructions that prevent hardware separation from the buoyancy aid need not be retested.

### 5.1.4 Inflation Status Indicators

Inflatable buoyancy aids complying with this part of the ISO 12402 series:2020 shall indicate if the inflator is correctly armed with a sealed cylinder and fully operable except as specified in



 

ISO 12402-6:2020, 6.6. All inflation status indicators shall be grouped or located such that when installed on a buoyancy aid in their intended position, they are viewed simultaneously when examined prior to donning and shall be in a position where they can be checked by the wearer and/or a buddy after donning the buoyancy aid.

### 5.1.5 Ride-up prevention system

If a ride-up prevention system is supplied, the in-water performance tests shall be performed in accordance with ISO 12402-9:2020, 5.6, both with and without the ride-up prevention system in place.

### 5.1.6 Rearming and repacking information

The rearming and repacking information supplied with the buoyancy aid as defined in Clause 7, h) and i) shall be assessed to be useable by untrained users when rearming and repacking the buoyancy aid. The information supplied to support rearming and repacking shall include all media supplied by the manufacturer.

### 5.1.7 Oral inflation

An inflatable buoyancy aid shall permit the user to orally inflate by mouth while in or out of the water using either hand independently, when tested according to ISO 12402-9:2020, 5.6.8.

### 5.1.8 Magnetic properties

No metallic component shall affect a magnetic compass of a type commonly used in small boats by more than 1° when the PFD including all of its accessories and components is placed 500 mm from the compass, when tested according to ISO 12402-9:2020, 5.4.

## 5.2 Combination of buoyancy aids and accessories

Accessories used on buoyancy aids, performance level 50, shall comply with ISO 12402-8:2020 as specified in Table 1 of this document.

Combinations of a buoyancy aid and accessories shall not impair the performance of either item. This shall be proved by testing the buoyancy aid and accessories in combination. If necessary, the test sequence has to be arranged accordingly. Requirements and test methods for accessories are specified in ISO 12402-8:2020.

**Table 1 — Accessories**

| Accessory | Mandatory (M)/ Optional (O) | Subclause in this document | Subclause in ISO 12402-8:2020 |
|---|---|---|---|
| Emergency position-indicating light | O | — | 5.10 |
| Whistle | O | — | 5.2 |
| Lifting loop | O | — | 5.9 |
| Collar handle | O | 5.5 | — |
| Buddy line | O | — | 5.4 |
| Retroreflective material | O | 5.4.2 | — |
| Deck safety harness | O | — | 5.3 |
| Overpressure relief valve | O | 5.3.2 | — |
| Multi-chamber buoyancy system | O | — | 5.7, 5.8 |
| Protective cover | O | — | 5.6 |

**Table 1** *(continued)*

| Accessory | Mandatory (M)/ Optional (O) | Subclause in this document | Subclause in ISO 12402-8:2020 |
|---|---|---|---|
| Sprayhood | O | — | 5.5 |
| Ride-up prevention system | O | 5.1.5, 5.5 5.6.1.10, 5.6.3.7 | — |
| Personal locator device | O | — | 5.11 |

## 5.3 Types of buoyancy

### 5.3.1 General

**5.3.1.1** The amount of buoyancy and its distribution shall be such that the in-water performance required is met.

The minimum amount of buoyancy for a buoyancy aid as specified in Table 2 can be provided by inherently buoyant material, chambers inflated by gas or by a combination of the two.

**5.3.1.2** If the buoyancy aid is of a hybrid type, it shall provide, by its inherent buoyancy alone, the performance requirements of this document as a minimum.

**5.3.1.3** The buoyancy aid shall float for at least 5 min when tested in accordance with ISO 12402-9:2020, 5.5.11.

### 5.3.2 Inflatable buoyancy chambers

**5.3.2.1** Inflatable buoyancy chambers, components and relief valves shall be capable of withstanding an overpressure without damage or permanent deformation or evidence of leakage when tested in accordance with ISO 12402-9:2020, 5.5.14.

If a device is operated with an overpressure relief valve, it shall be tested in accordance with ISO 12402-9:2020, 5.5.14.

