



**SLOVENSKI STANDARD**  
**oSIST prEN 13138-4:2018**  
**01-april-2018**

---

**Plavajoči pripomočki za učenje plavanja - 4. del: Lastnosti, zahteve in postopki preskušanja v vodi za pripomočke razreda B**

Buoyant aids for swimming instruction - Part 4: In water performance, requirements and test procedures for Class B swimming devices

Auftriebshilfen für das Schwimmenlernen - Teil 4: Wassertechnische Anforderungen und Prüfungen für Produkte der Klasse B

Aides à la flottabilité pour l'apprentissage de la natation - Partie 4: Performances dans l'eau, exigences et méthodes d'essai pour classe B de portées au corps

<https://standards.iteh.ai/catalog/standards/sist/385e0f9a-6ad4-4e9a-bf8c-24a430c00398/osist-pr-en-13138-4-2018>

**Ta slovenski standard je istoveten z: prEN 13138-4**

---

**ICS:**

13.340.70	Rešilni jopiči, vzgonska pomagala in plavajoči pripomočki	Lifejackets, buoyancy aids and floating devices
97.220.40	Oprema za športe na prostem in vodne športe	Outdoor and water sports equipment

**oSIST prEN 13138-4:2018**

**en,fr,de**

**iTeh STANDARD PREVIEW**  
**(standards.iteh.ai)**

[oSIST prEN 13138-4:2018](https://standards.iteh.ai/catalog/standards/sist/385e0f9a-6ad4-4e9a-bf8c-24a430c00398/osist-pren-13138-4-2018)

<https://standards.iteh.ai/catalog/standards/sist/385e0f9a-6ad4-4e9a-bf8c-24a430c00398/osist-pren-13138-4-2018>

EUROPEAN STANDARD  
NORME EUROPÉENNE  
EUROPÄISCHE NORM

**DRAFT**  
**prEN 13138-4**

February 2018

ICS 13.340.70; 97.220.40

English Version

## Buoyant aids for swimming instruction - Part 4: In water performance, requirements and test procedures for Class B swimming devices

Aides à la flottabilité pour l'apprentissage de la natation - Partie 4: Performances dans l'eau, exigences et méthodes d'essai pour classe B de portées au corps

Auftriebshilfen für das Schwimmenlernen - Teil 4: Wassertechnische Anforderungen und Prüfungen für Produkte der Klasse B

This draft European Standard is submitted to CEN members for enquiry. It has been drawn up by the Technical Committee CEN/TC 162.

If this draft becomes a European Standard, 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.

This draft European Standard was established by CEN 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 CEN-CENELEC Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and United Kingdom.

Recipients of this draft are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

**Warning** : This document is not a European Standard. It is distributed for review and comments. It is subject to change without notice and shall not be referred to as a European Standard.



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

**CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels**

<b>Contents</b>	<b>Page</b>
European foreword.....	3
Introduction .....	4
1 Scope.....	5
2 Normative references.....	5
3 Terms and definitions .....	5
4 Safety and performance requirements .....	7
5 Testing.....	9
Annex A (normative) Dimensions of test manikins I to III.....	11
A.1 Dimensions of manikins I...III.....	11
A.2 Functional residual lung volume.....	14
A.3 Mass and density of components of manikins I...III.....	14
A.4 Centre of gravity of manikins I...III .....	14
A.4.1 Location .....	14
A.5 Calibration on land (dry), manikins I...III.....	15
Annex B (normative) Dimensions of manikins IV to VII .....	16
B.1 Dimensions of manikins IV to VII.....	16
B.2 Density of manikin components.....	20
B.3 Functional residual lung capacity (FRC).....	21
B.4 Calibration underwater (wet), manikins I...VII.....	21
Annex C (normative) In-water performance test, measuring devices fitted to free floating manikins I...VII, measurement of floating angle .....	23
C.1 In-water performance test, measuring devices fitted to free floating manikins I...VII, measurement of freeboard.....	23
C.2 In-water performance test, measuring devices fitted to free floating manikins I...VII, measurement of freeboard.....	24
Annex ZA (informative) Relationship between this European Standard and the essential requirements of Regulation (EU) 2016/425 of the European Parliament and of the Council of 9 March 2016 on personal protective equipment aimed to be covered.....	26
Bibliography.....	28

## European foreword

This document (prEN 13138-4:2018) 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 document is currently submitted to the CEN Enquiry.

