TCD 880-9:2026
ICS: 13.340.70

DRAFT ZANZIBAR NATIONAL STANDARD

Personal flotation devices — Part 9: Evaluation

DRAFT FOR PUBLIC COMMENT

ZANZIBAR BUREAU OF STANDARDS

©ZBS 2026 - All rights reserved
First edition

Foreword

This Draft Zanzibar National Standard has been prepared by Textiles and Leather Standards Technical Committee (TCC3). In accordance with the Zanzibar Bureau of Standard general procedures, this draft standard is here by presented to the public in order to receive any technical comment concerns.

The ZBS was established under the Standard Act No. 1 of 2011.

In the preparation of this Standard, the reference was made to the following sources:

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

Technical Committee Representatives

This Draft Zanzibar National Standard was prepared by Textiles and Leather Standards Technical Committee (TCC3) which consists of representatives from the following organizations:

Chief Government Chemist Laboratory Agency (CGCLA)
College of Engineering and Technology (CoET)
Lumumba Regional Hospital
Special Department Industrial Unit (SPEDIU)
The State University of Zanzibar (SUZA)
Zanzibar National Chamber of Commerce (ZNCC)
Zanzibar Food and Drug Agency (ZFDA)
Zanzibar Fisheries and Marine Resources Research Institute (ZAFIRI)
Zanzibar Bureau of Standards (ZBS) – Secretariat

Zanzibar Bureau of Standards (ZBS)
PO Box 1136
Zanzibar
Tel: +255 24 2232225
Fax: +255 24 2232225
E-mail: info@zbs.go.tz
Web: www.zbs.go.tz

DRAFT FOR PUBLIC COMMENT

Personal flotation devices — Part 9: Evaluation

1 Scope

This document specifies the processes for evaluation of personal flotation devices for fulfilment of the requirements in ZNS 840-2 to ZNS 840-6, with which this document is intended to be used.

The classification of PFDs used in the ZNS 840 series is given in Annex A for information.

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 139:2005+Amd.1:2011, *Textiles — Standard atmospheres for conditioning and testing*

ISO 2768-1, *General tolerances — Part 1: Tolerances for linear and angular dimensions without individual tolerance indications*

ISO 3386-1:1986+Amd.1:2010, *Polymeric materials, cellular flexible — Determination of stress-strain characteristics in compression — Part 1: Low-density materials*

ISO 12401, *Small craft — Deck safety harness and safety line — Safety requirements and test methods*

ZNS 840-2, *Personal flotation devices — Part 2: Lifejackets, performance level 275 — Safety requirements*

ZNS 840-3, *Personal flotation devices — Part 3: Lifejackets, performance level 150 — Safety requirements*

ZNS 840-4, *Personal flotation devices — Part 4: Lifejackets, performance level 100 — Safety requirements*

ZNS 840-5, *Personal flotation devices — Part 5: Buoyancy aids (level 50) — Safety requirements*

ZNS 840-6, *Personal flotation devices — Part 6: Special purpose lifejackets and buoyancy aids — Safety requirements and additional test methods*

ZNS 840-7, *Personal flotation devices — Part 7: Materials and components — Safety requirements and test methods*

ZNS 840-8, *Personal flotation devices — Part 8: Accessories — Safety requirements and test methods*

3 Terms and definitions

For the purposes of this draft standard, 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

DRAFT FOR PUBLIC COMMENT

 ©ZBS 2026 - All rights reserved

3.2
inherently buoyant
permanently less dense than water

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

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

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

3.6
PFD with secondary donning
PFD for which additional donning or adjustment is needed to place the PFD in its functioning position from the position it is normally worn

3.7
vest-type PFD
PFD covering the upper trunk of the user like a vest

3.8
yoke-type PFD
PFD in a style worn around the back of the neck and secured by a waist strap

3.9
buddy line
length of cord which can be tied or otherwise fixed to another person or to that person's *PFD* 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

3.10
lifting loop
device which facilitates manual recovery of a person from water

3.11
whistle
device which, when blown by mouth, produces an audible sound which can aid in the location of the user

3.12
hybrid PFD
PFD of combined buoyancy types, i.e. inherent and inflatable

3.13
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

DRAFT FOR PUBLIC COMMENT

3.14
offshore
water that is unprotected and influenced by threat conditions such as waves, tide, currents or wind at sea or on inland waters

3.15
primary means of inflation
means of inflating an inflation chamber that meets the applicable PFD 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)

3.16
primary chamber
inflation chamber associated with the *primary means of inflation* that alone meets the applicable *PFD* performance requirements

3.17
back-up chamber
inflation chamber other than the *primary chamber(s)* or *supplemental chamber* that, when used alone, provides performance in case the primary chamber fails to function

3.18
supplemental chamber
inflation chamber other than a primary chamber or back-up chamber 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

3.19
status indicator
part or parts of an inflation system which provide user feedback to assist in keeping an inflatable PFD in an armed and ready condition

3.20
adult lifejacket
PFD intended for users with a body mass greater than 40 kg

3.21
infant lifejacket
lifejacket intended for users with a body mass less than or equal to 15 kg

3.22
child lifejacket
lifejacket intended for users with a body mass greater than 15 kg and less than or equal to 40 kg

3.23
child buoyancy aid
buoyancy aid intended for users with a body mass greater than 25 kg and less than or equal to 40 kg

3.24
collar handle
device on the upper back of a *PFD* which facilitates getting hold of the wearer

3.25
test panel
group of persons, experienced in testing *PFDs*, who observes the *test subjects* undergoing the tests

DRAFT FOR PUBLIC COMMENT

 ©ZBS 2026 - All rights reserved

3.26
test subject
human selected to be an integral part of a test

4 Classification of personal flotation devices

An overview of this classification is given in Annex A for information.

5 Test methods

5.1 General

PFDs/devices that aim to fulfil the requirements and essential requirements of ZNS 840-2 to ZNS 840-6 shall pass the applicable procedures and sequences as specified in the following order in this part.

Unless otherwise specified, a new sample of the PFD to be tested may be used for each of the tests.

The tests shall be performed in a sequence in accordance with Table 1 for inherently buoyant PFDs and Table 2 for inflatable PFDs. The temperature cycling test in 5.5.3 and the rotating shock bin test in 5.5.2 shall be carried out prior to all other tests.

A combination of a PFD and accessories shall not impair the performance of either item. This shall be proved by testing the PFD and accessories in combination. If necessary, the test sequence has to be arranged accordingly. Requirements and test methods for accessories are specified in ZNS 840-8.

The human subject performance tests shall be carried out under the direction of a test panel. The test panel shall consist of 2 persons.

If there is any question about the performance observed, the test shall be repeated with an additional person. The panel is to be qualified by having experience of observing or conducting the specific test (see Note 1) on at least 3 occasions.

> NOTE 1 Specific test means, for instance, that experience with stability testing would not qualify for self-righting testing or that experience with self-righting testing of inherently buoyant PFDs would not qualify as experience with similar testing of inflatable PFDs.
>
> NOTE 2 It is recommended that the test panel have at least one member regularly participating in experience exchanges and round robin tests.

5.2 Sampling and conditioning

5.2.1 Sampling

One sample of each size of the device to be tested shall be provided, unless otherwise specified in this document.

5.2.2 Conditioning

Prior to testing, the samples shall be conditioned for (24 ± 0.1) h under the appropriate standard atmosphere as defined in ISO 139:2005+Amd.1:2011 according to the specific fabric used for the PFD.

If testing under wet conditions is required, the sample shall be soaked for (5 ± 1) min in fresh water or as specified by the test procedure itself.

5.3 Criteria

All required samples of the PFD shall pass all tests specified in 5.5 for the entire device to meet the requirements of the relevant parts of the ZNS 840 series.

DRAFT FOR PUBLIC COMMENT

5.4 Magnetic properties testing

Place a direct-reading magnetic compass in an undisturbed magnetic area (i.e. an area in which magnetic items and direct current electrical cables are not continually moved or switched). Check the compass to ensure that it has negligible pivot friction. This can be done by deflecting the compass card by 10° by means of a magnet and then removing the deflecting force, when the card should return to within 0.5° of its original position.

Present all metal components (with any hooks closed) individually to the compass on an approximately east-to-west line, to a position where the nearest point of the component is (500 ± 10) mm horizontally from the centre of the compass. Lightly tap the compass to eliminate the effect of friction. Record the angle, in degrees, of any deflection of the compass from its position before the metal components were brought near the compass.

5.5 Mechanical properties tests

5.5.1 General

The mechanical properties of the PFD shall be tested to determine if the device:

a) provides resistance against wear and tear;
b) remains functional after extreme temperatures;
c) remains functional after external loads are applied; and
d) remains functional after exposed to flames.

The mechanical properties tests shall be conducted in the sequence in accordance with Table 1 or Table 2 on device(s) of the required size(s). The samples in Tables 1 and Table 2 shall follow the test sequence defined.

Table 1: Property tests for inherently buoyant PFDs

Tests	Samples			
	A[a]	B[b]	C[c]	D[b]
5.5.3 Temperature cycling test	X	X	X	X
5.5.2 Rotating shock bin test	X	X	X	X
5.5.4 Horizontal load test		X	X	
5.5.4 Vertical load test		X	X	
5.5.5 Lifting loop test		X[d]		
5.5.6 Buddy line test		X[d]		
5.5.7 Collar handles		X[d]		
5.5.8 Body strap hardware secureness test		X[d]		
5.5.10 Measurement of buoyancy of the whole device	X			
5.5.12 Buoyancy test for inherently buoyant material[e]	X			
5.5.13 Test of the resistance to burning			X	
5.5.15 Strength test of attachment points				X

DRAFT FOR PUBLIC COMMENT

©ZBS 2026 - All rights reserved

[a] For each size.
[b] This sample shall be the smallest size for end user mass group.
[c] This sample shall be the largest size for each user group.
[d] A different sample is allowed to be used for this test; however, the samples shall be tested in accordance with 5.5.2 and 5.5.3 prior to testing.
[e] This buoyancy test is only applicable for PFDs where the inherently buoyant material is qualified according to ZNS 840-7, 4.8.2.5

Table 2: Property tests for inflatable PFDs

Tests	Samples			
	A[a]	**B**[b]	**C**[c]	**D**[b]
5.5.3 Temperature cycling test	X	X	X	X
5.5.2 Rotating shock bin test	X	X	X	X
5.5.4 Horizontal load test		X		
5.5.4 Vertical load test		X	X	
5.5.5 Lifting loop test		X[d]		
5.5.6 Buddy line test		X[d]		
5.5.7 Collar handles		X[d]		
5.5.8 Body strap hardware secureness test		X[d]		
5.5.14 Over-pressure test			X	
5.5.11 Uninflated buoyancy test	X			
5.5.10 Measurement of buoyancy of the whole device	X			
5.5.9 Inflation tests		X		
5.5.16 Test of the resistance to inadvertent inflation		X		
5.5.13 Test of the resistance to burning			X	
5.5.15 Strength test of attachment points				X[d]

[a] For each size.
[b] This sample shall be the smallest size for each user mass group.
[c] This sample shall be the largest size for each user group.
[d] A different sample is allowed to be used for this test, but the samples shall be submitted to 5.5.2 and 5.5.3 prior to testing.

DRAFT FOR PUBLIC COMMENT

5.5.2 Rotating shock bin test

5.5.2.1 Principle

The PFD shall provide a resistance against wear and tear.

The test shall be conducted after the temperature cycling test in 5.5.3 for all samples prior to conducting any other property tests.

The PFD shall meet the requirements in the relevant product standard after being submitted to this test.

5.5.2.2 Apparatus

The equipment used shall be that shown in Figure 1 and consist of a box 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 Figure 1 and permit the bin to be rotated freely.

5.5.2.3 Procedure

The PFDs specified by Tables 1 or 2 shall be exposed to this test in the condition ‘ready for use’. Buckles shall be closed, and webbing straps shall not be tightly wrapped around the device. Inflatables shall be packed and armed.

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 min^{-1}.

On completion of the rotations without any readjustment, the specimen shall be removed and inspected for any damage that would affect the function of the device.

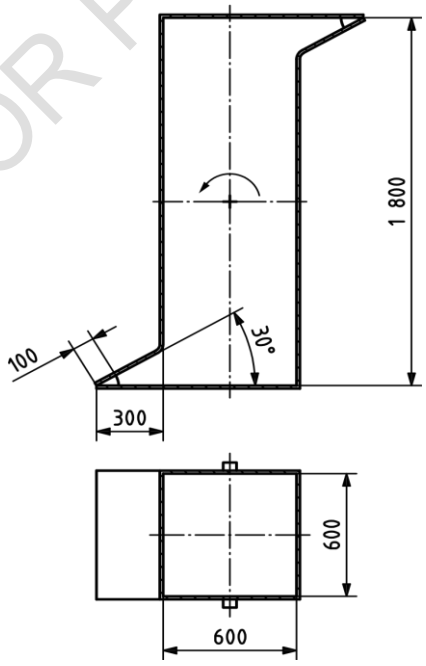
In addition, if inflatable, the device shall be inflated, without any adjustment, then allowed to rest for (5.0 ± 0.1) min, after which it shall be examined for damage and checked for leaks under water.

The appropriate performance test(s) according to the relevant performance level and according to Table 1 or Table 2 shall be performed. Any damage or dislodging shall be reported if detected.

Check whether any damage, dislodging, loosening of gas cylinders and/or leakage were observed.

For an inflatable device, check whether any status indicators maintain a positive indication. Check whether the gas cylinder has been loosened or dislodged.

Dimensions in millimetres



NOTE: In this figure, dimensions are identical once rotated 180° on its central axis.

Figure 1: Design of rotating shock bin apparatus

DRAFT FOR PUBLIC COMMENT

©ZBS 2026 - All rights reserved

5.5.2.4 Results

Report whether any damage, dislodging, loosening of threads and/or leakage were observed and which functional tests were performed including the results.

For an inflatable device, report whether any status indicators maintain a positive indication. Report whether the gas cylinder has been loosened or dislodged.

5.5.3 Temperature cycling test

5.5.3.1 Principle

The PFD shall remain functional after exposure to extreme temperatures.

This test is to simulate extreme storage temperatures and is not an indication of performance temperatures.

This test shall be conducted for all samples prior to conducting any other property tests.

5.5.3.2 Procedure

5.5.3.2.1 Inherently buoyant PFDs

The PFDs specified by Table 1 shall be exposed to this test with buckles closed but not tightened or wrapped around.

Each sample shall be alternately subjected for 8 h to surrounding temperatures of (–30 ± 2) °C and (60 ± 2) °C. These alternating cycles need not follow immediately after each other and the following procedure, repeated for 10 cycles, is acceptable:

a) An 8 h cycle at (60 ± 2) °C is to be completed in one day. The samples are to be removed from the warm chamber that same day and left exposed under ordinary room conditions until the next day.

b) An 8 h cycle at (−30 ± 2) °C is to be completed the next day. The samples are to be removed from the cold chamber that same day and left exposed under ordinary room conditions until the next day.

At the conclusion of the final 8 h cycle at (60 ± 2) °C and the final 8 h cycle at (−30 ± 2) °C, one sample shall be removed and fully opened to simulate donning within 30 s after removal from the chamber.

Record whether the PFD shows signs of damage such as shrinking, cracking, swelling, dissolution or change of mechanical qualities.

5.5.3.2.2 Inflatable PFDs

The PFDs specified by Table 2 shall be exposed to this test in the condition “ready for use”. Buckles shall be closed, and webbing straps shall not be tightly wrapped around the device. The PFDs shall be packed and armed.

For automatic inflatable PFDs, two samples shall be subjected to the temperature cycling test in the uninflated condition and shall then be externally examined.

For manual only inflatable PFDs, one sample shall be subjected to the temperature cycling test in the uninflated condition and shall then be externally examined.

DRAFT FOR PUBLIC COMMENT

Each sample shall be alternately subjected for 8 h to surrounding temperatures of (−30 ± 2) °C and (60 ± 2) °C. These alternating cycles need not follow immediately after each other and the following procedure, repeated for 10 cycles, is acceptable. The automatic and manual inflation systems, as applicable, shall each be tested immediately at the conclusion of the final temperature cycling test for the high and low temperature as follows:

a) After the final high temperature cycle at (60 ± 2) °C, the inflatable PFDs are removed from the warm chamber. One shall be activated using the automatic inflation system (for automatic PFDs) by placing it in sea water at a temperature of (30 ± 2) °C and one shall be activated using the manual inflation system. The samples shall then be suitably dried, rearmed and repacked in accordance with the manufacturer's instructions and exposed to the final low temperature cycle.

b) After the final low temperature cycle at (–30 ± 2) °C, the inflatable PFDs are removed from the cold chamber. One shall be activated using the automatic inflation system (for automatic PFDs) by placing it in sea water at a temperature of (-1^{+2}_{0}) °C and one shall be activated using the manual inflation system.

Record whether the inflatable PFD shows signs of damage such as leaking, shrinking, cracking, swelling, dissolution or change of mechanical qualities. For automatic and manual inflation, record whether inflation is successful.

5.5.3.3 Results

After the completion of the temperature cycling test, the PFDs shall be examined for any damage resulting in functional damage of the PFD.

5.5.4 Horizontal and vertical load tests

5.5.4.1 Principle

The PFD shall be subjected to tension via its integral structure, such as a waist belt or harness arrangement, by means of a specified load. The tests shall be carried out in the following order and be applied to the same PFD sample:

a) horizontal load test wet;

b) vertical load test wet.

5.5.4.2 Apparatus

The apparatus consists of a horizontally suspended upper cylinder, of diameter (50 ± 5) mm for PFD user masses less than 40 kg, or of diameter (125 ± 10) mm for PFD user masses of 40 kg and above, to which the PFD is fitted. The length of the test cylinder shall be sufficient to accommodate the full width of the portion of the PFD under test.

For the horizontal load test shown in Figures 3 and 4, an additional lower test cylinder of similar size to the upper cylinder shall be placed in the PFD in the position indicated. The axes of the upper and lower cylinders shall be regarded as the datum positions A1-A2 and B1-B2, respectively, shown in Figures 3 and 4.