**5.3.2.2** Gas-inflated buoyancy aids shall withstand the inflation test in accordance with ISO 12402-9:2020, 5.5.9, before the buoyancy test in accordance with ISO 12402-9:2020, 5.5.10, is performed. Both automatic and manual inflation modes shall be tested. A buoyancy aid shall attain the minimum buoyancy required by Table 2 within the stated time limits below. The buoyancy aid shall also achieve its intended shape.

For automatic inflation mode, the time required from the immersion of the inflator until initiation of inflation shall not exceed 5 s when tested according to ISO 12402-9:2020, 5.5.9 and from initiation of inflation to when the minimum buoyancy is obtained shall not exceed another 5 s.

For manual inflation mode, the time required from the manual activation of the device to when the assembly begins to rise to the surface shall not exceed 5 s when tested according to ISO 12402-9:2020, 5.5.9.

**5.3.2.3** For inflatable buoyancy aids, the inflation mechanism shall not activate below 13 N and shall activate between 13 N and 120 N when tested in accordance with ISO 12402-9:2020, 5.5.9.

### 5.3.3 Inherently buoyant material

**5.3.3.1** 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.

**5.3.3.2** Any inherently buoyant material shall prove to have properties in accordance with ISO 12402-7:2020, 4.8.

### 5.3.4 Total buoyancy provided

**5.3.4.1** For the purpose of assessment in accordance with this document, items of different size are to be accompanied by stated minimum and maximum user's mass, which shall conform to the marked size ranges.

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 mass and girth ranges.

**5.3.4.2** When tested in accordance with ISO 12402-9:2020, 5.5.10, the total buoyancy provided by the buoyancy aid shall not be less than the applicable minimum buoyancy as specified in Table 2.

**Table 2 — Minimum buoyancy as a function of the user's mass**

| Parameter | User | | | | |
|---|---|---|---|---|---|
| | Child buoyancy aid | Adult buoyancy aid | | | |
| User's mass, $m$ (kg) | $25 < m \leq 40$ | $40 < m \leq 50$ | $50 < m \leq 60$ | $60 < m \leq 70$ | $m > 70$ |
| Minimum buoyancy, $F$ (N) | 35 | 40 | 40 | 45 | 50 |

**5.3.4.3** If the buoyancy aid is intended for two or more mass categories, the buoyancy shall be at least as specified for the heavier category.

**5.3.4.4** The buoyancy of the buoyancy aid shall be tested in accordance with ISO 12402-9:2020, 5.5.10. When comparing the initial measurements with the measurement after 24 h, the loss of buoyancy shall not exceed 5 %.

The buoyancy, measured in any test carried out for the purpose of ascertaining conformity to this document, shall not be less than that claimed on the marking of the buoyancy aid, or less than that required in 5.3.4.2.

### 5.3.5 Buoyancy retention factor (V-factor method)

#### 5.3.5.1 General

This requirement is only applicable to buoyancy aids where the inherently buoyant material is qualified according to ISO 12402-7:2020, 4.8.2.5.

Any inherently buoyant material shall prove to have properties in accordance with ISO 12402-7:2020, 4.8.

When foam flotation material is qualified by ISO 12402-7:2020, 4.8.2.5, and tested in accordance with ISO 12402-9:2020, 5.5.12, the minimum total buoyancy shall be not less than the applicable minimum buoyancy values required by Table 2, or not less than the value determined according to Formulae (1) or (2), whichever is greater.

This requirement is only applicable where the V-Factor method is used to qualify inherently buoyant material in accordance with ISO 12402-7:2020, 4.8.2.5.

a) For a vest-type PFD, Formula (1) applies:

$$B_t = 0{,}82 \cdot F \sum_{i=1}^{N} \frac{P_i}{3R_i - 2} \quad (1)$$

b) For a full-sleeved jacket or suit-style PFD, i.e. buoyancy aid with buoyancy covering the torso and arms (and perhaps legs), Formula (2) applies:

$$B_t = 0{,}70 \cdot F \sum_{i=1}^{N} \frac{P_i}{3R_i - 2} \quad (2)$$

where

$B_t$ is the minimum total buoyancy required for the PFD, in N;

$F$ is the applicable minimum buoyancy for the PFD, as specified in Table 2, in N;

$P_i$ is the fraction of buoyancy provided by the $i^{th}$ material to the total buoyancy of the PFD;

$R_i$ is the applicable value specified in Table 3, retention factor;

$N$ is the number of materials used in the PFD.