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

For relationship with EU Directives, see informative Annex ZA, which is an integral part of this document.

EN 13138, Buoyant aids for swimming instruction, consists of the following parts dealing with buoyant devices for swimming instructions for the various stages of the learning process:

- Part 1: Safety requirements and test methods for buoyant aids to be worn
- Part 2: Safety requirements and test methods for buoyant aids to be held
- Part 3: Safety requirements and test methods for swim seats
- Part 4: In-water performance testing of buoyant aids to be worn

[oSIST prEN 13138-4:2018  
https://standards.iteh.ai/catalog/standards/sist/385e0f9a-6ad4-4e9a-bf8c-24a430c00398/osist-pren-13138-4-2018](https://standards.iteh.ai/catalog/standards/sist/385e0f9a-6ad4-4e9a-bf8c-24a430c00398/osist-pren-13138-4-2018)

## Introduction

Over more than two decades of standardisation work in this field it was not possible to establish test methods to verify “Buoyant Aids for Swimming Instruction” with regard to their in-water performance. Do they provide help when learning to swim? Is a user supported in a way that he/she can adopt easily the optimal floating angle for chest strokes? Which type is best for what category of users? Do swimming devices prevent a passive user from sinking unstoppable to the ground? With regard to babies, infants and young children all this could only be estimated but never objectively measured. In-water tests were only possible with school kids and even here the behaviour of young children cannot be considered as “standard-test-method”-conform.

With the submission of prEN 13138-4:2018 these problems have been solved. All above mentioned crucial parameters can be measured objectively. The allocation of a type of swimming device to a user group – defined by body weight and body size – can be based on objective performance data. Tests gave prove: Due to their comparatively heavy heads babies and infants are the most demanding users. The centre of gravity – in particular when immersed – is positioned high on the body. They are “top-heavy”! More over there is little space on the tiny bodies to attach a swimming device above the immersed centre of gravity so that a positive torque can be applied to support the heavy heads. These problems diminish with increasing age/weight/body size. The increased body height stretches the space to attach swimming devices on the torso and lowers the centre of gravity. The influence of head weight in relation to bod weight gets lesser and lesser. A swimming device can be positioned near the chest and even belly area without losing the desired support when learning to swim.

The performance criterion of a swimming device is the floating angle achieved with a swimming device done. According to this standard this final floating angle is required to be 0° or above. Prevention from sinking is measured as freeboard at head. This freeboard is 0 mm or more. The performance unit is the so-called TLC (TURNING-LIFTING-CAPACITY) of a swimming device. It is measured in angle degrees and means that for the top heavy kids the device has to turn and to lift the body from a head downwards in-water positon to at least the horizontal. To reproduce the top heaviness of small kids the test manikins are calibrated to a negative sinking angle. Manikins representing older users are calibrated to only –10° and finally 0°. Here it matters most that the swimming device does not create a downwards torque. The natural sinking angle of older kids and adults is positive, i.e. they sink feet first.

The manikin tests specified in this standard end with the age/weight group of 6-7 years and 30 kg. From that size on human tests can be applied. The tests subjects are requested to behave like the manikins and simulate a passive user. Passive user? Learning process? Yes! A standard test method striving for objective and reproducible product related performance measurements has to eliminate subjective factors. Not the skills of a user to cope with a product can be measured but sole and purely the product properties and their performance data.

All test conditions simulate a worst case situation, i.e. a passive user. The manikin’s head however is immersed and receives buoyancy during all tests. In praxis children still have to struggle to generate sufficient dynamic buoyancy to keep the head above water and to move forwards. Swimming aids are no live preservers, they do not protect against drowning! But they help and give a certain protection without releasing the user from the efforts when learning to swim.

## 1 Scope

This European Standard specifies safety and performance requirements regarding the in-water behaviour of Buoyant aids for swimming instruction according to prEN 13138-1:2018. It specifies in-water test methods based on the application of test manikin as well as on human test subjects.