For the vertical load tests shown in Figures 5 and 6, the lower apparatus shall have the dimensions as indicated in Figures 7 and 8. The diameter of the tube shown in Figure 7 shall be (50 ± 10) mm for PFD user masses less than 40 kg and (125 ± 10) mm for user masses of 40 kg and above.

For all load tests, any load from the test fixtures applied to the device shall be included in the test load.

DRAFT FOR PUBLIC COMMENT

 ©ZBS 2026 - All rights reserved

NOTE: Other test arrangements can be used, i.e. by means of a hydraulic jig, if the load is maintained and the same accuracy of results can be achieved.

5.5.4.3 Procedure

5.5.4.3.1 General

The webbing or movable part of the assembled PFD shall be marked at each point of adjustment prior to application of each test load. This includes tie tapes, draw cords, and lacing, as well as webbing hardware adjustments. Except for hardware closures on buoyancy aids, the tests shall be repeated on each closure independently. For buoyancy aids, all closures shall be fastened and adjusted to the midrange to approximate even loading.

5.5.4.3.2 Horizontal load test

The PFD shall be fitted to the upper test cylinder, in the manner shown in Figure 3 for yoke-type PFDs or Figure 4 for vest-type PFDs. If inflatable, it shall be tested both when un-inflated and when inflated by its primary means of inflation; the sample shall be inflated by its primary means of inflation (30 ± 5) min prior the test being carried out. The PFD shall be attached to the cylinders such that all adjustment devices are tested.

The lower test cylinder shall be fixed in the appropriate positions shown in Figures 3 and 4. The specified load shall be added and the test arrangement shall be adjusted such that the axes A_1-A_2 and B_1-B_2 of the upper and lower test cylinders are substantially parallel and horizontal. Apply the test load steadily until the PFD is hanging freely without jerking and maintain the test load for the specified period.

5.5.4.3.3 Vertical load test

The PFD shall be fitted to the upper test cylinder, in the manner shown in Figure 5 for yoke-type PFDs or Figure 6 (a or b) for vest-type PFDs.

If inflatable, it shall be tested both when un-inflated and when inflated by its primary means of inflation; the sample shall be inflated by its primary means of inflation (30 ± 5) min prior the test being carried out.

For yoke-type PFDs, adjust the harness to fit the manikin according to Figure 5. For vest-type PFDs, fasten the PFD in such a way that any adjustment devices are tested. Attach the load suspension cord to the PFD in the appropriate positions shown in Figure 6 a) or b). Apply the test load steadily without jerking. Maintain the test load for the specified period.

5.5.4.4 Results

The PFD shall be examined for any failures resulting in functional damage. Measure and record any adjustment device slippage. For inflatables, the PFD shall be checked for leakage.

5.5.5 Lifting loop test

5.5.5.1 Principles

The lifting loop on the PFD shall be subjected to tension via its integral structure by means of a specified load.

DRAFT FOR PUBLIC COMMENT

5.5.5.2 Apparatus

The apparatus consists of a sized dummy, appropriate for the device tested, such as that shown in ISO 12401:2009, 5.2.2.2, or the appropriately sized test form (see Figure 8) and a cylinder of (50 ± 5) mm in diameter.

For all load tests, any load from the test fixtures applied to the device shall be included in the test load.

> NOTE: Other test arrangements may be used, e.g. by means of a hydraulic jig, if the load is maintained and the same accuracy of results can be achieved.

5.5.5.3 Procedure

All PFDs equipped with a lifting loop shall be soaked in fresh water for a period of 5 min. The PFD shall then be fitted to the appropriate test dummy or the test form in Figure 8 according to the manufacturer's donning and adjustment instructions. If inflatable, the lifejacket shall be inflated prior to load application.

Then apply the loads F_1 or F_2, which include the weight of the dummy or test form (see Figure 2), to the lifting loop using the lower attachment point of an appropriately sized dummy such as that shown in ISO 12401:2009, 5.2.2.2, or the appropriately sized test form (Figure 8). Lift the dummy or test form by means of a cylinder of (50 ± 5) mm in diameter, which is put through the loop without jerking until it is suspended freely. The dummy or test form may be modified to prevent the device from slipping off of the neck projection if needed for a valid test.

Maintain the load for the time specified in 5.5 of the relevant part of the ZNS 840 series.

5.5.5.4 Results

The device shall support the load required for the duration required by the relevant part. At the conclusion of the procedure, the device shall be examined by visual inspection for physical damage that would likely prevent it from functioning as intended such as broken hardware, torn fabric, foam relocation and ruptured seams.

5.5.6 Buddy line test

5.5.6.1 Principle

The buddy line on the PFD shall be subjected to tension via its integral structure by means of a specified load.

5.5.6.2 Apparatus

The apparatus consists of an appropriately sized dummy such as that shown in ISO 12401:2009, 5.2.2.2, or the appropriately sized test form (see Figure 8). The dummy or test form may be modified to prevent the device from slipping off of the neck projection if needed for a valid test.

For all load tests, any load from the test fixtures applied to the device shall be included in the test load.

> NOTE: Other test arrangements can be used, e.g. by means of a hydraulic jig, if the load is maintained and the same accuracy of results can be achieved.

5.5.6.3 Procedure

If a buddy line is attached to a PFD, a load of (750 ± 10) N, which includes the weight of the dummy or test form, shall be applied for (1.0 ± 0.1) min. The load is then to be increased until the buddy line separates, or until a total load of 1 500 N is reached. The loads shall be applied perpendicular to the PFD, whilst the PFD is fitted to an appropriately sized dummy such as that shown in ISO 12401:2009,

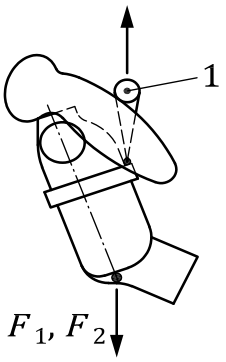
DRAFT FOR PUBLIC COMMENT

 ©ZBS 2026 - All rights reserved

5.2.2.2, or the appropriately sized test form (see Figure 8). When necessary to keep the dummy or test form from becoming unstable during the test, due to the location of the buddy line, the dummy or test form shall be supported appropriately.

5.5.6.4 Results

Report if the buddy line remained attached to the PFD, without damage to the PFD, after the (750 ± 10) N load was applied for (1.0 ± 0.1) min. Also report if the buddy line become detached after the load of at least 750 N and less than 1 500 N was applied. If the buddy line became detached, report if there was damage to the PFD such as relocation of foam.



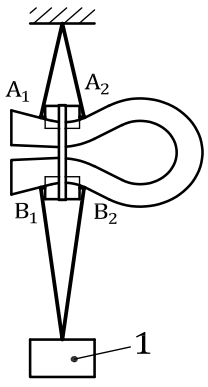
Key

1 buddy line

F_1 load for adult size (according to 5.5 in the relevant part of the ZNS 840 series, mass of the dummy included)

F_2 load for child size (according to 5.5 in the relevant part of the ZNS 840 series, mass of the dummy included)

Figure 2 — Test dummy



Key

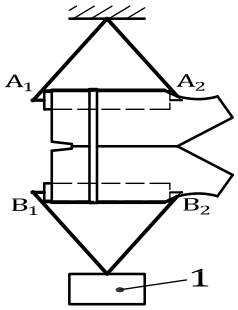
1 test load

A_1, A_2 upper test cylinder

B_1, B2 lower test cylinder

Figure 3: Horizontal load test of yoke-type PFD

DRAFT FOR PUBLIC COMMENT



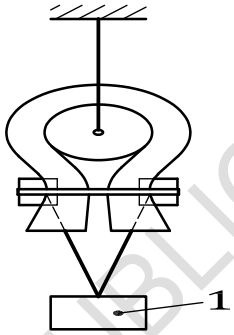
Key

1 test load

A_1, A_2 upper test cylinder

B1, B2 lower test cylinder

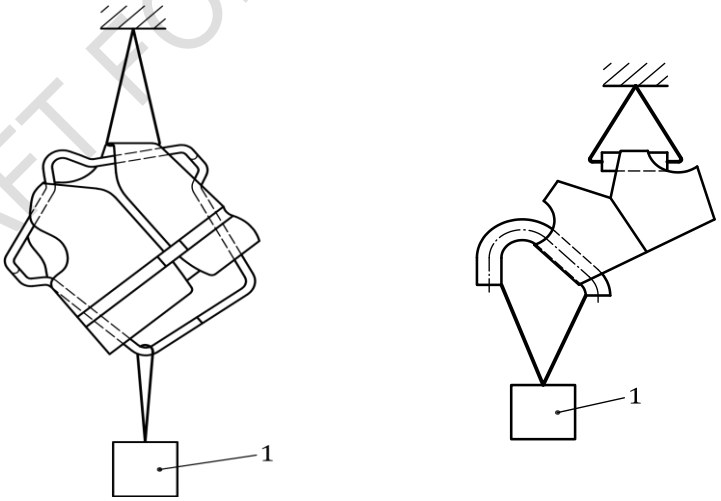
Figure 4: Horizontal load test of vest-type PFD



Key

1 test load

Figure 5: Vertical load test of yoke-type PFD



a) Test frame **b) Bent tube**

Key

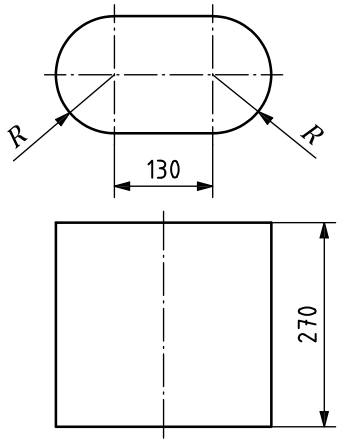
1 test load

Figure 6 — Vertical test of vest-type PFD

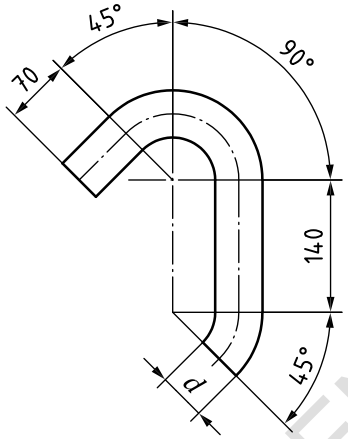
DRAFT FOR PUBLIC COMMENT

 ©ZBS 2026 - All rights reserved

Dimensions in millimetres



a) Body



b) Bent tube

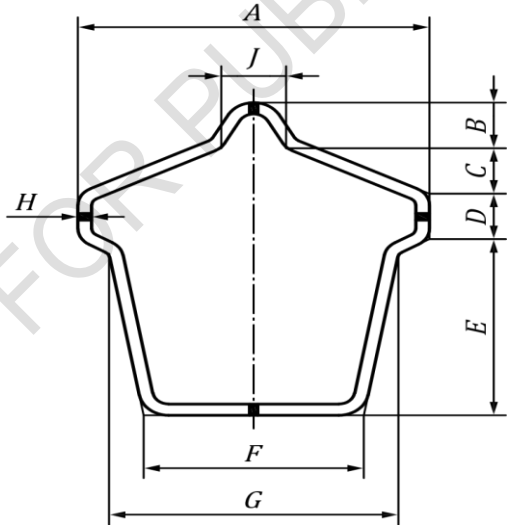
Key

R 155 mm

d (125 ± 10) mm for adult size, (50 ± 10) mm for child size

Figure 7: Body and bent tube for vertical load test, general tolerances according to ISO 2768-1:1989, tolerance class 'v'

Dimensions in millimetres



Key

Size	A	B	C	D	E	F	G	H	I
Adult	610	114	76.2	127	381	432	508	25.4	178
Child	508	102	76.2	102	279	330	406	22.2	152
Infant	305	63.5	38.1	63.5	191	203	241	19.1	76.2

Figure 8: Test form for vertical load test, lifting loop and buddy lines general tolerances according to ISO 2768-1:1989, tolerance class "v"

DRAFT FOR PUBLIC COMMENT

5.5.7 Collar handles

5.5.7.1 Principle

The collar handle on the PFD shall be subjected to tension via its integral structure by means of a specified load.

5.5.7.2 Apparatus

The apparatus consists of the appropriately sized test form (see Figure 8) and a 50 mm wide strap having a 6 mm thick foam covering or a horizontally suspended cylinder of diameter (50 ± 5) mm.

For all load tests, any load from the test fixtures applied to the device shall be included in the test load.

NOTE: Other test arrangements can be used, e.g. by means of a hydraulic jig, if the load is maintained and the same accuracy of results can be achieved.

5.5.7.3 Procedure

The PFD shall be fitted to an appropriate test form to suspend the PFD vertically in the inverted position. A 50 mm wide strap having a 6 mm thick foam covering or a horizontally suspended cylinder of diameter (50 ± 5) mm, shall be passed through the collar handle strap and the vertical test load specified. The test load shall be raised slowly until supported by the collar handle strap.

Maintain the load for (5 ± 0.1) min.

5.5.7.4 Results

Report if the collar handle remained attached to the PFD, without damage to the PFD such as relocation of foam. Any damage shall be reported.

5.5.8 Body strap hardware secureness test

5.5.8.1 Principle

The principle is to determine whether hardware necessary for the performance of the device does not disengage.

NOTE: This test only applies to the hardware that is not mechanically attached to either the device, webbing or lacing.

5.5.8.2 Procedure

With the retention means on the webbing (or the lacing) located as close as possible to the rigidly mounted adjustable hardware, the suspended webbing shall be tensioned with a force of (90 ± 5) N and applied to the end of webbing at rate that disallows an impact force, see Figure 9.

The hardware may be tested at an angle different than perpendicular to the force, if it is determined that it produces more slippage through the hardware.

If a T-tab construction is used, the tab shall be placed against the webbing to allow for a greater possibility of unthreading, as shown in Figure 9.

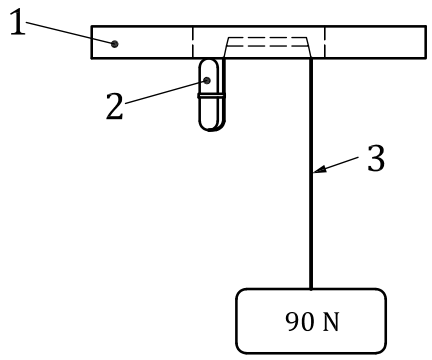
5.5.8.3 Results

Report if the free end completely separates from the hardware.

Hardware shall be rigidly mounted

DRAFT FOR PUBLIC COMMENT

 ©ZBS 2026 - All rights reserved



Key

1 hardware
2 retention means
3 webbing, test load 90 N

Figure 9 — Hardware secureness test configuration

5.5.9 Inflation tests

5.5.9.1 Principle

These tests shall be conducted to ensure that the PFD achieves the required buoyancy and distribution through the chamber within the required time and that the inflator fires within the required load range

5.5.9.2 Apparatus

The apparatus consists of the appropriately sized test form (see Figure 8).

NOTE: Other test arrangements can be used, if the same accuracy of results can be achieved.

5.5.9.3 Procedure

For automatic and manual PFDs, the inflation tests shall be carried out twice; once at (+30 ± 1) °C and once at (−5 ± 1) °C in accordance with a) and b) below.

For automatic PFDs, an additional inflation test at (0 ± 1) °C shall be carried out using fresh water as the means of automatic activation in accordance with c) below.

a) Two inflatable PFDs shall be conditioned by exposing them for (5.0 ± 0.1) h at a temperature of (−5 ± 1) °C. The two inflatable PFDs shall then be inflated. One shall be activated using the automatic inflation system by placing it in sea water at a temperature of (−1 ± 2) °C and the other shall be activated using the manual inflation system. The samples shall then be suitably dried, re-armed and repacked in accordance with the manufacturer's instructions.

b) The two inflatable PFDs shall then be conditioned by exposing them for (5.0 ± 0.1) h at a temperature of (+30 ± 1) °C. The two inflatable PFDs shall then be inflated. One shall be activated using the automatic inflation system by placing it in sea water at a temperature of (+30 ± 2) °C and the other shall be activated using the manual inflation system.

c) For automatically inflated PFDs one inflatable PFD shall then be suitably dried, re-armed and repacked in accordance with the manufacturer's instructions and further conditioned by exposing it for (5.0 ± 0.1) h to an air temperature of (0 ± 1) °C. The sample shall be activated using the automatic inflation system by placing it in fresh water at a temperature of (0 ± 2) °C.

DRAFT FOR PUBLIC COMMENT

d) One inflatable PFD shall be placed securely on a test form. A force starting at 13 N shall be applied to the pull toggle in the correct direction to activate the inflation mechanism. The force shall be increased steadily until the inflation mechanism activates or 120 N is reached.

5.5.9.4 Results

For 5.5.9.3, a), b) and c): After firing the inflation mechanism, observe and record whether the inflated PFDs achieve sufficient buoyancy specified by Table 2 of the relevant part of the ZNS 840 series, including correct distribution through the chambers, within the time required in the relevant part of the ZNS 840 series. The time from immersion until initiation of inflation in automatic mode shall be reported.

For 5.5.9.3, d): When manually fired record whether the inflation mechanism activates between 13 N and 120 N pulling force.

5.5.10 Measurement of buoyancy of the whole device

5.5.10.1 Principle

The buoyancy of the device shall be measured using Archimedes' principle of weighing the submerged device in water, as specified below. This test applies to both, inflatable and inherently buoyant PFDs.

The buoyancy of the PFD shall be measured and recorded after entrapped air has been removed and 24 h after the initial buoyancy has been measured.

For inflatable and multi-chamber devices, the test shall be repeated according to the number of inflatable chambers and inflatable systems in deflated condition as described in ZNS 840-8, 5.7. Every possible combination of chambers and inflation systems shall be tested with one of the chambers in the deflated condition.

The chamber shall be fitted with the correct gas cylinder.