This requirement does not apply to foam that is not relied upon for compliance with the requirement of Table 2, provided that the PFD complies with the requirements of the in-water human subject performance tests, ISO 12402-9:2020, 5.6, both with and without the foam in place.

**Table 3 — Values of $R_i$**

| Application | V-Factor for material[a] | $R_i$ |
|---|---|---|
| Wearable PFD – vest-type | ≥94 | 0,94 |
| | <94 | V-factor/100 |
| Wearable PFD – jacket-style and suit-style | ≥90 | 0,90 |
| | <90 | V-factor/100 |

[a] The applicable factor (V) as determined in accordance with ISO 12402-7:2020, 4.8.2.5.

### 5.3.5.2 Buoyancy distribution

When the buoyancy aid's back-inherently buoyant material is less than 40 % of the total buoyancy, the aggregate V-factor of the foam aft of the body axis shall be not more than 5 points greater than the aggregate V-factor of the foam forward of the body axis. An approximation of the aggregate V-factor can be calculated by the following Formula (3):

$$V_a = \sum_{i=1}^{N} R_i \left( \frac{P_i}{\sum_{i=1}^{N} P_i} \right) \quad (3)$$

where

$V_a$ is the approximate aggregate V-factor of two or more buoyancy foams in either the front of the buoyancy aid or in the back of the buoyancy aid, as applicable;

$P_i$ is the fraction of buoyancy provided by the $i^{th}$ material to the buoyancy of either the front of the buoyancy aid or back of the buoyancy aid, as applicable;

$R_i$ is the applicable value specified in Table 3 for the $i^{th}$ material;

$N$ is the number of materials used in the front or back of the buoyancy aid.

When the buoyancy aid's back inherently buoyant material is greater than 40 % of the total buoyancy, the aggregate V-factor of the foam aft of the body axis shall be not more than 2 points greater than the aggregate V-factor of the foam forward of the body axis.

## 5.4 Conspicuousness

### 5.4.1 Colour

The requirement in ISO 12402-7:2020, 4.3.3 is not applicable. Buoyancy aids may be of any colour or multiple colours. There is no requirement for colour.

### 5.4.2 Retroreflective material

There is no requirement for retroreflective material. Buoyancy aids may be provided with retroreflective material of any colour.

## 5.5 Strength

The vertical and horizontal strength of the device shall be tested in accordance with ISO 12402-9:2020, 5.5.4. No damage shall occur impairing the function of the buoyancy aid as specified in this document. The means of adjustment shall not have a slippage exceeding 25 mm when subjected to the test.

The horizontal load shall be no less than 2 000 N for adult buoyancy aids and 1 000 N for child buoyancy aids when tested in accordance with ISO 12402-9:2020, 5.5.4.3.2. The vertical load shall be no less than 750 N for adult buoyancy aids and 500 N for child buoyancy aids when tested in accordance with ISO 12402-9:2020, 5.5.4.3.3. The load shall be maintained for 5 min.

The horizontal load value shall also apply for the lifting loop tested according to ISO 12402-9:2020, 5.5.5. The load shall be maintained for 5 min.

Where a ride-up prevention system is supplied as part of a device the strength tests shall be conducted both with and without the ride-up prevention system correctly fitted. If provided, the test panel shall verify that each hardware-webbing-end tab combination shall remain firmly engaged and usable when subjected to normal handling.

The vertical load value shall apply for the collar handle load test when tested in accordance with ISO 12402-9:2020, 5.5.7. The load shall be maintained for (5 ± 0,1) min.

All attachment points on inherently buoyant PFDs, attachment points on the chambers of an inflatable PFD and joints and couplings within attached inflation system components shall be tested in accordance with ISO 12402-9:2020, 5.5.15. For each attachment to an inflatable chamber, a load of (220 ± 10) N shall be supported without impairing the performance of the PFD or its component parts.