This document applies only in connection with prEN 13138-1:2018.

## 2 Normative references

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

prEN 13138-1:2018, *Buoyant aids for swimming instruction — Part 1: Safety requirements and test methods for buoyant aids to be worn*

## 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:

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <http://www.iso.org/obp>

### 3.1

#### **buoyancy**

resultant upthrust of a swimming device when totally submerged in fresh water with its uppermost part just below the water surface

### 3.2

#### **inherent buoyancy**

upthrust provided by material which is less dense than water or by sealed chambers that are not inflatable and are filled with air or gas

### 3.3

#### **buoyant aid for swimming instruction (in brief "swimming device")**

garment or device which when worn or held correctly will provide the buoyancy required to become familiar with movement through the water, assist with learning to swim or to improve swimming strokes

### 3.4

#### **minimum buoyancy**

least buoyancy required by the standard

### 3.5

#### **original buoyancy**

buoyancy provided by the complete device when first tested

**prEN 13138-4:2018 (E)****3.6****class A device**

buoyant device in which the child is in contact with the water positioned inside the buoyant structure so that it will keep the passive user in a stable floating position where the base of the chin is at or above the surface of the water.

Note 1 to entry: This device is intended to allow the user to become familiar with the water environment.

**3.7****class B device**

buoyant swimming device intended to be worn, to be securely attached to the body and to introduce the active user to the range of swimming strokes

**3.8****class C device**

device intended to be held either in the hands or by the body and to assist with swimming strokes and/or improving specific elements of the strokes

**3.9****device to be worn**

device having either inherent buoyancy or may be inflated to provide buoyancy and which is securely attached to the body in such a way that it cannot be accidentally removed and so as to provide the user with buoyancy

**iTeh STANDARD PREVIEW**  
**(standards.iteh.ai)**

**3.10****device to be held**

device held either in the hands or by the body and provides buoyancy whilst it is being held by the user

[oSIST prEN 13138-4:2018](https://standards.iteh.ai/catalog/standards/sist/385e0f9a-6ad4-4e9a-bf8c-24a430c00398/osist-pren-13138-4-2018)

**3.11****conditioning**

process to which the complete device shall be submitted that includes immersion in chlorinated swimming pool water and storage in cold and hot conditions and comprising a number of cycles, to simulate the conditions to which the device is likely to be subjected in normal use and storage

<https://standards.iteh.ai/catalog/standards/sist/385e0f9a-6ad4-4e9a-bf8c-24a430c00398/osist-pren-13138-4-2018>

**3.12****component**

sub group of the entire device which contributes to either buoyancy, function or safety

**3.13****swim seat**

buoyant device intended to introduce the user to the aquatic environment and to build water confidence as a pre-requisite to learning to swim.

Note 1 to entry: Swim seats provide safety for the user but do not guarantee protection against drowning.

Note 2 to entry: Swim seats are learning aids and should not be mistaken with aquatic toys as defined in EN 71-1.

**3.14****swim seat system**

all integrated components (parts) of a swim seat which contribute to stable floating conditions and to safety during normal use or after an emergency capsizing



**3.15****escape**

complete separation between the test dummy and the swim seat in case of a deliberate capsizing of the swim seat or swim seat system

**3.16****assessment panel**

group of three people who are appointed by a test house, all of whom are experienced in assessing buoyant swimming devices

**3.17****kick board**

buoyant device designed to be held in the hands or by the arms in order to support the body in the water to assist the user to improve swimming strokes

**3.18****Turning-Lifting-Capacity****TLC**

Turning-Lifting-Capacity of a swimming device is its capability to turn the user's body into a specified floating angle and to lift it to a level where the body floats at least just on equal level with the water surface or above

Note 1 to entry: It is expressed the angle between calibrated sinking angle and floating angle achieved by the device

iTeh STANDARD PREVIEW  
(standards.iteh.ai)

**3.19****sinking angle**

sinking angle is the angle to which a test manikin is intentionally calibrated when hung on its center of gravity and completely immersed under water.