5.5.10.2 Apparatus

The standard equipment required consists of a weighted cage, whose submerged weight is greater than 1,1 times the expected buoyancy value of the PFD, and a tank of fresh water deep enough to accommodate the device horizontally with its upper surface at a depth of 100 mm to 150 mm below the water surface without contacting the sides of the tank or the bottom and supported by a calibrated load cell or balance.

5.5.10.3 Procedure

If the PFD contains an inflatable buoyancy chamber, it shall be inflated using the correct size cylinder, if applicable, on the primary inflation chamber. The internal pressure of the PFD shall be recorded (10 ± 1) min after inflation at a temperature of (20 ± 5) °C. The chamber shall be evacuated and then refilled with air through the oral inflation tube to the pressure reached by the primary means of inflation (or [4.0 ± 0.5] kPa, if orally inflated).

The PFD shall be enclosed in the weighted cage.

The cage shall be suspended from the load cell in fresh water at a temperature of (20 ± 5) °C so that the upper surface of the horizontally positioned PFD is submerged at 100 mm to 150 mm below the surface. The immersed combined weight shall be recorded as A.

The assembly shall remain immersed for (24.0 ± 0.5) h, after which time the combined weight shall again be recorded as B.

DRAFT FOR PUBLIC COMMENT

 ©ZBS 2026 - All rights reserved

The PFD shall finally be removed from the cage. The weighted cage shall again be immersed and the result again recorded as C.

The water temperature, air temperature, and atmospheric pressure shall be recorded at the start of each test and then after completion of each test.

5.5.10.4 Results

The buoyancy values shall be corrected to a temperature of 20 °C and pressure of 1 atmosphere (101.325 kPa).

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.

5.5.11 Uninflated buoyancy test

5.5.11.1 Principle

An inflatable PFD shall have sufficient buoyancy in the uninflated state to resist sinking.

5.5.11.2 Procedure

A fully packed ready-for-use inflatable device shall be released from a height of (1 000 ± 100) mm into water. If a device incorporates an automatic inflation system, the system shall be disarmed. If the automatic inflation system cannot be disarmed, additional weight shall be applied to the PFD that equals the weight of a fully charged gas cylinder.

The inflation device shall be released such that the inflator is closest to the water.

5.5.11.2 Results

After 5 min, record whether or not the device is floating.

5.5.12 Buoyancy test for inherently buoyant material

5.5.12.1 Principle

This buoyancy test is only applicable for PFDs where the inherently buoyant material is qualified according to ZNS 840-7, 4.8.2.5.

If a PFD‘s buoyancy is provided by inherently buoyant material according to ZNS 840-7, 4.8.2.5, the PFD shall be modified to simulate the in-water performance of the PFD after ageing of the foam.

5.5.12.2 Procedure

5.5.12.2.1 The buoyancy of the material aft of the body axis and the buoyancy of the material forward of the body axis shall be determined individually in accordance with 5.5.10.3.

5.5.12.2.2 It is permissible to submerge the sample long enough to provide a stabilized reading.

5.5.12.2.3 Each foam insert of the sample is to have an amount of the foam removed by skiving the surface of greatest area, or the equivalent, so that the buoyancy, *B* (in kJ), of the altered insert (tolerance for front inserts: plus 0 %, minus 15 %; and for back inserts: plus 15 %, minus 0 %) is as follows:

$$\mathrm{B} = \mathrm{B}_0 \left(\frac{3\mathrm{V}}{100}\right) - 2 \qquad (1)$$

Where:

DRAFT FOR PUBLIC COMMENT

B_0 is the buoyancy of the insert as provided in the as-received device, in kJ;

V is the V-factor of the foam from which the insert is formed, determined in accordance with ISO ZNS 840-7, 4.8.2.5.

The sample then shall be reassembled in a manner that represents the construction of the complete device, to account for buoyancy loss from sewing and the like.

5.5.12.3 Results

Record the results of the in-water performance tests.

5.5.13 Test of the resistance to burning

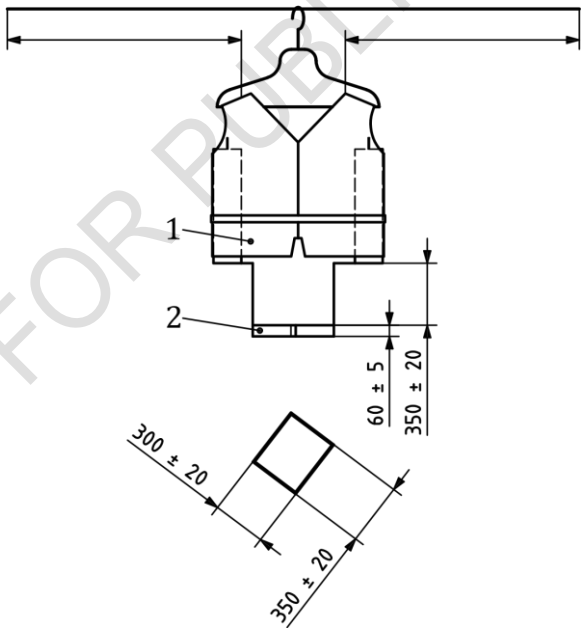
5.5.13.1 Principle

This test is run to determine whether the PFD creates a greater hazard to the user when exposed to flame than if the user were not wearing any PFD. The premise is that a person sustains injury if subjected to a fire as specified herein for more than 2 s, and a PFD shall not add fuel to or intensify such an exposure and shall remain functional after the exposure.

5.5.13.2 Apparatus

The test pan shall be (300 ± 20) mm × (350 ± 20) mm × (60 ± 5) mm. See Figure 10. The test shall be conducted in a large, essentially draft-free enclosed area.

Dimensions in millimetres



Key

1 PFD
2 test pan

Figure 10 — Test arrangement

5.5.13.2 Procedure

10 mm of water shall be put in the bottom of the test pan, followed by enough petrol or n-heptane to make a minimum total depth of 40 mm.

DRAFT FOR PUBLIC COMMENT

 ©ZBS 2026 - All rights reserved

The petrol or n-heptane shall be ignited and allowed to burn freely for 30 s before the device is inserted.

The upright device shall be passed through the flames in a forward, vertical, free-hanging position, with the bottom of the device (350 ± 20) mm above the top edge of the test pan. Loose parts, e.g. crotch straps, shall be secured above the lower edge of the bottom of the device. The sample shall be exposed to the flame for 2 s, starting as soon as the leading edge of the sample is touched by the flames and stopping as the trailing edge leaves the flames.

If the device is burning upon emergence from the flames, 6 s shall elapse before extinguishing the flames.

If inflatable, the device shall be tested in the un-inflated position as worn.

Gas cylinders shall be removed from inflatable PFDs for the duration of this test.

5.5.13.3 Results

After this test the device shall be examined for physical damage that would likely prevent its function.

If damage is detected, the device shall be retested as follows and failure shall be reported.

Buoyancy shall be measured and recorded (30 ± 1) min after submersion according to 5.5.10 and the horizontal and vertical load test according to 5.5.4 shall be repeated with 75 % of the original load requirement.

5.5.14 Overpressure test

5.5.14.1 Principle

The inflatable buoyancy chambers, inflation components and overpressure relief valves shall be capable of withstanding an internal over-pressure at a temperature of (20 ± 2) °C.

5.5.14.2 Apparatus

a) A source of dry compressed air;

b) air pressure gauge; and

c) timing device.

5.5.14.3 Procedure

a) For a single chamber device, the chamber shall be subjected to the overpressure test. It shall be inflated to (4.0 ± 0.1) kPa through the oral tube using compressed air with any overpressure relief valves disabled, then fire one cylinder of the correct size using the inflation mechanism.

   The device shall then be set aside for (10 ± 1) min. The pressure shall be measured and then the pressure shall be increased by 20 % with compressed air through the oral inflation tube. After a (5 ± 1) min stabilization period, no rupture, visible damage, or leakage observable by submersion shall result. For devices that incorporate overpressure relief valves, the test shall be repeated with the relief valves enabled. The overpressure relief valves shall operate in accordance with the manufacturer's specifications.

b) For multi-chamber devices, all chambers shall be subjected to the overpressure test. Each chamber shall independently be inflated to (4.0 ± 0.1) kPa through the oral tube using compressed air with any the overpressure relief valves disabled, then fire one cylinder of the correct size using the inflation mechanism.

DRAFT FOR PUBLIC COMMENT

The device shall then be set aside for (10 ± 1) min. The pressure shall be measured and then the pressure shall be increased by 20 % with compressed air through the oral inflation tube. After a (5 ± 1) min stabilization period, no rupture, visible damage, or leakage observable by submersion shall result. The chamber shall then be deflated to (4.0 ± 0.1) kPa. The above procedure shall be repeated for each of the other inflation mechanisms and it shall be observed that none of the specified damages as indicated above occur. This procedure shall be repeated until each inflation mechanisms fired. If a supplemental inflation chamber is fed with gas from any of the other inflation chamber(s) designed to provide buoyancy, then it is tested as part of that chamber. For devices that incorporate relief valves, the test shall be repeated with the relief valves enabled. The overpressure relief valves shall operate in accordance with the manufacturer's specifications.

The gas cylinder used in this test shall be sized according to the markings on the PFD.

Chamber integrity and leakage shall be checked after 5 min.

5.5.14.4 Results

The operation of the relief valves shall be noted to ensure that the excess pressure is relieved. Any leakage of the inflatable buoyancy chambers, inflation components and relief valves shall be reported. Report if there is any damage that affects the integrity of the chamber and the performance of the PFD.

5.5.15 Strength test of attachment points

5.5.15.1 Principles

All attachment points on inherently buoyant PFDs and on the inflatable chambers of the PFD and on joints and couplings within attached inflation system components shall be subjected to a tension by means of a specified load.

5.5.15.2 Apparatus

A test dummy such as that shown in ISO 12401:2009, 5.2.2.2, or a test form can be used as illustrated and described in Figure 8.

5.5.15.3 Procedure

The sample shall be mounted on a test dummy or the test form illustrated in Figure 8 in the uninflated condition.

For inflatable PFDs, each chamber shall be inflated using a fully charged gas cylinder according to the manufacturer’s instructions. A steady force of (220 ± 10) N shall be applied to the inflation system, by means of a clamp, lacing, or the like, applied to the inflation mechanism as near as possible to the point where it enters the buoyancy chamber. This load should be maintained for 5 min during which the direction and angle in which it is applied should be continuously varied. On completion the device should be left in the inflated condition for 30 min. Check for any leakage. The test shall be repeated for each separate chamber.

For inherently buoyant and inflatable PFDs having other identifiable attachments such as a loop for accessories (for example a personal marker light), the procedure detailed above shall be repeated using a load of (150 ± 10) N applied to the attachment points.

5.5.15.4 Results

For each attachment, report whether the load was supported without causing loss of function of the PFD or its component parts. For inflatables, the PFD shall be checked for leakage.

DRAFT FOR PUBLIC COMMENT

 ©ZBS 2026 - All rights reserved

5.5.16 Test of the resistance to inadvertent inflation

5.5.16.1 Principles

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

5.5.16.2 Apparatus

The PFD shall be fitted correctly to a free-standing rotating manikin or equivalent type of test form of adult size, with a minimum shoulder height of 1 500 mm. The PFD shall be deployed in the mode in which it is used ready for use, but not deployed as used in the water (i.e. if it is equipped with a cover which is normally used closed, then the cover shall be closed for the test). See Figure 11.

Two spray nozzles shall be installed so as to spray fresh water onto the PFD, as shown in Figure 11. One shall be positioned 500 mm above the highest point of the PFD, be oriented at an angle of 15° from the vertical centreline of the manikin and be centred on the inflation system. The other nozzle shall be installed horizontally at a distance of 500 mm, be centred on the inflation system, and oriented directly at the PFD. These nozzles shall have a spray cone of 30°, each orifice being (1.5 ± 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 flow of 600 l/h, and a temperature of (19 ± 5) °C.

5.5.16.3 Procedure

The sprays shall be turned on, and the PFD exposed to the following series of spray exposures by turning the test apparatus according to Figure 11:

a) 10 min with high spray on the front;

b) 10 min with high spray on the left side;

c) 10 min with high spray on the back; and

d) 10 min with high spray on the right side.

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). For every 1 min of the 10 min period, during exposures a), b) and d), the horizontal spray shall be applied for 3 s.

At the conclusion of the exposure, submerge the PFD in water to determine if the automatic inflation mechanism activates within the required time.

5.5.16.4 Results

Report whether the device activates during the exposure and whether it activates when submerged following the exposure.

Dimensions in mm

DRAFT FOR PUBLIC COMMENT

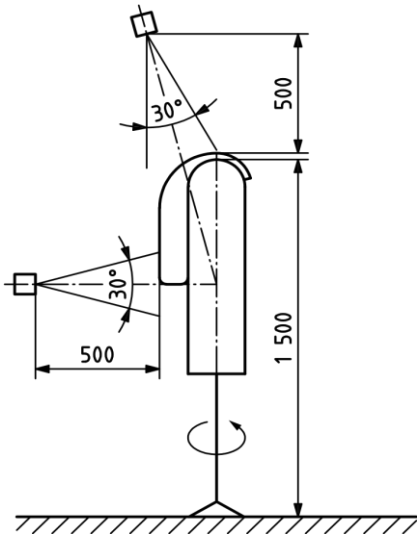


Figure 11 — Test apparatus for automatic inflation devices

5.6 Human subject performance tests

5.6.1 General

5.6.1.1 Test subjects

The PFD shall be tested according to the relevant part of the ZNS 840 series using test subjects in front of the test panel described in 5.1. Tests shall be conducted in an area including a work area and a swimming pool, containing fresh water, treated as necessary for hygienic purposes.

Due to the high variability between human test subjects and the difficulty in assessing some subjective measures, for tests according to 5.6, a test subject may be disqualified if demonstrated not to perform in accordance with this standard when tested in a reference vest as specified in Annexes B, C or D. When a reference vest is used, the test report shall state the model of the reference vest(s).

Test subjects shall be generally informed of the methods and intent of the in-water performance tests, but should have no knowledge of the specific PFD being tested. The subjects shall be in suitable health to physically perform the tests. Any potential risk to the test subjects shall be assessed and measures taken to reduce the risk. The principles of the Declaration of Helsinki as amended shall be considered where applicable.

All samples shall pass all objective tests for the entire device to meet the requirements of the relevant part of the ZNS 840 series. However, due to the high variability between human test subjects and the difficulty in assessing some subjective measures, it is permitted that, if a device does not completely meet the requirements of the following subjective tests in a single sample and in no more than one human test subject, a substitution procedure be used. In these circumstances, two other human test subjects within the same height/weight category, with the same gender, and wearing the same PFD, should be subjected to the same test before the same test panel.

If this additional test is still not clearly passed as required in the relevant part of the ZNS 840 series, then the device shall be deemed to have failed, whilst if it is clearly passed, the test panel shall deem that the device has passed the test overall.

> NOTE: For the purpose of this clause, ‘subjective tests’ includes all tests that require the participation of human test subjects.

The tests may be modified for child and infant test subjects under 12 years of age who are not water adapted, so as to ensure their safety and co-operation. When assessing child and infant sized PFDs,

DRAFT FOR PUBLIC COMMENT

 ©ZBS 2026 - All rights reserved

subjective indicators, such as self-righting and jumping can be hazardous and more subjective. The position in the water and support afforded can be useful indicators when applied to child and infant PFDs.

Reference testing with a manikin shall be carried out in accordance with 5.7.

5.6.1.2 Subject requirements for adults

PFDs shall be tested using 8 subjects if the device is sized to accommodate a range of chest sizes in excess of 400 mm or a body mass range greater than 30 kg.

If the manufacturer offers different sizes, five subjects for lifejackets and special purpose devices and three subjects for buoyancy aids shall be used to test each size range which does not exceed increments of 150 mm chest size or 20 kg body mass. PFD designs having size ranges between these limits shall be tested on a proportionate number of subjects.

The test shall be carried out with able-bodied persons according to Table 3. The marked mass and/or height and chest size, if stated, on the PFD shall be taken into account when selecting test subjects.

Table 3: Adult test subjects

Height range mm	**Body mass range, kg**							
	40 to 50	>50 to 60	>60 to 70	>70 to 80	>80 to 100	>100 to 110	>110 to 120	>120
<1 500	X	X	X	X	—	—	—	—
1 500 to 1 600	X	X	X	X	X	—	—	—
>1 600 to 1 700	—	X	X	X	X	X	—	—
>1 700 to 1 800	—	—	X	X	X	X	X	X
>1 800 to 1 900	—	—	X	X	X	X	X	X
>1 900	—	—	—	—	X	X	X	X

The following applies:

a) No more than two thirds of test subjects shall be of any one gender.

b) At least one subject shall be selected per body mass range which is appropriate to the PFD.

c) At least one subject shall be selected per height range which is appropriate to the PFD.

d) A uniform distribution across mass range shall be maintained.

e) At least one subject for the lowest body mass shall be within the manufacturer's stated range ±5 %. Subjects of less than 40 kg may be shorter than 1 400 mm if required.

f) At least one subject for the highest body mass shall be within the manufacturer's stated range ±5 %.

5.6.1.3 Subject requirements for infants and children

Test subjects shall be selected to fully represent the range of sizes for which the device shall be approved. Devices for children or infants shall be tested on children as small as approximately 760 mm tall and 9 kg mass. At least six test subjects shall be used for each 380 mm or 16 kg step of size range according to Table 4 or 5, as applicable.

Water tests using children or infants shall minimize distress or risk to the child or infant. Consideration shall be taken of their age and ability.

DRAFT FOR PUBLIC COMMENT

Table 4: Child test subjects

Height range mm	**Body mass range, kg**									
	>14 to 17	>17 to 20	>20 to 22	>22 to 25	>25 to 28	>28 to 30	>30 to 33	>33 to 36	>36 to 38	>38 to 41
790 to 1 050	X	X	X	—	—	—	—	—	—	—
900 to 1 180	X	X	X	X	—	—	—	—	—	—
1 020 to 1 300	—	—	X	X	X	X	—	—	—	—
1 120 to 1 350	—	—	—	—	X	X	X	—	—	—
1 220 to 1 500	—	—	—	—	—	—	X	X	X	X
1 450 to 1 650	—	—	—	—	—	—	—	—	X	X

The following applies:

a) At least one subject shall be selected per height for the body mass range, which is appropriate to the PFD.

b) At least one subject shall be selected per body mass range which is appropriate to the PFD.

c)A uniform distribution across mass range shall be maintained.

d) At least one subject for the lowest body mass shall be within the manufacturer's stated range ±5 %.

e) At least one subject for the highest body mass shall be within the manufacturer's stated range ±5 %.