For inherently buoyant and inflatable PFDs having other identifiable attachments, a load of (150 ± 10) N shall be supported without causing loss of function of the PFD or its component parts.

After the test, the PFD shall be visually inspected and for inflatable PFDs, the PFD shall be inflated and there shall be no leakage.

## 5.6 Performance

### 5.6.1 General

**5.6.1.1** When worn, the buoyancy aid shall not be unduly bulky, heavy or uncomfortable when tested in accordance with ISO 12402-9:2020, 5.6.

**5.6.1.2** Buoyant materials shall not display bunching when tested in accordance with ISO 12402-9:2020, 5.6.3 and 5.6.4.

**5.6.1.3** When worn, the buoyancy aid shall allow tightening and loosening of essential adjustments both ashore and in the water, if necessary, to allow the device not unduly restrict the vision, hearing, breathing or movement of the user when tested in accordance with ISO 12402-9:2020, 5.6.1.7.

The buoyancy aid shall not interfere with vision when worn both ashore and in the water and shall allow sufficient comfort, and head and limb movement to preclude it from being removed because of encumbrance or discomfort during emergency use both ashore and in the water.

**5.6.1.4** The buoyancy aid shall not contain any component nor use any method of component attachment which in normal use is likely to cause injury to the user or damage the buoyancy aid.

**5.6.1.5** The buoyancy aid shall not hinder the user from performing necessary tasks. The user shall be able to swim whilst using the buoyancy aid, climb a ladder, and board a SOLAS liferaft or rigid platform when tested in accordance with ISO 12402-9:2020. At least two-thirds of subjects who can accomplish the task specified in ISO 12402-9:2020, 5.6.7, without the buoyancy aid shall also be able to perform it with the buoyancy aid.

**5.6.1.6** There shall be no damage, such as shrinking, cracking, swelling, dissolution or change of mechanical properties, which impairs the performance or donning characteristics of the buoyancy aid when tested in accordance with ISO 12402-9:2020, 5.5.3. If the manufacturer provides additional storage conditions, those conditions shall be taken into account in addition, to the temperature cycling test in accordance with ISO 12402-9:2020, 5.5.3.

**5.6.1.7** The buoyancy aid shall not form channels having a tendency to direct water into the face or to the head of the user. The test panel shall witness this by visual inspection during the in-water performance tests according to ISO 12402-9:2020, 5.6.

**5.6.1.8** Automatic inflatable buoyancy aids shall not inflate inadvertently when tested in accordance with ISO 12402-9:2020, 5.5.16.

**5.6.1.9** When tested in accordance with ISO 12402-9:2020, 5.5.13, the buoyancy aid shall not continue to burn 6 s after removal from the flame, and shall retain at least the minimum required buoyancy.

**5.6.1.10** A buoyancy aid may be provided with a ride-up prevention system.

If a ride-up prevention system is supplied on a buoyancy aid, the in-water performance tests shall be performed in accordance with ISO 12402-9:2020, 5.6.1.8, both with and without the ride-up prevention system in place, except as defined in the next paragraph.

The tests shall be performed with the ride-up prevention system in place, when either one of the following applies:

a) when the manufacturer declares that the ride-up prevention system is essential to meet the in-water performance requirements, as declared in the user information,

b) where the device cannot be donned without the ride-up prevention system correctly fitted.

**5.6.1.11** There shall be no damage impairing the performance of the buoyancy aid when tested in accordance with ISO 12402-9:2020, 5.5.2. In addition, for an inflatable device, the status indicators shall maintain a positive indication. Neither the gas cylinder nor the inflation system shall become loose or dislodged.

### 5.6.2 Donning, adjustment and fit

**5.6.2.1** The buoyancy aid shall have a proper fit and adjustment. It shall be easy to don. Ties and fastenings necessary for proper performance should be few and simple.

**5.6.2.2** Donning shall be obvious and simple with the briefest of instructions as provided by the manufacturer. Donning shall be possible without assistance, except for child buoyancy aids, for which adult assistance is permitted in accordance with ISO 12402-9:2020, 5.6.2.2.