standards/sist/385e0f9a-6ad4-4e9a-bf8c-24a430c00398/osist-pren-13138-4-2018

**4 Safety and performance requirements****4.1 General**

Swimming devices when correctly worn shall assist the active wearer in his/her attempts to learn to swim. The device shall support the immersed body in a way that it does not exert forces or torques which are counterproductive to the basic swimming techniques. If the active user becomes passive the swimming device shall prevent the user from sinking no further than just below the water surface. In order to satisfy this requirement the provision of the minimum buoyancy as specified in prEN 13138-1:2018 requires the correct fit and positioning to be adhered too. Safety and performance requirements as well as in-water testing in paragraphs 4.3 to 4.6 below have been specified.

All tests shall be performed in chest stroke position of the test manikin / human test subject and in calm fresh water. Depending of the type of swimming aid to be tested, manikins shall be fitted with the appropriate arm stumps as shown in Annex A, Figure A.1, Key number 1.

Test manikins as specified in Annexes A and B already provide the adequate residual functional lung volume and the required body posture.

If swimming aids of an equal design series cover more than one mass range only the lowest and highest mass range needs to be tested in order to meet the requirements for the entire series.

**4.2 Category of users, test manikins, human test subjects**

Safety and performance requirements as specified in Clause 5 shall be verified according the allocation of test manikin or human test subject to the appropriate swimming aid as specified in Table 1.

Table 1 — Category of user in combination of test manikin or human test subject

Category of user		Test manikin / human test subject / devices All types of swimming aids as specified in prEN 13138-1:2018
Age years	Mass range kg	
Up to 1	Up to 11	Apply test manikin I <sup>a</sup> according to prEN 13138-4:2018, Annex A
1 to 2	11 to 15	Apply test manikin II <sup>a</sup> according to prEN 13138-4:2018, Annex A
2 to 3	15 to 18	Apply test manikin III <sup>a</sup> according to prEN 13138-4:2018, Annex A Testing by extrapolation manikin II results according to 5.3.2 may be applied
3 to 6	18 to 30	Apply test manikin VII <sup>a</sup> according to prEN 13138-4:2018, Annex B
6 to 12	30 to 60	Apply human test subject 1 with a body mass of 50 kg to 60 kg with body mass index of 20 – 24
Over 12	Over 60	Apply human test subject 2 with a body mass of 60 kg to 80 kg with body mass index of 20 – 24
NOTE It is essential that the max value of the mass range corresponds to the weight of the test manikin / human test subject. The anthropometric definitions/settings cover a continuous subsequence including all ages / weight from year 1 to year 7 (10 kg to 30 kg) and manikins in these ranges can be needed for special applications.		
<sup>a</sup> Swimming devices are classified for user groups. Testing aims to consider the lowest and highest category of users not intermediate users.		

### 4.3 Prevention from sinking

With the swimming aid correctly fitted to the appropriate test manikin or human test subject it shall be shown that the manikin / body is prevented from sinking further than just underneath/on the water surface (equal level). Testing shall be performed in accordance with 5.2 or 5.3 and Annex C.

### 4.4 Flotation angle (horizontal, vertical)

With the swimming aid correctly fitted to the appropriate test manikin or human test subject it shall be shown that the manikin / human body takes an in-water position which is from horizontal to vertical, feet down. There shall be no forces causing the manikin or test subject to rotate on the longitudinal axis from the initial chest down to a chest up (or supine) or head down position. Testing shall be performed in accordance with 5.2 or 5.3 and Annex C.

### 4.5 Displacement of the device on the body

With the swimming aid correctly fitted to the appropriate test manikin or human test subject it shall be shown that after all of the specified movements in the water according to 5.4 the swimming aid has not become displaced to a degree that a floating angle between horizontal to vertical, feet down, can no longer be maintained.

### 4.6 Retention of function after failure of an air chamber

The failure of the air chamber most likely to cause failure shall not cause sinking of the manikin / test subject. Swimming aids made from inherent buoyant material are exempted from this requirement.

## 5 Testing

### 5.1 Test methods

The following methods are specified:

- Free floating manikins: see Annex C for in-water testing manikins by measuring and visual inspection;
- Underwater Photography/Video for human subjects (borderline cases or if results are not clear).