Table 5 — Infant test subjects

Height range mm	**Body mass range, kg**		
	<11	11 to 14	14 to 17
<830	X	X	—
790 to 1 050	X	X	X
900 to 1 180	—	—	X

The following applies:

a) At least one subject shall be selected per body mass range or height which is appropriate to t

b) A uniform distribution across mass range shall be maintained.

c) At least one subject for the lowest body mass shall be within the manufacturer's stated rang

d) At least one subject for the highest body mass shall be within the manufacturer's stated ran he PFD. e ±5 %. ge ±5 %.

When conducting water performance tests, child- and infant-size PFDs shall meet the requirements for the minimum buoyancy of the applicable performance standards ZNS 840-2 to ZND 840-5. The range of sizes for child- and infant-size PFDs shall be considered based on the test results. PFDs shall be sized by height or by height and body mass.

DRAFT FOR PUBLIC COMMENT

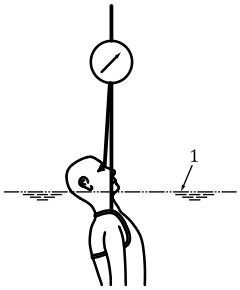
 ©ZBS 2026 - All rights reserved

5.6.1.4 In-water weight

The in-water weight test is an optional test in order to verify the performance of the human test subject. This test shall only be carried out on adults.

The in-water weight of a test subject shall be measured to ensure an adequate minimum acceptable range of representative subjects. The in-water weight of a test subject of 40 kg or more is taken with the tip of the chin and bottom of the ear lobes touching the water at the bottom of the normal breathing cycle (see Figure 12). The in-water weight is the highest repeated value out of 10 readings or the third highest value if none is repeated. Additional weight may be secured to the ankle(s) to maintain the subject in a vertical position provided that the additional weight is subtracted from the total in-water weight.

NOTE: The in-water weight can be used to verify the morphology of test subjects.



Key

1 water level

Figure 12: In-water weight test arrangement

5.6.1.5 Dress

All test subjects shall use only bathing costumes during height, weight, and in-water measurements and for all in-water tests.

After being weighed and measured, the subject shall be dressed in ordinary clothing (see 5.6.2.1) to conduct the donning test before becoming familiar with the PFD being tested.

5.6.1.6 Test sequence

The sequence of human subject performance tests shall be conducted in accordance with Table 6.

Table 6: Test sequence for ZNS 840-2 to ZNS 840-5

Test name	Clause
Donning	5.6.2
1 m water entry	5.6.3
Self-righting and stability	5.6.4
Freeboard	5.6.5
3 m water entry	5.6.3
Freeboard	5.6.5
In-water stability[a]	5.6.6
Boarding	5.6.7

DRAFT FOR PUBLIC COMMENT

Ergonomics[b]	5.6.1.7
Ride up assessment[b]	5.6.1.8
[a] Applicable for devices covered in ZNS 840-2 to ZNS 840-4 [b] To be conducted during all human subject tests.	

5.6.1.7 Ergonomics

5.6.1.7.1 General

The test panel shall observe the test subject for ease of movement and elicit comments from the subjects relating to comfort or interference with desirable behaviour or movements during all the human subject tests. Particular attention shall be paid to

a) head and limb movement, and the potential to interfere with normal wear and emergency use or the subject desiring to remove the PFD due to discomfort; and
b) any interference with necessary functions, vision, hearing, breathing or circulation.

Assessments shall be made both out of and in the water, and with the PFD both inflated and uninflated, if applicable.

Encumbrance of the PFD shall be assessed during:

a) donning/secondary-donning (5.6.2);
b) entering the water (5.6.3);
c) swimming and boarding actions (5.6.7); and
d) oral inflation (5.6.8).

5.6.1.7.2 Encumbrance assessment

5.6.1.7.2.1 Principle

The test subjects shall assess comfort, snagging and interference with movement when using the PFD, to determine whether the PFD is fit for the intended normal wear and emergency use.

5.6.1.7.2.2 Procedure

The test panel shall observe ease of movement and elicit comments from the subjects during the following activities:

a) climbing from the water onto a liferaft or a boarding platform according to 5.6.7 and sitting in the liferaft or on the boarding platform simulating awaiting rescue;
b) climbing a distance of 2 500 mm up and down a vertical ladder while out of water;
c) drinking from a cup while out of water;
d) touching toes while out of water;
e) accessing and using any additional items provided on or with the PFD, such as whistle, buddy line, or light while in and out of water;
f) tightening and/or loosening of all essential adjustments to a snug fit while in and out of water.

5.6.1.7.2.3 Results

Report whether the subject is able to perform each activity.

DRAFT FOR PUBLIC COMMENT

©ZBS 2026 - All rights reserved

5.6.1.8 Ride up assessment

The test panel shall observe and assess whether the user slips out of the PFD at any time during human subject testing when tested in accordance with 5.6 of these documents. The test panel shall observe and assess whether the PFD rides up to such an extent as to impede the performance requirements given in the relevant part of the ZNS 840 series during human subject testing.

5.6.2 Donning test

5.6.2.1 Principle

PFDs are evaluated for ease of donning and to assess correct fit, positioning on the body and adjustment.

5.6.2.2 Procedure

If the PFD is an integral part of another garment, then this test shall only apply to its donning and doffing for its function as a PFD.

Inflatable PFDs shall be tested inflated and un-inflated.

Ordinary clothing is defined as follows:

a) underwear (short sleeved, short legged);
b) shirt (long sleeved);
c) trousers (not woollen); and
d) athletics shoes, if the device is required to be donned over the foot and leg.

Heavy weather clothing is defined as ordinary clothing with the addition of an arctic parka with hood and warm cotton gloves.

All devices requiring additional action by the user, such as oral inflation or other activities in the way of secondary donning, shall be tested on each subject to demonstrate that they can be accomplished within the prescribed time.

For PFDs according to ZNS 840-3 to ZNS 840-5, subjects who are completely unfamiliar with the PFD shall attempt to don the PFD to a snug fit, wearing a bathing costume at their first attempt, then dressed in ordinary clothing at the second. If the attire customary to the designated purpose of the PFD or ordinary clothing can have an adverse effect on the test results, the tests shall be repeated with all subjects wearing such attire. For infant and child devices, donning may be performed with assistance from an adult when the test subject is under 12 years of age. For lifejackets according to ZNS 840-2 the test shall be run wearing ordinary clothing. Each subject may have two attempts as follows.

a) For all PFDs, the first attempt shall be with no assistance, guidance or prior demonstration.

For an infant or child, the assisting adult shall not be given any guidance or prior demonstration. The PFD, with closures undone and adjusted to fit a mid-sized subject, shall be placed on the deck, face up, in front of the test subject.

The instruction provided shall be identical for each subject and shall be equivalent to the following: “PLEASE DON THIS DEVICE SECURELY AS QUICKLY AS YOU CAN.” The attempt shall be timed. Donning is considered complete when the subject has donned and adjusted the PFD correctly in accordance with the manufacturer's instructions.

b) For PFDs according to ZNS 840-2 to ZNS 840-6, the second attempt, if necessary, shall be after the test subject or assisting adult is allowed up to 3 min to examine the PFD and read any instructions for use included with the PFD.

DRAFT FOR PUBLIC COMMENT

c) If necessary, the second attempt shall be after the subjects or assisting adult have viewed a demonstration of proper donning of the lifejacket.

If specified in the relevant parts of the ZNS 840 series, each subject shall make one additional donning attempt using the procedures specified in a) while using heavy weather clothing.

For inflatable PFDs, the donning test shall be repeated with the PFD fully inflated. The second attempt, if necessary, should allow the test subject or assisting adult to be instructed that partial deflation is acceptable to successfully don the PFD in the inflated condition. Donning is considered complete when the subject has donned and securely adjusted the PFD correctly in accordance with the manufacturer's instructions.

For devices requiring additional action by the user, such as oral inflation or other activities in the way of secondary donning, subjects should enter the water after primary donning is complete, and attempt the secondary donning.

5.6.2.3 Results

The test panel shall record the time it takes each subject to completely don the device and record whether the PFD is correctly fitted and positioned on the body.

For a PFD with secondary donning, the time for secondary donning to achieve positive freeboard shall also be recorded.

The number and percentage of persons who are wearing ordinary clothing and are completely unfamiliar with the PFD and capable of completely donning the PFD without assistance, guidance or prior demonstration within the required time shall be recorded. If less than the required percentage of the first group of test subjects are able to don the lifejacket within the required time on the first attempt, a second and third set of test subjects may be used to cumulatively demonstrate if a higher percentage can don the PFD. If used, the second and third set of subjects shall meet the same criteria as the first set of subjects.

For PFDs requiring donning after the subjects have read the instructions printed on the PFD, the number of persons capable of completely donning the PFD without assistance in the required time period shall be recorded.

For lifejackets requiring donning after the subjects have viewed a demonstration of proper donning of the lifejacket, the number of persons capable of completely donning the PFD without assistance in the required time period shall be recorded.

For lifejackets requiring donning while wearing heavy weather clothing, the number of persons capable of completely donning the PFD without assistance in the required time period shall be recorded.

5.6.3 Water entry test

5.6.3.1 Principle

PFDs shall be evaluated for their ability to stay on a user when falling or jumping into the water from height, and to remain in a usable position. The evaluation is intended to cover most unfavourable attitudes of water entry.

5.6.3.2 Procedure

5.6.3.2.1 The PFD shall be tested according to the designated design. Any non-structural elastic material used to improve the fit of the garment shall be cut prior to the test.

DRAFT FOR PUBLIC COMMENT

 ©ZBS 2026 - All rights reserved

5.6.3.2.2 For inflatable PFDs, the water entry test shall prove all service conditions, i.e. for a PFD being inflated both automatically and manually, or if of multi-chamber design also with one of the compartments uninflated. They shall be armed with the appropriately sized gas cylinder and ready for use. The tests shall be repeated as many times as necessary to verify all service conditions.

5.6.3.2.3 All PFDs shall be donned in accordance with the manufacturer's instructions for use prior to water entry. The test subject shall step into the water, feet first with arms held vertically over the head, from a height of (1 000 ± 100) mm and then relax to simulate a state of exhaustion. The subject shall not readjust the PFD after the water entry.

For an inflatable PFD, it shall also be donned and inflated by the manual means of inflation whilst out of water. The test subject shall then repeat the jump into water and shall then relax after water entry.

If multiple chambers are provided, each combination of secondary chambers shall be tested in combination with the primary chamber unless redundant to the primary chamber without altering the size and shape of the inflated device.

If other orientations of water entry such as a dive or a feet-first step with arms at sides are more likely to produce adverse results, the above test procedure shall be repeated with such other orientation.

5.6.3.2.4 After the initial 1 000 mm jump, the mouth freeboard according to ZNS 840-2 to ZNS 840-5 shall be measured when the test subject has come to rest in a stable floating position, to assess whether any riding-up or displacement of the PFD has resulted in an unacceptable decrement in performance.

5.6.3.2.5 When testing PFDs according to ZNS 840-2 to ZNS 840-4, the feet-first water entry tests shall be repeated with the subject entering the water from a height of 3 000 + 500/0 mm while holding on to the PFD or arms braced to avoid possible injury. The subject shall be familiar with jumping from such height. If inflatable, all chambers, unless redundant, shall be inflated. The freeboard shall be measured again when the test subject has come to rest in a stable floating position.

5.6.3.2.6 When using human test subjects for testing child PFDs according to 5.6.3 a jump from the side of the pool is sufficient.

5.6.3.2.7 When testing infant PFDs, only the in-water tests according to 5.6.5 shall be conducted.

5.6.3.3 Results

After the initial 1 000 mm jump, record mouth freeboard once the test subject has come to rest in a stable floating position. Record the individual and average of all subjects' trunk angles from the vertical. Record the individual and average of all subjects' face plane (head) angles from the horizontal.

After the initial 1 000 mm jump, the test panel shall report whether the PFD impairs the vision, hearing or respiration of the user.

After the 3 000 mm jump, record mouth freeboard once the test subject has come to rest in a stable floating position.

The panel shall observe and report whether the PFD is dislodged, harms the wearer, has been damaged to endanger its in-water performance, and brings the wearer to the surface in the attitude specified in the applicable part of the ZNS 840 series.

When not required to bring the subject to a face-up position, the panel shall observe whether the PFD permits the subject to maintain a vertical or backwards inclined attitude without having to carry out any movement other than specified in the applicable part of the ZNS 840 series.

DRAFT FOR PUBLIC COMMENT

5.6.4 Self-righting and stability test

5.6.4.1 Principle

5.6.4.1.1 The tests according to 5.6.4 shall demonstrate that a PFD (see 5.6 ZNS 840-2 to ZNS 840-4) being evaluated provides

a) an adequate face-up stability, and associated resistance to being turned face down by waves or other forces, and
b) the intended potential for bringing the user face up in the unlikely event that the user either enters the water face down and unconscious, or becomes unconscious in the water.

5.6.4.1.2 The test according to 5.6.4.3 b) is to demonstrate that a buoyancy aid according to ZNS 840-5, that is not designed to self-right the wearer provides adequate face-up stability and associated resistance to being turned face down.

5.6.4.2 Apparatus

For the measurement stopwatch, freeboard and angle measurement devices according to Figure 13 shall be used. If a reference vest is used for calibration, it shall be constructed in accordance with Annexes B, C or D according to the size of PFD being tested.

5.6.4.3 Procedure

These test procedures recognize that different body types present differing resistance to the face-up turning capacity of a PFD, and therefore are intended to evaluate a wide range of the population with as few test subjects as possible.

An inflatable PFD shall be tested when inflated by its primary means of inflation. Chambers provided with only oral inflation capability shall be tested inflated to $(4\ {}^{0}_{-1})$ kPa. Multiple redundant chambers that provide the same size and shape as chambers when previously tested need not be retested.

Because a tense subject is neither representative nor simulates a state of utter exhaustion, the starting time for all righting tests shall not begin until the subject is noted to be in a relaxed position. A relaxed position should be achieved by having the subject relax his body with arms starting perpendicular to the body (as in mid position of a breaststroke) and the head going into the water at the same time. If turning starts before the subject has relaxed, the test is invalid and the test shall be repeated. If the PFD is so buoyant that the subject cannot get his/her face down into the water before being righted, the turn shall be counted.

The amount of air in test subjects' lungs has a profound influence on the test results, and subjects should be instructed accordingly. For a 'normal breath' or 'half breath' the lungs should be near the top of 'tidal volume' only. Persons in repose, breathing normally, are at the top of tidal volume when their lungs are at their highest, or largest, during such a breathing cycle. When the procedure requires the subject to 'exhale' or exhale in the water, the subject relaxes completely while allowing air to gradually flow out of the lungs, not forcing it out, until they reach 'functional residual capacity' (FRC) and no less. A person in repose, breathing normally, will be at FRC when their lungs are at their lowest, or smallest, during such a breathing cycle.

Unless otherwise specified, for each of the following procedures, as the subject places the face in the water the lungs shall be near the top of tidal volume by instructing the subject to take a normal breath or half breath.

The PFD shall be tested on each test subject by carrying out the following tests as called for by its intended performance level, in the relevant part of the ZNS 840 series applicable to its intended classification.

DRAFT FOR PUBLIC COMMENT

 ©ZBS 2026 - All rights reserved

During testing the panel shall observe whether any closure fails to remain secure.

a) Leg release righting test for life jackets

Facing away from the test assistant, the subject shall attain a face-down horizontal position in the water, but with mouth held out of the water. The feet shall be supported, shoulder-width apart with the heels at the surface of the water, by a test assistant. After assuming a starting position with the legs straight and arms along the sides, the subject shall be instructed in the following sequence to allow the body to gradually and completely relax:

i allow the arms and shoulders to relax;
ii allow the legs to relax, and then the spine; and
iii relax the neck, allowing the face to fall into the water while breathing out normally.

During the relaxation phase, the test assistant shall maintain the subject in a stable position. Immediately after the subject has relaxed with the face in the water, if possible, simulating a state of utter exhaustion, the test assistant shall release the subject's feet. The subject shall remain relaxed while the turning time is measured. The turning time is determined from the release of the feet until the subject's mouth is clear of the water, to the nearest 0,1 s. The test shall be conducted six times, discarding the highest and lowest turning times and averaging the remaining four times.

Child subjects not able to relax the arms are instructed to straighten the arms along the sides.

b) Vertical stability test for buoyancy aids

During the test, the panel shall observe whether any closure fails to remain secure.

For determination of the floating position of a buoyancy aid, each subject shall don the device and enter the water.

The subject shall then assume an upright, slightly behind vertical position in the water, keeping the head, torso, and legs in the same plane, while holding the arms at the sides. A straight rod with an inclinometer attached may be used to establish the starting position is (5° ± 2°) behind vertical. The subject shall maintain this position until the device induces motion (forward or backward of vertical). Then, the subject shall allow the arms, legs, torso, and head to assume their naturally relaxed positions so that the head falls in the direction of induced motion. If motion is not induced, the subject shall allow the head to fall backwards and then allow the arms, legs and torso to assume their naturally relaxed positions. Record if the freeboard is positive.

c) Flotation attitude test for lifejackets

To assess the floating position for lifejackets, the angle of the trunk and head shall be measured.

Measure the angle of the face in relation to the horizontal, using an imaginary line from the chin to the forehead. Measure the angle of the body trunk from vertical, using an imaginary line from the shoulder to the hip. The angle of the trunk shall be measured underwater, to reduce any effect due to the refraction properties of water.