When tested in accordance with ISO 12402-9:2020, 5.6, donning by all means of securing the buoyancy aid required to meet the in-water performance requirements shall take no longer than 1 min. The inflated donning shall take no longer than 2 min.

**5.6.2.3** When tested in accordance with ISO 12402-9:2020, the means of adjustment within the stated size range shall ensure a secure fit. Security of fit shall not be dependent upon highly elastic material.

**5.6.2.4** Each mode of inflation shall be tested both in and out of the water in accordance with ISO 12402-9:2020, 5.6., as applicable.

### 5.6.3 In-water performance

**5.6.3.1** A buoyancy aid shall provide lateral support of the user so that the mouth is held clear off a still water surface, with the trunk of the body inclined backwards from the vertical when tested in accordance with ISO 12402-9:2020, 5.6.4.

**5.6.3.2** The freeboard, measured in accordance with ISO 12402-9:2020, 5.6.5, shall be positive for each human test subject.

**5.6.3.3** When floating in an attitude of relaxed static balance, each human test subject's respiration shall not be impeded at any time, and each subject shall be able to maintain a stable position and not to turn face down, when tested in accordance with ISO 12402-9:2020, 5.6.

**5.6.3.4** When the buoyancy aid is in an operational condition, it shall permit the test subject to turn into the position required by 5.6.3.2 within 5 s when tested in accordance with ISO 12402-9:2020, 5.6.

**5.6.3.5** When tested in accordance with ISO 12402-9:2020, 5.6.3, the buoyancy aid shall not become dislodged, cause harm to the test subject or be damaged so as to affect its in-water performance or buoyancy.

**5.6.3.6** The user shall not slip out of the buoyancy aid when tested in accordance with ISO 12402-9:2020, 5.6.

**5.6.3.7** The buoyancy aid shall not ride up to such an extent as to impair its performance, meeting the requirements given in this part of the ISO 12402 series:2020 when tested in accordance with ISO 12402-9:2020.

**5.6.3.8** With each test subject in the water, the PFD shall permit oral inflation sufficient to provide the test subject with positive freeboard within 45 s for any PFD up to 150 N buoyancy. For PFDs over 150 N buoyancy, an additional 15 s is allowed for each additional 50 N buoyancy.

## 5.7 Multi-chamber buoyancy systems

**5.7.1** For multi-chamber buoyancy systems where the minimum performance required is provided by the aggregate buoyancy of multiple primary chambers, each required chamber shall have independent primary automatic inflation, and the total system shall meet all the performance requirements of this part of the ISO 12402 series:2020 without exception.

**5.7.2** Multi-chamber buoyancy systems that provide back-up or supplemental flotation shall be in accordance with ISO 12402-8:2020, 5.7 or 5.8 as applicable.

If provided, a full back-up chamber or combination of full back-up chambers shall, when tested according to ISO 12402-8:2020, 5.7, and ISO 12402-9:2020, 5.6, provide at least in-water performance conforming to this part of the ISO 12402 series:2020. If provided, partial back-up chamber or combination of partial back-up chambers shall, when tested according to ISO 12402-8:2020, 5.7, and ISO 12402-9:2020, 5.6, provide at least in-water performance conforming to ISO 12402-5:2020.

If provided with a supplemental chamber(s), the PFD shall meet the in-water performance requirements of this document with and without the supplemental chamber(s) inflated when tested in accordance with ISO 12402-8:2020, 5.8 and ISO 12402-9:2020, 5.6.

# 6 Marking

## 6.1 General

The buoyancy aid shall be permanently and legibly marked with the information given in 6.2, which shall be given at least in the official language(s) of the country of destination. Information shall be given preferably as pictograms, or as text combined with pictograms, or, if defined pictograms do not exist, as text alone.