### 5.2 Test procedure with a human test subject

For testing purposes the human test subjects shall don the swimming aid correctly and enter the water in an upright posture until sufficient water depth is reached to perform the test and prevent the feet from touching the pool basin floor when floating passively. Arms shall be held down against the sides of the torso. Breathing shall be stopped after the last exhalation. When the passive body achieves full buoyancy the influence of the swimming device to the human body shall be verified. This should take between 5 s and 10 s.

When using human subjects, if a test result is not clear, underwater photography/video shall be used so that a reliable measurement of all specified angles, longitudinal angle and horizontal angle can be obtained. The reference lines of the test manikin/human test subject are the spine and the shoulder axis.

NOTE Some people float with the hips and buttocks near the surface, forcing the head down. This needs to be taken into account when choosing live subjects to ensure that they fit within the criteria in Table 1.

### 5.3 Test procedure with free floating manikin (see Annex C)

[oSIST prEN 13138-4:2018](https://standards.iteh.ai/catalog/standards/sist/385e0f9a-6ad4-4e9a-bf8c-24a430c00398/osist-pren-13138-4-2018)

#### 5.3.1 General <https://standards.iteh.ai/catalog/standards/sist/385e0f9a-6ad4-4e9a-bf8c-24a430c00398/osist-pren-13138-4-2018>

After having the relevant manikin calibrated for the use in water and the specified sinking angle (see Table B.3) the test procedure shall be as specified below:

- a) Attach swimming device to be tested to the relevant manikin according to manufacturer's instructions.
- b) Attach measuring devices at head and feet.
- c) Lower test manikin horizontally down until it floats freely.
- d) Wait until residual air has escaped.
- e) Check whether:
  - the manikin is prevented from sinking (freeboard  $\geq 0$ );
  - the manikin's flotation angle in longitudinal direction is as required, see 5.4 (floating angle  $\geq 0^\circ$ );
  - the swimming device shall not be displaced when the manikin is moved, see 5.4;
  - flotation angle after failure of the air chamber most likely to cause failure is as required, see 5.5;
- f) Measure the floating angle and determine the TLC (Turning-Lifting-Capacity according to 5.3.2 and Annex C, Figure C.1).

**prEN 13138-4:2018 (E)**

NOTE It is important that the weight of the measuring devices does not falsify the floating angle. Compensation by calibration.

**5.3.2 Testing by extrapolation of Turning-Lifting-Capacity (TLC) from manikin II to manikin III**

Swimming devices intended for the user range 18...30kg (test manikin III) can be tested by using manikin II and extrapolating the TLC achieved with this manikin to the required floating angle of manikin III.

When tested in accordance with Annex C the TLC-angle  $x^\circ$  measured with manikin II shall be equal or greater than 1,8 x the calibrated sinking angle of manikin III, ( $\beta = -10^\circ$ ) the swimming device has met the requirement for manikin III.

$$x^\circ \geq 1,8 \times \beta^\circ (x^\circ \geq 18^\circ, \text{ see Figure C.1})$$

NOTE It is proven fact, that with growing age (body size, position of body centre of gravity) the task of a swimming device to support the human body in a favourable position to facilitate learning to swim becomes continuously easier. Tests gave prove that all types of swimming devices achieve a minimum TLC-angle  $x$  of  $20^\circ$  when testes with manikin II and  $-25^\circ$  sinking angle. Therefore the extrapolation approach is justified.

**5.4 Testing for displacement of the device on the body**

Testing shall be performed as specified in 5.2 or 5.3. If a stable floating position has been achieved the test manikin / test subject shall be moved by external force, in the following order: 1; 2; 3. Where testing is conducted with inflatable devices, these should be fully inflated.

- Test 1:  $45^\circ$  feet down from the position achieved in the water;
- Test 2:  $45^\circ$  head down from the position achieved in the water;
- Test 3:  $45^\circ$  to the right and left around the torso's longitudinal axis.

**5.5 Test method for retention of function after failure of an air chamber**

Testing shall be performed as specified in 5.2 or 5.3 but with the air chamber most likely to cause failure deflated.