5.6.4.4 Results

5.6.4.4.1 Report whether any closure securing the PFD to the body does not remain secure during the tests.

DRAFT FOR PUBLIC COMMENT

5.6.4.4.2 For lifejackets according to 5.6.3.4 of ZNS 840-2 to ZNS 840-4, report the average time to bring each test subject's mouth clear of the water without him/her having to carry out any voluntary movement.

5.6.4.4.3 For buoyancy aids according to ZNS 840-5, report whether

a) any subject's respiration is impeded in an attitude of relaxed static balance at any time;
b) there is any tendency for a subject to be turned face-down from the position of relaxed static balance in the water;
c) there is any negative freeboard.

5.6.4.4.4 For lifejackets report the measured mouth freeboard, trunk and head angles. Record whether the PFD impairs the vision, hearing or respiration of the user.

5.6.5 Measurement of freeboard

5.6.5.1 Principle

The freeboard shall be measured as the vertical difference between the water surface and the lowest corner of the mouth.

5.6.5.2 Apparatus

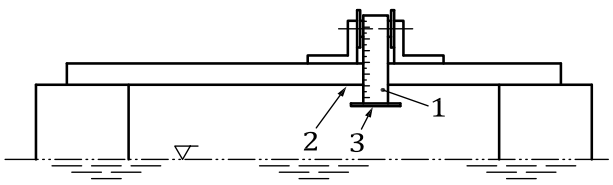
A suitable measuring device is shown in Figure 13. It consists of two floats made of closed-cell foam, connected by a rigid bridge at such a height that a test subject using a PFD in the water has approximately 100 mm clearance between the top of his head and the bridge. On the bridge, one third of the way along from one end, a steel measuring tape roll or drum 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 maintain a fixed tape protrusion length. At the free end of the tape, a plastic disk of (100 ± 5) mm diameter is fixed in a perpendicular position. There is also a measuring mark made along the bottom edge of the bridge.

5.6.5.3 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. After the subject has attained an attitude of relaxed static balance, the distance between the measuring line and the lowest point of respiration, typically the corner of the mouth of the subject shall be measured while the subject is at the lowest level attained during the normal breathing cycle.

5.6.5.4 Results

The individual freeboard for each subject shall be recorded.



Key

1 tape
2 measuring mark
3 plastic disk

Figure 13: Device for measuring freeboard

DRAFT FOR PUBLIC COMMENT

 ©ZBS 2026 - All rights reserved

5.6.6 In-water stability test for lifejackets

5.6.6.1 Principle

This test is to assess the ability of a lifejacket to safely support the user.

5.6.6.2 Procedure

The test subject shall attain a relaxed face-up position of static balance in the water with shoulders and back toward the test conductor. The subject shall be instructed to place elbows against his/her sides, hands on stomach, under the lifejacket if possible, and bring the knees up as close to the chest as possible while keeping them together. The test conductor shall grasp the subject's shoulders and rotate the subject clockwise around the longitudinal axis of the torso so that the subject attains a (55 ± 5)° list. The subject shall then be released. It shall be observed whether the subject returns to a stable face-up position. This test shall be repeated, but the subject is rotated counter-clockwise.

5.6.6.3 Results

Report whether the candidate device did or did not return the subject to a stable face-up position according to 5.6.6.2.

5.6.7 Boarding test

5.6.7.1 Principle

The test shall prove and limit the encumbrance of a PFD on the ability of the wearer to climb out of water under adverse conditions.

5.6.7.2 Apparatus

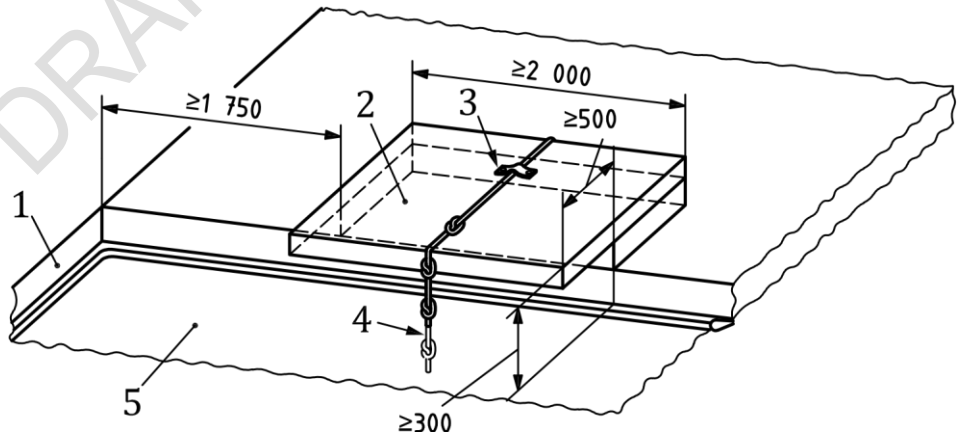
A SOLAS life raft or rigid platform as shown in Figure 14 with its surface 300 mm above the water surface shall be used.

5.6.7.3 Procedure

All test subjects according to 5.6.1.2, without using the PFD, shall attempt to swim 25 m and board the SOLAS life raft or rigid platform. Each test subject who successfully completes this task shall perform it again while wearing the PFD.

If two thirds of the subjects do not qualify without wearing the PFD additional subjects may be used until the required number of subjects qualify.

Dimensions in millimetres



DRAFT FOR PUBLIC COMMENT

Key

1 pool side
2 platform
3 rope fixing point
4 rope
5 water level

Figure 14: Boarding platform

5.6.7.4 Results

Report the type of apparatus used, the number of test subjects who attempted the boarding test, the number of test subjects who were disqualified, and the number of those who successfully completed the boarding while wearing the PFD.

5.6.8 Oral inflation

5.6.8.1 Principle

An inflatable lifejacket shall permit the user to orally inflate while in or out of the water, using either hand independently.

5.6.8.2 Procedure

The test shall be carried out both in and out of the water as follows.

a) Testing in dry conditions on deck; with the unarmed, packed and uninflated device correctly donned, each test subject shall locate the oral inflation mechanism. After successfully accessing the oral inflation mechanism the test subject shall demonstrate that oral inflation can be achieved using each hand separately.
b) Test in the water with the test subject treading water; with the unarmed, packed and uninflated device correctly donned, each test subject shall be instructed to locate the oral inflation mechanism upon the command ‘Go’. The test subject shall then locate and attempt to inflate the device using the oral inflation tube, to a volume sufficient enough to obtain positive freeboard and as quickly as possible. Record if the freeboard is positive. If positive, the test subject shall then demonstrate that the oral tube is accessible with the opposite hand.

5.6.8.3 Results

Report if the oral inflation mechanism is accessible by either hand both in and out of the water. Report the time required to achieve a positive freeboard.

5.7 Tests using manikins

5.7.1 General

The test can be used as a supplementary tool to assess PFDs in accordance with ZNS 840-2, ZNS 840-3 and ZNS 840-4, 5.6.3.1, designed for infants or children of less than 20 kg using manikin. The characteristics of a relevant manikin are specified in Annex E.

The manikin shall be dressed in a close-fitting non-buoyant bathing suit. The manikin harness shall be fitted and the PFD shall then be donned on the manikin, over the harness, following the manufacturer’s instructions.

All tests shall be carried out in an indoor pool, in calm water.

DRAFT FOR PUBLIC COMMENT

 ©ZBS 2026 - All rights reserved

The test panel may reject a test result when the floating attitude of the manikin is not representative of a relaxed infant or child, e.g. if one of the limbs is bent into an unnatural position.

5.7.2 Test order

5.7.2.1 General

The tests shall be carried out in one sequence and in the order given in 5.7.2.2 to 5.7.2.4.

5.7.2.2 Series 1:

a) Fall from sitting position on pool-side, 500 mm above water surface (face-forward); b) mouth freeboard;
b) fall from sitting position on pool-side, 500 mm above water surface (face-forward); d) mouth freeboard;
c) fall from sitting position on pool-side, 500 mm above water surface (face-forward); f) mouth freeboard;
d) body angles;
e) self-righting;
f) mouth freeboard (conscious, central head position).

Remove from water and inspect for damage.

5.7.2.3 Series 2:

a) Fall from 1 000 mm (forward-bent);
b) mouth freeboard;
c) fall from 1 000 mm (forward-bent);
d) mouth freeboard;
e) fall from 1 000 mm (forward-bent);
f) mouth freeboard.

Remove from water and inspect for damage.

5.7.2.4 Series 3:

a) Fall from 3 000 mm (forward-bent);
b) mouth freeboard;
c) fall from 3 000 mm (forward-bent);
d) mouth freeboard;
e) fall from 3 000 mm (forward-bent);
f) mouth freeboard.

Remove from water and inspect for damage.

5.7.3 Fall from a height

5.7.3.1 Principle

The principle is to assess the performance of a PFD when the manikin is dropped into the water from a height of (500 ± 50) mm, (1 000 ± 50) mm or (3 000 ± 50) mm.

5.7.3.2 Procedure

The PFD shall bring the manikin to the surface within 5 s of impact.

DRAFT FOR PUBLIC COMMENT

The manikin shall then float in a face-up posture with the mouth clear of the water. There shall be no functional damage to the PFD.

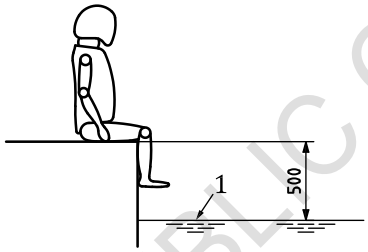
For the drop from the pool-side, the manikin shall be seated at a height of 500 mm above the water surface. Slight even pressure shall be placed on the back of the shoulders, pushing the manikin forwards into the water. See Figure 15.

For the drops from 1 000 mm and 3 000 mm, the quick-release system and line shall be attached to the harness using the D-ring at the back of the neck. Ensure that the PFD is not hindered in any way by the release system. The manikin shall be suspended in a forward-bent position, with the bottom of the feet 1 000 mm or 3 000 mm above the water surface for the drops from 1 000 mm and 3 000 mm, respectively. See Figure 16.

The manikin shall be released, and submersion time recorded as the time from the manikin hitting the water to the time when the mouth markers are seen above the water surface.

Three tests shall be performed at each height. The PFD shall be inspected for displacement after each test and then adjusted. After the third drop, the PFD shall be inspected for damage.

Dimensions in millimetres

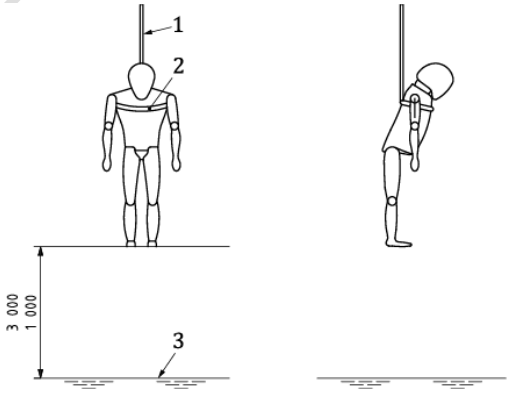


Key

1 water surface

Figure 15: 500 mm fall from pool

Dimensions in millimetres



Key

1 line
2 harness with quick-release system at back of neck
3 water surface

Figure 16: Forward-bent drop

DRAFT FOR PUBLIC COMMENT

©ZBS 2026 - All rights reserved

5.7.4 Mouth freeboard

5.7.4.1 Principle

The freeboard has to be determined according to 5.6.5. With reference to the testing with a manikin, it is to ensure that the lower corner of the mouth is held at a sufficient height above the water surface.

The risk of water washing over the face of the child shall be reduced.

5.7.4.2 Procedure

For a device for measuring freeboard, see 5.6.5.2. The plastic disc at the free end of the measuring tape shall be reduced to a diameter of (20 ± 5) mm.

The tape shall be lowered to the marker at the lower corner of the mouth.

Following a drop test, mouth freeboard shall be measured without adjustment to the position of the head (the unconscious position). Three measurements of mouth freeboard shall be made at each drop height.

Following the self-righting test, a single measurement of mouth freeboard shall be made with the head adjusted to a central (conscious) position in line with the body without adjusting the position of the PFD on the manikin.

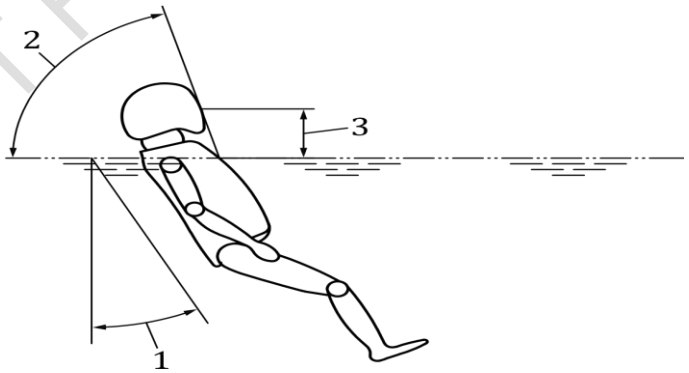
Following a fall into water, the angle of the body in relation to the water surface shall be assessed. It shall be reported whether the body floats in a face-up position (see Figure 17) and whether the head is bent slightly forward relative to the torso, with the nose above the mouth.

> NOTE: If the head of an unconscious child was horizontal, the child could choke due to the tongue blocking the respiratory tract.

Measure the angle of the face in relation to the horizontal, using an imaginary line from the chin to the forehead.

Measure the angle of the body trunk in relation to the vertical, using an imaginary line from the shoulder to the hip.

The angle of the trunk shall be measured underwater, to reduce any effect due to the refraction properties of water. The angle shall be measured from the side and not over the chest.



Key

1 trunk angle
2 face-plane angle
3 mouth freeboard

Figure 17: Mouth freeboard and flotation attitude

DRAFT FOR PUBLIC COMMENT

5.7.5 Self-righting and stability

5.7.5.1 Principle

The principle is to measure the time taken for a PFD to turn the manikin from a face-down to a face-up position with the mouth clear of the water surface. Many children, particularly those who cannot swim, panic if they fall into the water. Therefore, the PFD shall turn a child onto its back with ease, and only be stable in that position.

5.7.5.2 Procedure

With the manikin starting in a face-up floating position, one shoulder of the manikin shall be pushed under water, through an angle of 90°. It shall be assessed whether the manikin returns to the face-up position. Repeat, pushing down the opposite shoulder.

To assess self-righting, turn the manikin onto its front in the face-down floating position, with arms and legs in line with the body. Hold the manikin by the shoulders, in this horizontal position, without applying any significant downward force. Once in the correct position, release.

Time self-righting from the point when the manikin is released to the point when the marked mouth of the manikin is clear of the water surface.

The self-righting test shall be repeated a further two times. All three tests shall meet the requirement for the PFD to pass.

DRAFT FOR PUBLIC COMMENT

©ZBS 2026 - All rights reserved

Annex A

(informative)

Classification of personal flotation devices

A.1 Classes

A.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.

A.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.

A.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 ZNS 840-6.

A.2 Performance levels

A.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.

A.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.

A.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.

DRAFT FOR PUBLIC COMMENT

A.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.

DRAFT FOR PUBLIC COMMENT

©ZBS 2026 - All rights reserved

Annex B

(normative)

Adult reference vest for test subject disqualification

B.1 General

This annex specifies the design and construction of the adult reference vest used to disqualify individual test subjects and to verify that the group of test subjects used represents a valid cross-section of the adult population when testing lifejackets according to ZNS 840-2 to ZNS 840-6.

B.2 Description

The reference vest shall be made with two types of buoyant foam in a vest style using a heavy nylon cover fabric shell secured to the body with 25 mm webbing, closures, and adjustments. The shell shall be made with slide fasteners (zippers) in place of closing seams to hold the foam within, in order that the foam inserts can be easily removed to check their buoyancy and renew or supplement them if they are out of tolerance. Hook and loop fasteners are used on the interior foam retainers to position and prevent shifting of the foam panels. The vest shall be designed to fit persons of a chest size from 700 mm to 1 350 mm and to be comfortable to use as a non-reversible device such that it would be obvious to the user as to which shall be the inside and outside of the device, even under reduced lighting conditions.

B.3 Materials

B.3.1 General

All materials used shall comply with ZNS 840-7.

B.3.2 Foam requirements

B.3.2.1 General

The performance of the reference vest shall be dependent on having the proper foam stiffness and shapes.

B.3.2.2 Stiffness

Two foams of different stiffness are used: one shall be a soft foam and the other shall be a stiff foam. A bridge deflection test shall be provided to determine acceptability for the intended application. Figure B.1 provides the set-up details and Table B.1 provides the specific measured values. For selecting the type of foam for the specific insert, see Tables B.2 and B.3. To measure the centre deflection of a foam panel of the specified cross-section ($a \times b$) and 110 mm wide, place the foam panel centred across the two equal height, parallel, horizontal surfaces separated by the specified distance (c), and then load with a mass of the specified width. The length of the load shall be at least 110 mm, such that when placed on the foam panel it extends over the full width of the foam panel. The load may extend beyond the width of the foam panel provided that it is centred over the panel with equal amounts extending over the sides of the foam panel. Measure the deflection at the bottom centre location of the foam panel 30 s after placing the load on the panel.

B.3.2.3 Shape

The shape of each foam insert is specified in Figures B.8 to B.11. For dimensions, see Tables B.2 and B.4.

DRAFT FOR PUBLIC COMMENT

B.3.2.4 Buoyancy

The total design buoyancy of the inserts shall be 149 N. Table B.3 specifies, for each insert, the buoyancy and buoyancy tolerances. These values apply to both new and used inserts. Table B.3 also specifies the buoyancy distribution between the front and back inserts and the tolerance.

B.3.3 Other component requirements

See Table B.2.

B.4 Construction

B.4.1 The construction and assembly of the device shall be in accordance with Tables B.2 to B.5 and Figures B.2 to B.17.

B.4.2 The seam allowances are 13 mm, unless otherwise specified.