## 6.2 Information on the buoyancy aid

Information on the buoyancy aid shall include the following items:

a) identification of the manufacturer — at least the name of the manufacturer or representative and their mailing address;

b) the class of the PFD according to 4.1 and the performance level according to 4.2;

c) the statement that it is not a PFD until fully inflated (only on an inflatable PFD);

d) the size range of the buoyancy aid, e.g. range of chest girth and user's body mass;

e) the minimum buoyancy provided and amount of inflatable buoyancy, if a hybrid type;

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

g) simple donning and adjustment instructions;

h) a warning that states: "Check before each use according to manufacturer's instructions" or the pictogram according to Figure 1;

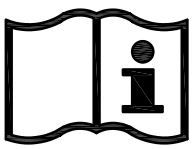

**Figure 1 — Pictogram (ISO 7000-1641)**

i) simple instructions for use;

j) if inflated by gas, the correct filled gas mass of the cylinder (in g). This information shall appear near the place where the cylinder is actually fitted;

k) if inflated by gas, a warning that gas cylinders are dangerous goods, and that they shall be kept away from children and not misused;



 

l) the manufacturer's model, designation, serial number, and quarter (or month) and year of manufacture;

NOTE Months are given as Arabic numerals (1 to 12), and quarters as Roman numerals (I to IV) in order, starting from 1st January.

m) the number of this part of ISO, i.e. ISO 12402-5:2020;

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

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

p) the text "Train yourself in the use of the device";

q) the text "Teach the child to float in this buoyancy aid", if intended for children;

r) the text "For children less than 6 years of age use automatically operating devices only", if intended for children;

s) the range of its specific application;

t) the expected servicing interval assuming average use, and a space for servicing dates to be marked, including additional items (gas bottles, bobbins, retroreflective tapes, etc.) and their replacement;

u) compatibility with the intended safety harnesses, clothing or additional equipment as relevant, specific equipment to be listed;

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

w) the text "WARNING: Limited protection against drowning."

The label bearing this information shall be permanently affixed to the buoyancy aid, shall be resistant to salt water and stand at least 10 washes carried out in accordance with the manufacturer's instructions. The label shall not shrink more than 10 % after washing.

Special 'lace up' pictograms showing the manufacturer's exact recommendations for webbing (narrow fabric) lacing through the buckle and fastening combination of the 'cow-tail' and the text "Practice and training are required with this device before use" shall be placed on the buoyancy aid and in the accompanying information.

## 7 Information supplied by the manufacturer

The buoyancy aid shall be supplied with an explanatory leaflet containing at least the following items:

a) items given in 6.2;

b) the recommendation that the user should try out the buoyancy aid to ascertain its performance before use;

c) full instructions for donning and use (also instructions for whistle and light if fitted);

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

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

f) instructions about security of fit and the need to check and tighten the adjustments in the event of water entry;

g) such other general advice on the care and use of the buoyancy aid as the manufacturer sees fit;

h) instructions for the user on how to check the buoyancy aid before each use;

i) end user information to allow the user to rearm and repack;

j) contact details for advice on rearming, repacking and servicing of the buoyancy aid;

k) an additional warning about use in colder temperatures and the effect on the performance of the PFD;

NOTE 1 Item k) only on an inflatable PFD.

l) the warning statement: "WARNING: In cold environments inflation may be slower and lower performance may result";

NOTE 2 Item l) only on an inflatable PFD.

m) a warning that states: "Check the buoyancy aid before each use";

n) where the buoyancy aid has not been marked with the date of this document, it shall either be provided in the information leaflet supplied by the manufacturer or other documentation provided with the product.

# 8 Consumer information at point of sale

## 8.1 General

A plain text version (according to Figures 2 and 3) and/or a marking information (see Figure 4) shall be applied for consumer information.

## 8.2 Plain text 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 buoyancy aid itself or by additional labelling on the packaging.

If the presentation of information is divided in various sections, they shall be given in such a way that the consumer can perceive all sections together ("Survey on the entire PFD-system"). The layout of the labels given in Figures 2 and 3 is recommended, whereas the content is mandatory.

If the plain text version is chosen, the information shall be laid out in accordance with Figure 2. The minimum dimension of the information shall be 75 mm × 75 mm. Colours for the text and the label may vary, but shall always contrast with the background.

NOTE 1 Information in row (8) can be given by plain text data or by representing the supplier's logo.

NOTE 2 The label shown in Figure 2 can form the left side of a complete label (see Figure 3) presenting all stipulated data from the data list (see 8.3).

The layout of the right part of the label in Figure 3 is optional. For the contents, see 8.3. The entries in the table are examples.