B.4.3 All structural seams use a lock-type stitch so that the seam will not unravel when a force is applied in the direction of the seam on any of the threads forming the stitch. Stitching should have a density of 7 stitches to 12 stitches per 25 mm of stitch length. The box-x stitching on the webbing shall be 15 mm × 18 mm, unless otherwise specified. The bar-tack stitching on the webbing shall be 15 mm × 2 mm.

B.4.4 On the closing seam of the back section of the outer and inside covers, the cut ends of the fabric are turned under and stitched so that the fabric does not ravel. The cut ends of webbing should be heat-sealed.

B.4.5 A tab on the ends of the waist belt shall be formed by turning under 40 mm of material twice and stitching 19 mm from the end of the folds with box-x or bar-tack stitching.

B.4.6 A tolerance of ±6 mm shall be used throughout for fabric cutting and stitching assembly. A tolerance of ±6 mm shall be also used for foam cutting; however, the buoyancy requirements of Table B.3 shall be met.



a) Initial set-up **b) Bridge deflection after 30 s**

Key

1 load, centred over gap *c*
2 foam

Figure B.1 — Foam bridge deflection test

Table B.1: Specifications for the foam bridge deflection test

Foam type	Dimension shown in Figure B.1 mm						Load mass kg
	a (length)	(Not shown) (width)	*b* (thickness)	*c* (span)	*d* (load width)	*e* (deflection)	
Stiff	394	110	83	300	120	<20	8.6
Soft	394	110	45	150	30	≥25	0.75

DRAFT FOR PUBLIC COMMENT

 ©ZBS 2026 - All rights reserved

Table B.2: Parts, quantity and assembly

Component	Description	Quantity	See Figure	Construction notes
1 Cover fabric	420 denier nylon, with ravel-resistant coating, orange			
1.1 Front outer cover		1	B.2	
1.2 Back outer cover		1	B.2	
1.3 Inside cover		1	B.3	
1.4 Centre gusset		2	B.4	
1.5 Collar, outer and inside cover		2	B.5	
1.6 Fabric reinforce-ment		4	B.6 B.14	Attach to inside of collar cover, as attachment 1, for reinforcement at webbing attachment (see Figure B.14).
1.7 Interior fabric retainers for foam inserts 1		2	B.7 B.13	Attach to inside of front cover, as attachment 3, stitch to cover at each side to form a foam retainer for inside front foam insert components 2.2.1 and 2.2.2 (see Figure B.13).
1.8 Interior fabric retainers for foam inserts 2		2	B.7 B.14	Attach hoop and loop fasteners to the ends and stitch at centre to the inside of front cover, as attachment 4, to form a foam retainer for front foam insert components 2.1.1 and 2.1.2 (see Figure B.13).
2 Foam				
2.1 Stiff	See Tables B.1 and B.3			
2.1.1 Front foam insert, right side	81 mm thick	1	B.8	
2.1.2 Front foam insert, left side	81 mm thick	1	B.8	
2.1.3 Collar foam insert	56 mm thick	1	B.10	
2.2 Soft	See Tables B.1 and B.3			
2.2.1 Inside front foam insert, right side	46 mm thick	1	B.9	
2.2.2 Inside front foam insert, left side	46 mm thick	1	B.9	

DRAFT FOR PUBLIC COMMENT

Table B.2 *(continued)*

Component	Description	Quantity	See Figure	Construction notes
2.2.3 Back foam insert	32 mm thick	1	B.11	
3 Webbing	25 mm, polypropylene, with easy adjustment and no significant slippage when used with the specified hardware.			
3.1 Chest strap	127 mm, black	2	B.12	On left side of front cover, attach webbing with male buckle. On right side of front cover, attach webbing with female buckle. The free ends of the chest strap are folded under the yellow webbing (collar attachment webbing), with reinforcing fabric (see Figure B.6) on inside of cover fabric. A box-x stitch shall be used to attach the chest strap to the front cover.
3.2 Waist belt	203 mm, black	2	B.12	On left side, attach waist belt with slide and buckle clip waist belt. On right side, attach bottom belt with D-ring and slide.
3.3 Waist belt	1 867 mm, black	1	B.12 B.13	Form 40 mm tab on each end. Attach to back cover using three box-x stitches (after front and back covers are assembled).
3.4 Belt loop on front cover	76 mm, black	2	B.12	Attach webbing to front outer cover and form a belt loop (one on each side) by two sets of double bar tack stitches.
3.5 Belt loop on inside cover	89 mm, black	2	B.13	Attach webbing to inside cover and form a belt loop (one on each side) by two box-x stitches.
3.6 Collar attachment	1 384 mm, yellow	1	B.14 B.6 B.12	Attach webbing to collar and reinforcing fabric, in two places using box-x stitch.
4 Hook and loop fastener	50 mm × 70 mm, black generic	2	B.13 B.7	Hook and loop fasteners are attached to the ends of interior fabric retainer for foam insert.
5 Thread	Generic synthetic	AR		
6 Hardware				

DRAFT FOR PUBLIC COMMENT

©ZBS 2026 - All rights reserved

Table B.2 *(concluded)*

Component	Description	Quantity	See Figure	Construction notes
6.1 Buckle	Male and female 25 mm, plastic, 890 N single-end strength	1		Chest strap
6.2 Slide	Adjuster 25 mm, plastic, 1 600 N single-end strength	2		Waist belt
6.3 Snap hook	25 mm, stainless steel, 1 600 N single-end strength	1		Waist belt
6.4 D-ring	25 mm, stainless steel, 1 600 N single-end strength	2		Waist belt
6.5 Zipper	280 mm, plastic (zipper chain and pulls)	1	B.14	Foam access for collar cover
6.6 Zipper	370 mm, plastic (zipper chain and pulls)	1	B.12	Foam access for back cover
6.7 Zipper	440 mm, plastic (zipper chain and pulls)	2	B.12 B.13	Foam access for front cover

Table B.3 — Foam inserts buoyancy specifications

Values in Newton

Insert	Front right	Front left	Inside front right	Inside front left	Back	Collar
Foam type[a]	Stiff	Stiff	Soft	Soft	Soft	Stiff
Buoyancy[b]	34 ± 1.1	34 ± 1.1	17.5 ± 0.65	17.5 ± 0.65	18 ± 0.7	28 ± 0.8

[a] The buoyancy of most foams changes over time with the greatest change occurring in the first several months after manufacture. The exact kind of foam selected needs to be evaluated to determine the amount of additional buoyancy needed at the time of manufacture to maintain the values specified.

[b] Buoyancy distribution: (69 ± 1.5) % front.

Table B.4 — List of dimensions shown in Figures B.2 to B.14

Dimensions in millimetres

Dimension	Figure											
	B.2	B.3	B.4	B.5	B.6, B.7	B.8	B.9	B.10	B.11	B.12	B.13	B.14
a	66	298	23	308	73	198	76	20	188	120	138	19
b	298	100	497	75	73	46	46	56	274	18	18	155
c	427	1106	586	10	130	76	394	51	414	35	35	53
d	430	199	102	288	205	84	38	216	343	5	295	25
e	423	398		342	72	76	51	229	147	95	55	45

DRAFT FOR PUBLIC COMMENT

f	141	597		396	470	157	165	259	223	320		
g	100	1124		65		394		45		90		
R								70				
h	705	141				46				40		
i	199					8				55		
j	398					20				255		
k	197					20				80		
l	723					76						
m						46						
n						38						
o						165						
p						25						

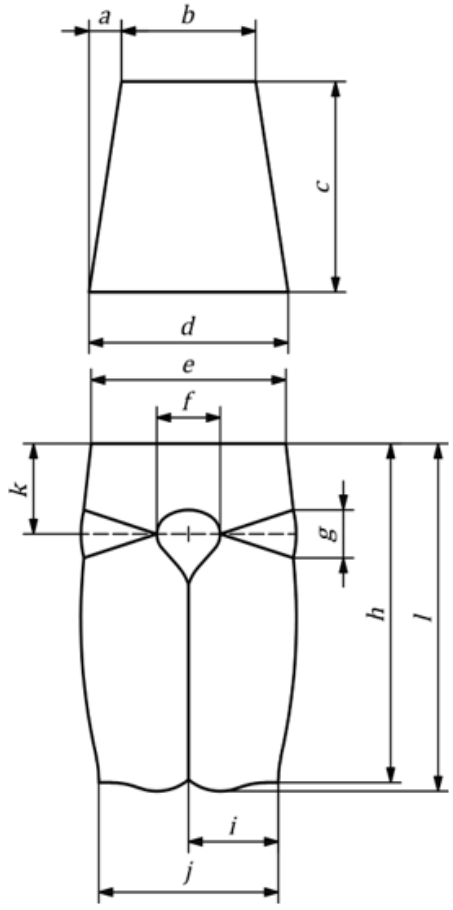


Figure B.2: Outer cover, front and back sections

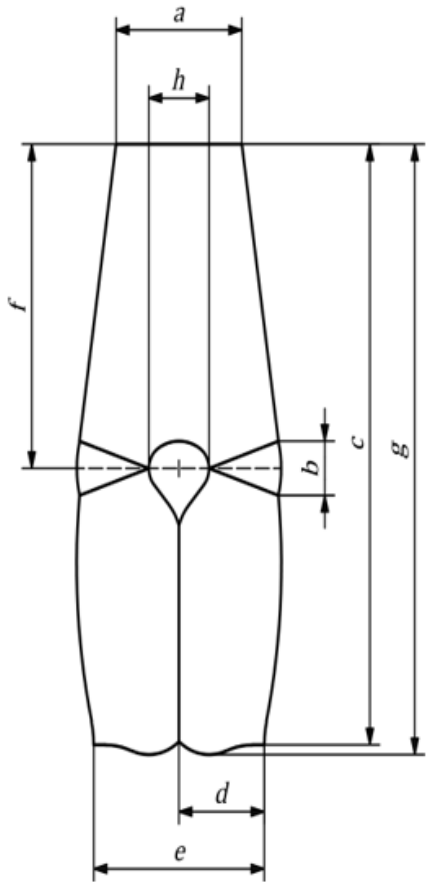


Figure B.3: Inside cover

©ZBS 2026 - All rights reserved

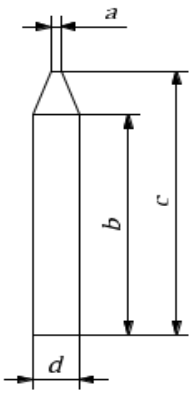


Figure B.4: Centre gusset

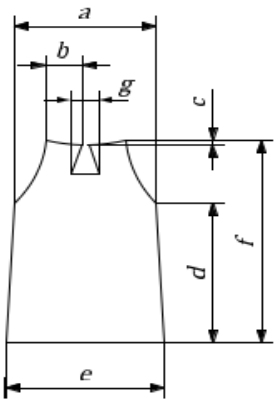


Figure B.5: Outer and inside cover, collar

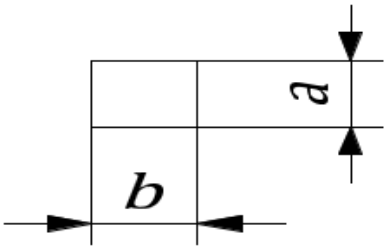


Figure B.6: Fabric reinforcement

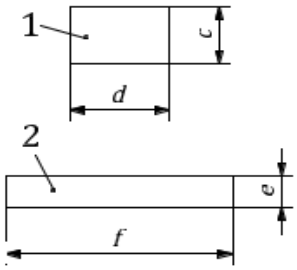
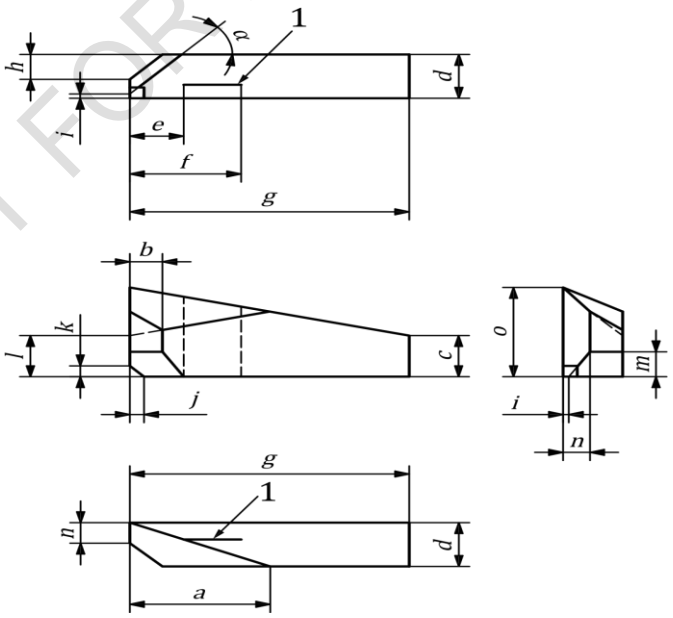


Figure B.7: Interior foam retainer

Key

1 interior fabric retainers for foam inserts 1
2 interior fabric retainers for foam inserts 2



Key

1 slot α 45°

Figure B.8: Front foam insert

DRAFT FOR PUBLIC COMMENT

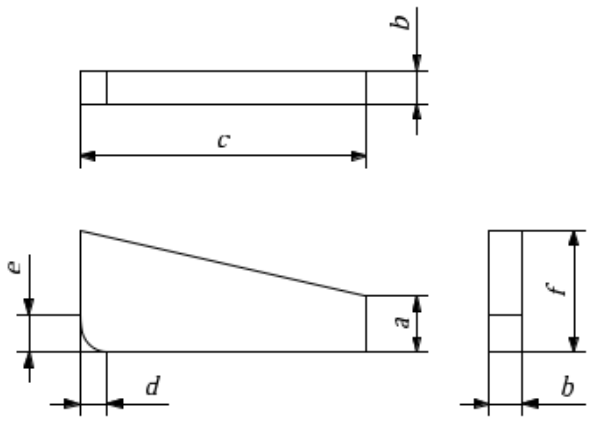
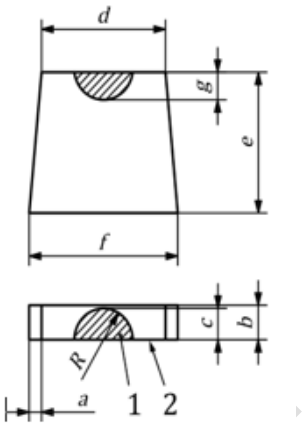


Figure B.9: Inside front foam inserts



Key

1 skive
2 side towards body

Figure B.10: Collar foam insert

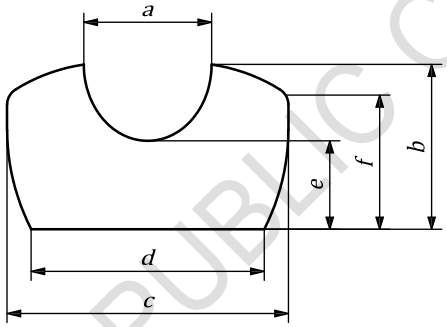
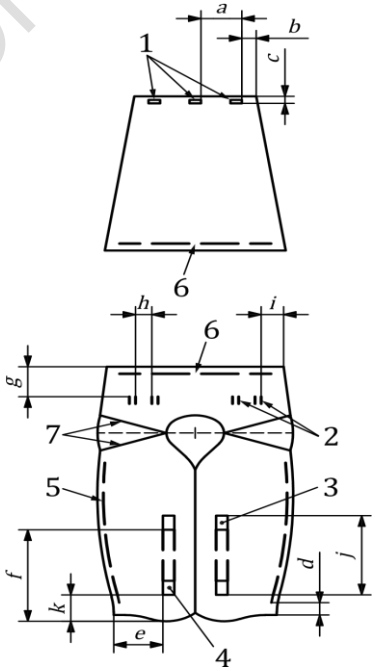


Figure B.11: Back foam insert (thickness = 25 mm)



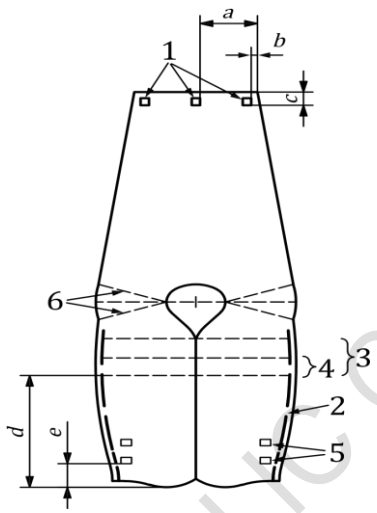
DRAFT FOR PUBLIC COMMENT

©ZBS 2026 - All rights reserved

Key

1 waist belt (1 867 mm) attachment to outside of back cover
2 belt loop webbing (76 mm) attachment to outside of front over
3 chest strap webbing (127 mm) attachment to outside of front cover
4 waist belt (203 mm) attachment to outside of front cover
5 zipper (440 mm) attachment to front
6 zipper (370 mm) attachment to the front and back covers
7 dart

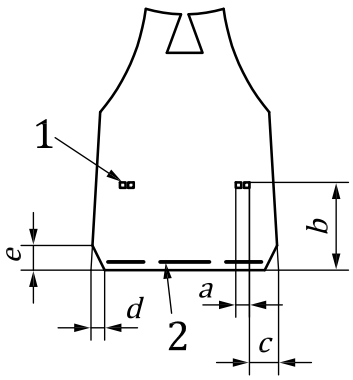
Figure B.12: Attachments to front and back cover (dimensions on pattern, before sewing)



Key

1 waist belt (1 867 mm) attachment to outside of back cover and inside cover (see Figure B.12)
2 zipper (440 mm) attachment
3 interior fabric retainer attachment to centre and outer edge of inside front cover
4 interior fabric retainer attachment to centre of inside front cover
5 belt loop webbing (89 mm) attachment to outside of cover
6 dart

Figure B.13: Attachments to inside cover (dimensions on pattern, before sewing)



Key

1 collar webbing (1 384 mm) attachment on the outside of the inner cover with reinforcement fabric inside
2 zipper (280 mm) attachment to the outer and inner covers

Figure B.14 — Attachments to outer and inside collar cover (dimensions on pattern, before sewing)

DRAFT FOR PUBLIC COMMENT

Table B.5: List of dimensions shown in Figures B.16 and B.17

Figure	Dimension, mm																	
	a	*b*	*c*	*d*	*e*	*f*	*g*	*h*	*i*	*j*	*k*	*l*	*m*	*n*	*o*	*p*	*q*	*r*
B.16	450	530	980[a]	90	60	340	20	310	70	50	60	260	240	270	130	80	70	30
B.17	260	340	230	120	215	210	60	290										
[a] Dimension *c* on Figure B.16 = dimensions *a* + *b* (i.e. dart closed).																		

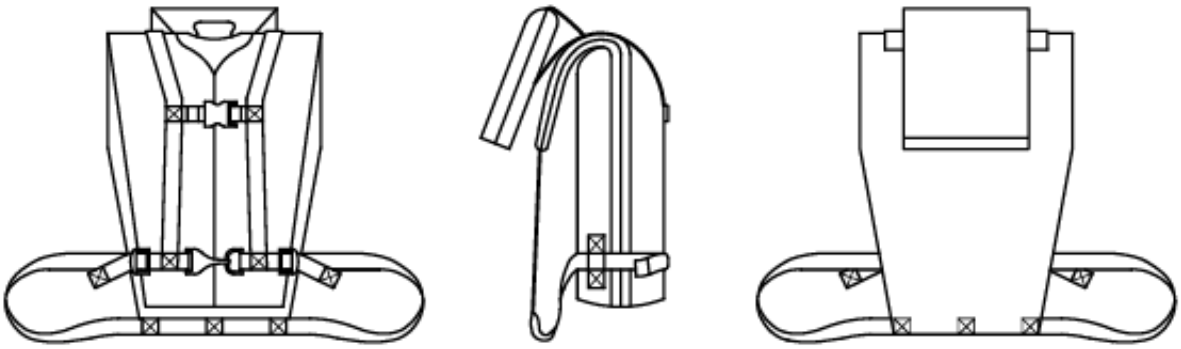
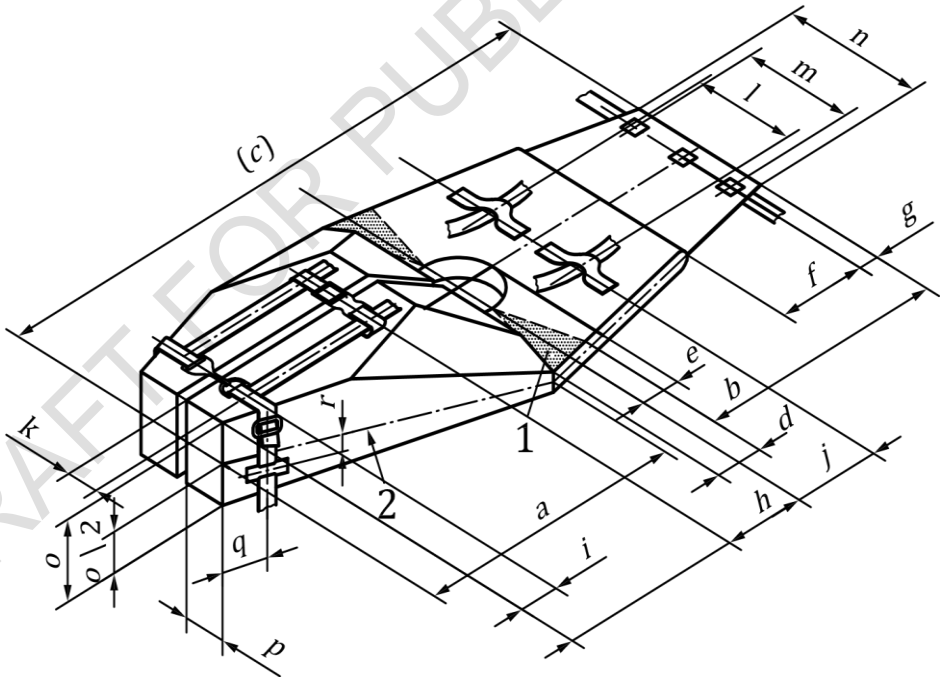


Figure B.15: Assembly views of finished reference vest



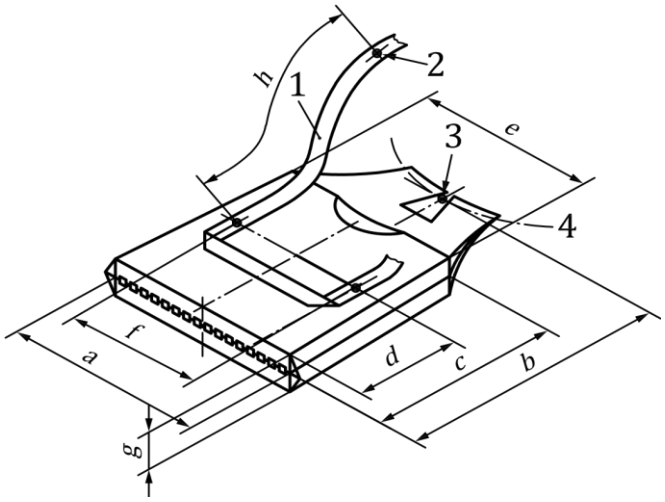
Key

1 dart at shoulder seam; shown spread out
2 seam line and side zipper location

Figure B.16: Assembly dimensions of finished reference vest body with collar removed

DRAFT FOR PUBLIC

©ZBS 2026 - All rights reserved



Key

1 collar attachment webbing
2 nearest point of attachment to chest of vest
3 centre of neck seam on vest
4 assembly seam in neck of vest

NOTE: *h* is measured along the webbing to nearest points of attachment.

Figure B.17: Assembly dimensions of finished reference vest collar

DRAFT FOR PUBLIC COMMENT

Annex C

(normative)

Child reference vest for test subject disqualification and test subject group validation (body mass from 25 kg to 40 kg)

C.1 General

This Annex specifies the design and construction of the child reference vest used to disqualify individual test subjects and to verify that the group of test subjects used represents a valid cross-section of the potential user population when testing lifejackets according to ZNS 840-2 to ZNS 840-6.

C.2 Description

This reference vest shall be made with layers of buoyant foam in a bib-style design using a heavy nylon shell cover fabric secured to the body with a waist belt with quick and positive closure and adjustment, along with a chest strap at the neck for closure and adjustment. The shell shall be made with slide fasteners (zippers) in place of closing seams to hold the foam within, in order that the foam inserts can be easily removed to check their buoyancy and renew or supplement them if they are out of tolerance. The vest shall be designed to fit persons of chest size from 500 mm to 700 mm. The vest was designed to be reasonably comfortable to use as a non-reversible device.

C.3 Materials

C.3.1 General

All materials used shall comply with ZNS 840-7.

C.3.2 Foam requirements

C.3.2.1 Stiffness and quality

The buoyant inserts are made of layers of medium stiffness foam to create a flexible but firm buoyancy element.

C.3.2.2 Shape

The shape of each foam layer is identified in Figures C.2 and C.3. Dimensions are given in Tables C.1, C.2 and C.3.

C.3.2.3 Buoyancy

The total design buoyancy of the device shall be 88 N. Table C.4 identifies, for each insert, the buoyancy, buoyancy tolerances, and distribution when checked at the time of testing.

C.3.3 Other component requirements

See Table C.1.

C.4 Construction

C.4.1 The construction and assembly of the device shall be in accordance with Tables C.1 and C.5 and Figures C.1 through C.9.

C.4.2 Seam allowances are 13 mm, unless otherwise specified.

C.4.3 All structural seams use a lock-type stitch so that the seam does not unravel when a force is applied in the direction of the seam on any of the threads forming the stitch. Stitching should have a

DRAFT FOR PUBLIC COMMENT

 ©ZBS 2026 - All rights reserved

density of 7 stitches to 12 stitches per 25 mm of stitch length. Box-x stitching on the webbing shall be 30 mm × 15 mm for the waist belt and 15 mm × 13 mm for the belt loop and chest strap, unless otherwise specified. The bar-tack stitching on webbing shall be 30 mm × 2 mm for the waist belt and 15 mm × 2 mm for the belt loop and chest strap.

C.4.4 The fabric reinforcements for the waist belt, belt loop, and chest strap should be attached to the inside surface of the outside cover before attaching any of these items. On the closing seam of the top and bottom sections of the outside and inside cover, the cut ends of the fabric are turned under and stitched when installing the zippers so that the fabric does not ravel and so that the folds are flush with the line where the zipper teeth mesh (zippers installed to be hidden by cover fabric when closed).

C.4.5 A tolerance of ±6 mm shall be used throughout for fabric cutting and stitching assembly. A tolerance of ±6 mm shall be also used for foam cutting; however, the buoyancy requirements of Table C.4 shall be met.

Table C.1 — Parts, quantity and assembly

Component	Description	Quantity	See Figure	Construction notes
1 Cover fabric	420 denier nylon, with ravel-resistant coating, orange			
1.1 Outside cover		1	C.1, C.4, C.9	
1.2 Inside cover		1	C.1, C.4, C.9	
1.3 Fabric reinforcement, chest strap		2	C.5, C.9	Attach one each to inside left and right outside covers for the chest strap. Use lock stitches on three sides each (see Figure C.9 for locations).
1.4 Fabric reinforcement, belt, and belt loop		2	C.5, C.9	Attach to inside left and right outside covers for the waist belt and belt loop. Use lock stitches on three sides (see Figure C.9 for location).
2 Foam	7 mm thickness, polyethylene foam, except for one layer as needed to achieve required buoyancy			Layers stacked per Figures C.2 and C.3.
2.1 Front foam insert, left		13 layers	C.2	Trim corners per Figure C.2, except layers C through E.
2.2 Front foam insert, right		13 layers	C.2	Trim corners per Figure C.2, except layers C through E.
2.3 Back foam insert		11 layers	C.3	
3 Webbing				All cut ends heat-sealed.

DRAFT FOR PUBLIC COMMENT

Table C.1 *(concluded)*

Component	Description	Quantity	See Figure	Construction notes
3.1 Waist belt webbing	38 mm, black, polypropylene, with easy adjustment and no significant slippage when used with the specified hardware.	1 285 mm cut length	C.1, C.8, C.9	On left side attach waist belt with fixed part of buckle. Tab on the end of belt formed by turning under 40 mm of material twice and stitching 19 mm from the end of the fold with a bar-tack stitch. For location see Figure C.9.
3.2 Belt loop webbing	19 mm, black, polypropylene.	80 mm cut length	C.1, C.9	Attach webbing to front outside cover with two sets of double bars-tack stitches to form a belt loop. For location see Figure C.9.
3.3 Chest strap webbing	19 mm, black, polypropylene.	235 mm and 80 mm cut length	C.1, C.7, C.9	Attach webbing with female buckle to right outside cover. Attach webbing with male buckle to left outside cover. For location see Figure C.9. Tab formed 75 mm from the free end of the male section of chest strap by folding in “Z” pattern 30 mm apart and stitching 15 mm from the fold with a bar-tack stitch. See Figure C.7.
4 Thread	Generic synthetic	AR		
5 Hardware				
5.1 Buckle	38 mm, plastic (male and female sections)	1	C.1, C.8	Used in waist belt assembly.
5.2 Buckle	19 mm, plastic (male and female sections)	1	C.1, C.7	Used in chest strap assembly.
5.3 Zipper	380 mm, plastic (zipper chain length)	1	C.1, C.9	
5.4 Zipper	150 mm, plastic separating (zipper chain and box/pin length)	2	C.1, C.9	

Table C.2: List of dimensions shown in Figure C.2

Dimension, mm	Insert layer				
	A	**B**	**C**	**D**	**E**
a	145	140	125	115	95
b	305	300	285	275	255
c	30	30	0	0	0

DRAFT FOR PUBLIC COMMENT

©ZBS 2026 - All rights reserved

Table C.3 — List of dimensions shown in Figure C.3

Dimension, mm	Insert layer				
	A	**B**	**C**	**D**	**E**
a	343	335	325	315	305
b	140	133	120	108	95
c	9	5	3	0	–5
R	46	50	52	55	55

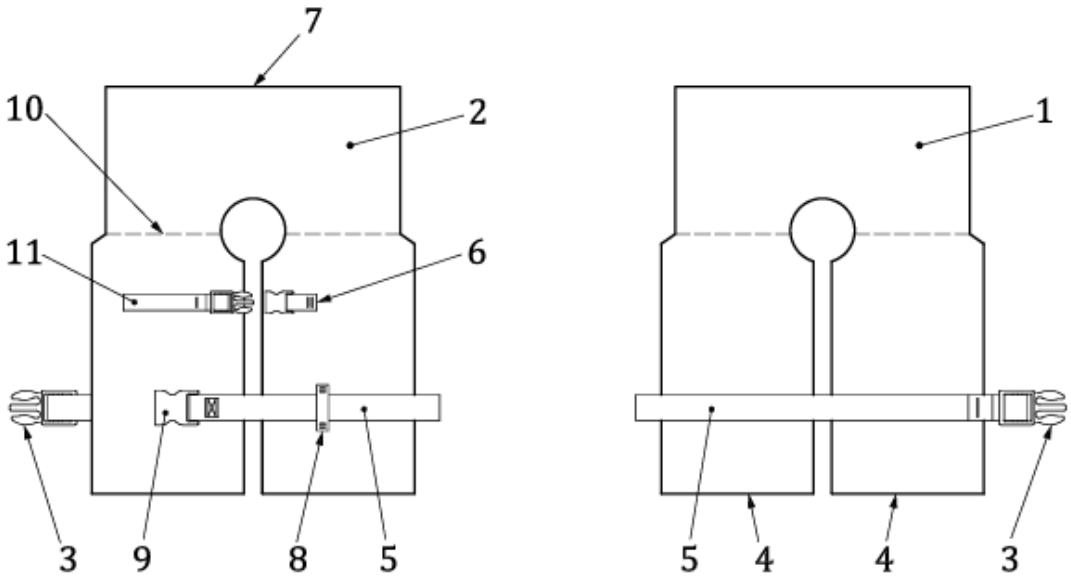
Table C.4: Foam insert specifications

Property	**Left front insert**	**Right front insert**	**Back insert**
Density	(29 ± 5) kg/m^3	(29 ± 5) kg/m^3	(29 ± 5) kg/m^3
Compressive strength at 25 %; determined in accordance with ISO 3386-1:1986 +Amd.1:2010	(35 ± 10) kPa	(35 ± 10) kPa	(35 ± 10) kPa
Buoyancy[a,b]	(31.5 ± 1.2) N	(31.5 ± 1.2) N	(25 ± 1.2) N
[a] The buoyancy of most foams changes over time with the greatest change occurring in the first several months after manufacture. The exact kind of foam selected needs to be evaluated to determine the amount of additional buoyancy needed at the time of manufacture to achieve the values specified. [b] Buoyancy distribution: (71.5 ± 1.5) % front.			

Table C.5: List of dimensions shown in Figures C.4 to C.9

Dimension, mm	**Figure C.4**	**Figure C.5**		**Figure C.6**	**Figure C.7**	**Figure C.8**	**Figure C.9**
		Fabric according to No. 1 in the key	**Fabric according to No. 2 in the key**				
a	420	75	80	75	90	1 150[a]	45
b	210	105	110		40		135
c	92						85
d	210						45
e	356						25
f	230						33
g	460						115
h	375						25
i	580						265
[a] With webbing assembly fully extended.							

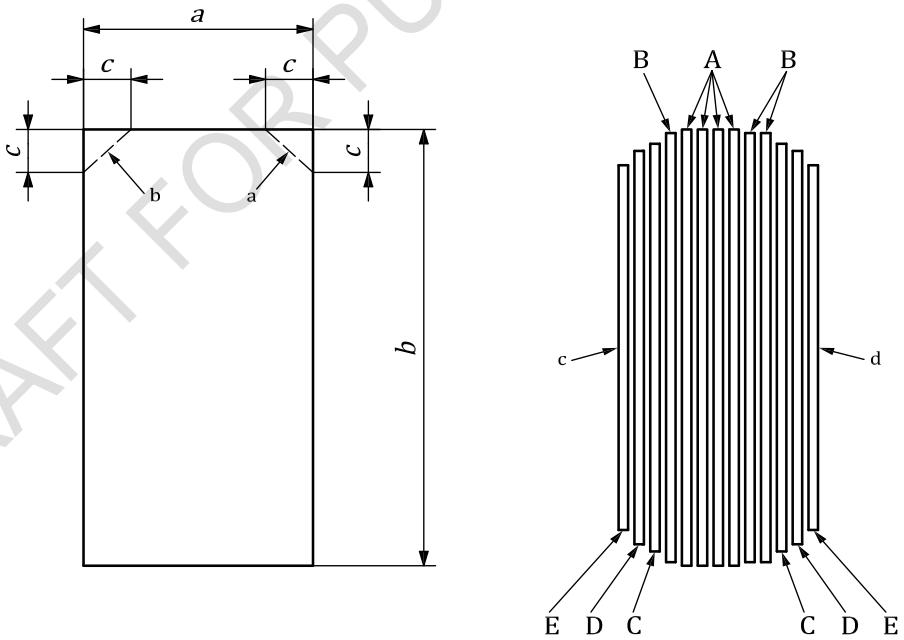
DRAFT FOR PUBLIC COMMENT



Key

1 inside cover fabric
2 outside cover fabric
3 adjustable part of closure
4 zippers for access to front right and left foam compartment
5 waist belt
6 fixed part of chest strap
7 zipper for access to back foam compartment
8 belt loop
9 fixed part of closure
10 lock stitch to provide foam compartment separation
11 adjustable part of chest strap

Figure C.1: General arrangement of the device, right side out (outside and inside)



[a] Trim upper right corner only for left insert layers according to Table C.2.
[b] Trim upper left corner only for right insert layers according to Table C.2.
[c] Outside.
[d] Inside.

Figure C.2: Front foam inserts (right and left sides)

DRAFT FOR PUBLIC COMMENT

©ZBS 2026 - All rights reserved

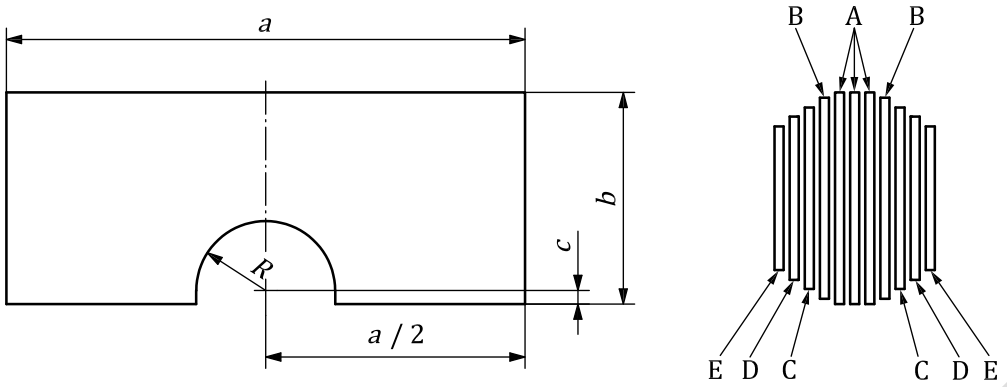


Figure C.3: Back foam insert

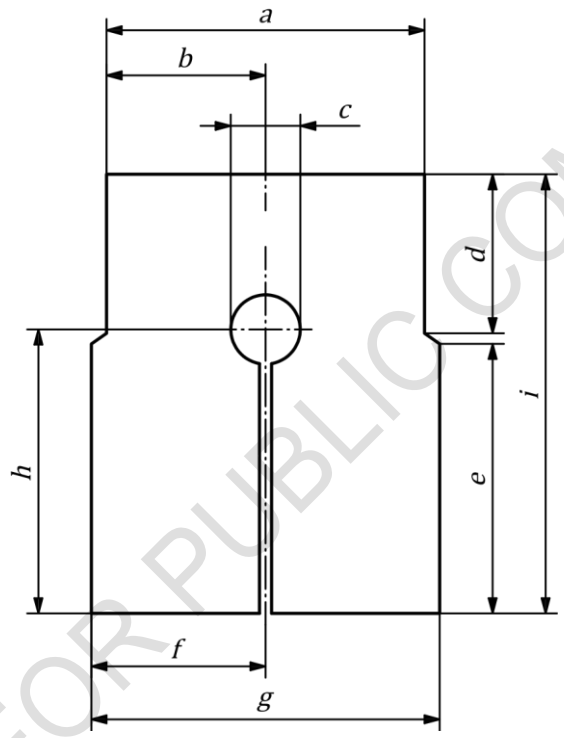
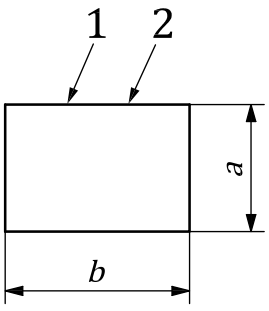


Figure C.4: Cover cut pattern (outside and inside covers)

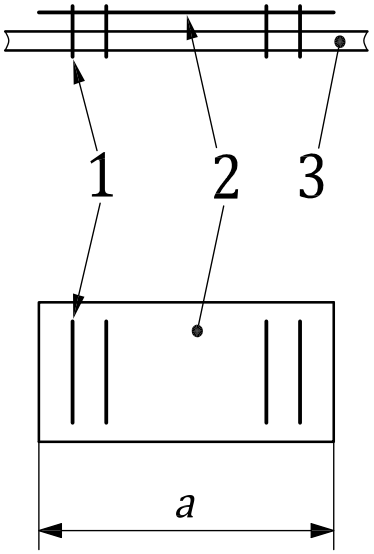


Key

1 fabric reinforcements for chest strap attachments
2 fabric reinforcement for waist belt and belt loop attachments

Figure C.5: Fabric reinforcements

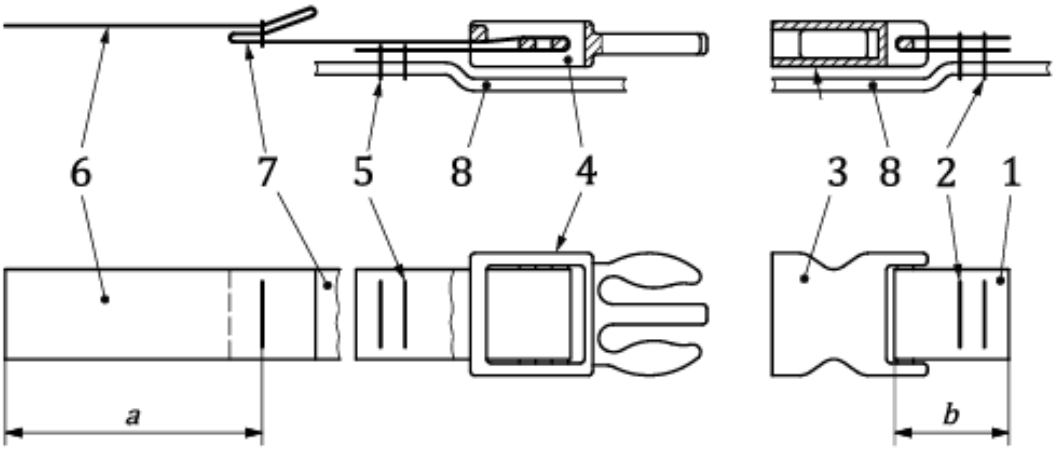
DRAFT FOR PUBLIC COMMENT



Key

1 bar-tack stitch
2 webbing
3 outer cover and reinforcement (shown on lower view only)

Figure C.6: Belt loop



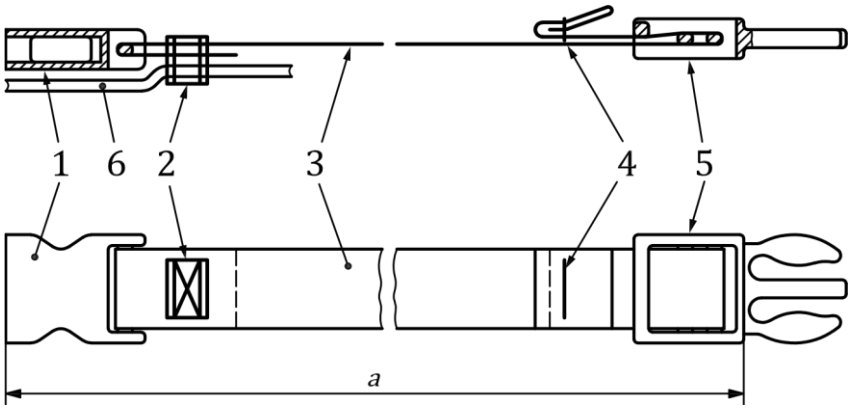
Key

1 webbing
2 double bar-tack (or box-x) stitch
3 fixed part of closure
4 adjustable part of closure
5 double bar-tack (or box-x) stitch
6 webbing
7 tab
8 outer cover and reinforcement (shown on lower view only)

Figure C.7: Chest strap assembly (adjustable part left and fixed part right)

DRAFT FOR PUBLIC COMMENT

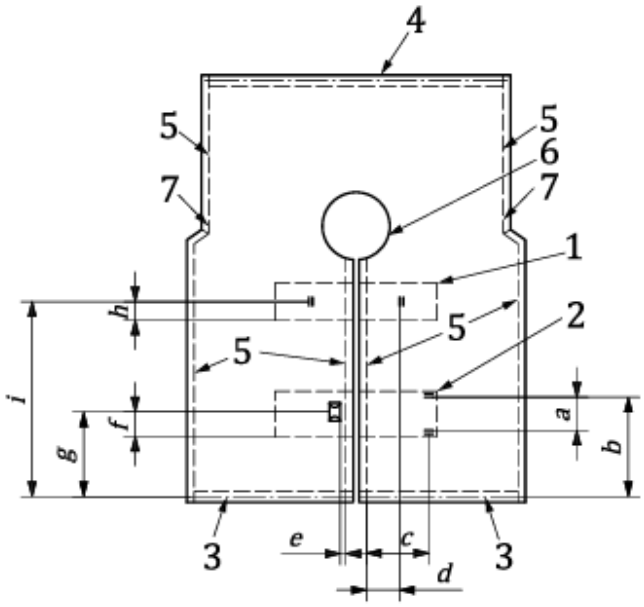
©ZBS 2026 - All rights reserved



Key

1 fixed part of plastic closure
2 box-x (or double bar-tack) stitch
3 webbing
4 tab, webbing double-folded and secured with a bar-tack stitch
5 adjustable part of plastic closure
6 outer left cover and reinforcement (shown on lower view only)

Figure C.7: Waist belt assembly



Key

1 stitching on interior fabric reinforcement for chest strap on right and left sides of the outside cover
2 stitching on interior fabric reinforcement for waist belt and belt loop on right and left sides of the outside cover
3 fabric fold and zipper teeth line of engagement when attached to outside and inside covers
4 fabric fold and zipper teeth line of engagement when attached to outside and inside covers
5 lock-stitch seam (with fabric face-to-face)
6 lock-stitch with 5 mm seam allowance and over-edge stitch (with fabric face-to-face)
7 after-stitching cut relief

Figure C.9: Initial assembly (outside and inside covers)

DRAFT FOR COMMENT

Annex D

(normative)

Reference vest for test subject disqualification and test subject group validation (body mass less than 25 kg)

D.1 General

This Annex specifies the design and construction of the reference vest used to disqualify individual test subjects and to verify that the group of test subjects used represents a valid cross-section of the potential user population.

D.2 Description

This reference vest shall be made with layers of buoyant foam in a bib-style design using a heavy nylon shell cover fabric secured to the body with a waist belt with quick and positive closure and adjustment, along with a chest strap at the neck for closure and adjustment. The shell is made with slide fasteners (zippers) in place of closing seams to hold the foam within, in order that the foam inserts can be easily removed to check their buoyancy and renew or supplement them if they are out of tolerance. The vest is designed to fit persons with a chest size of less than 500 mm. The vest shall be designed to be reasonably comfortable to wear as a non-reversible device.

D.3 Materials

D.3.1 General

All materials used shall comply with ZNS 840-7.

D.3.2 Foam requirements

D.3.2.1 Stiffness and quality

The buoyant inserts are made of layers of medium stiffness foam to create a flexible but firm buoyancy element.

D.3.2.2 Shape

The shape of each foam layer is identified in Figures D.2 and D.3. Dimensions are given in Tables D.1, D.2 and D.3.

D.3.2.3 Buoyancy

The total design buoyancy of the device is 71 N. Table D.4 identifies foam characteristics, the buoyancy for each insert and its tolerances, and the overall buoyancy distribution to be verified when using the PFD for certification testing.

D.3.3 Other component requirements

See Table D.1.

D.4 Construction

D.4.1 The construction and assembly of the device shall be in accordance with Tables D.1 and D.5 and Figures D.1 through D.9.

D.4.2 Seam allowances are 13 mm, unless otherwise specified.

DRAFT FOR PUBLIC COMMENT

 ©ZBS 2026 - All rights reserved

D.4.3 All structural seams use a lock-type stitch so that the seam does not unravel when a force is applied in the direction of the seam on any of the threads forming the stitch. Stitching should have a density of 7 stitches to 12 stitches per 25 mm of stitch length. Box-x stitching on the webbing is 30 mm × 15 mm for the waist belt and 15 mm × 13 mm for the belt loop and chest strap, unless otherwise specified. The bartack stitching on webbing is 30 mm × 2 mm for the waist belt and 15 mm × 2 mm for the belt loop and chest strap.

D.4.4 The fabric reinforcements for the waist belt, belt loop, and chest strap should be attached to the inside surface of the outside cover before attaching any of these items. On the closing seam of the top and bottom sections of the outside and inside cover, the cut ends of the fabric are turned under and stitched when installing the zippers so that the fabric does not ravel and so that the folds are flush with the line where the zipper teeth mesh (zippers installed to be hidden by cover fabric when closed).

D.4.5 A tolerance of ±6 mm is used throughout for fabric cutting and stitching assembly. A tolerance of ±6 mm is also used for foam cutting; however, the buoyancy requirements of Table D.4 shall be met.

Table D.1: Parts, quantity and assembly

Component	Description	Quantity	See Figure	Construction notes
1 Cover fabric	420 mm denier nylon, with ravel-resistant coating, orange			
1.1 Outside cover		1	D.1, D.4, D.9	
1.2 Inside cover		1	D.1, D.4, D.9	
1.3 Fabric reinforcement, chest strap		2	D.5, D.9	Attach one each to inside left and right outside covers for the chest strap. Use lock stitches on three sides each (see Figure D.9 for locations).
1.4 Fabric reinforcement, belt, and belt loop		2	D.5, D.9	Attach to inside left and right outside covers for the waist belt and belt loop. Use lock stitches on three sides (see Figure D.9 for location).
2 Foam	7 mm thickness, polyethylene (PE) foam, except for one layer as needed to achieve required buoyancy			Layers stacked per Figures D.2 and D.3.
2.1 Front foam insert, left		13 layers	D.2	Trim corners per Figure D.2, except layers B through G.
2.2 Front foam insert, right		13 layers	D.2	Trim corners per Figures D.2, except layers B through G.
2.3 Back foam insert		11 layers	D.3	

DRAFT FOR PUBLIC COMMENT

Table D.1 *(concluded)*

Component	Description	Quantity	See Figure	Construction notes
3 Webbing				All cut ends heat-sealed.
3.1 Waist belt webbing	38 mm, black, polypropylene, with easy adjustment and no significant slippage when used with the specified hardware.	1 085 mm cut length	D.1, D.8, D.9	On left side, attach waist belt with female buckle. Tab on the end of belt formed by turning under 40 mm of material twice and stitching 19 mm from the end of the fold with a bar-tack stitch. For location see Figure D.9.
3.2 Belt loop webbing	19 mm, black, polypropylene.	80 mm cut length	D.1, D.6, D.9	Attach webbing to front outside cover with two sets of double bar tack stitches to form a belt loop. For location see Figure D.9.
3.3 Chest strap webbing	19 mm, black, polypropylene.	235 mm and 80 mm cut length	D.1, D.7, D.9	Attach webbing with female buckle to right outside cover. Attach webbing with male buckle to left outside cover. For location see Figure D.9. Tab formed 75 mm from the free end of the male section of chest strap by folding in 'Z' pattern 30 mm apart and stitching 15 mm from the fold with a bar-tack stitch. See Figure D.7.
4 Thread	Generic synthetic	AR		
5 Hardware				
5.1 Buckle	38 mm, plastic (male and female sections)	1	D.1, D.8	Used in waist belt assembly
5.2 Buckle	19 mm, plastic (male and female sections)	1	D.1, D.7	Used in chest strap assembly
5.3 Zipper	350 mm, plastic (zipper chain length)	1	D.1, D.9	Installed to be hidden by cover fabric when closed.
5.4 Zipper	180 mm, plastic separating (zipper chain and box/ pin length)	2	D.1, D.9	Installed to be hidden by cover fabric when closed.

Table D.2: List of dimensions shown in Figure D.2

Dimension, mm	Insert ayer						
	A	**B**	**C**	**D**	**E**	**F**	**G**
a	140	133	127	120	108	95	83
b	190	184	178	172	165	160	140
c	28	28	28	28	28		

DRAFT FOR PUBLIC COMMENT

©ZBS 2026 - All rights reserved

Table D.3: List of dimensions shown in Figure D.3

Dimension, mm	Insert layer				
	A	**B**	**C**	**D**	**E**
a	310	303	290	275	255
b	165	160	140	120	95
c	3	3	3	3	−3
R	44	44	44	44	44

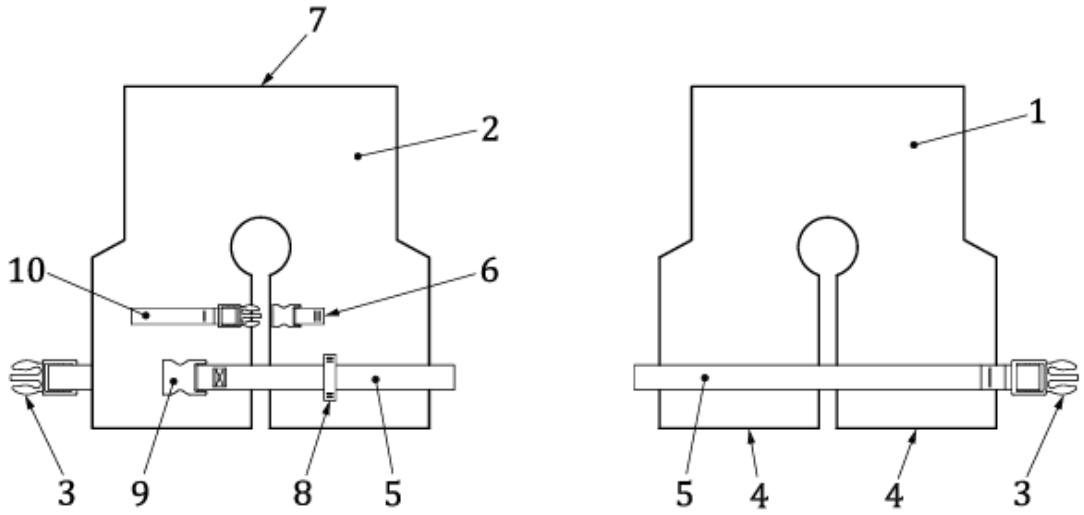
Table D.4: Foam insert specifications

Property	**Left front insert**	**Right front insert**	**Back insert**
Density	(25 ± 5) kg/m^3	(25 ± 5) kg/m^3	(25 ± 5) kg/m^3
Compressive strength at 25 %; determined in accordance with ISO 3386-1:1986 +Amd.1:2010	(28 ± 10) kPa	(28 ± 10) kPa	(28 ± 10) kPa
Buoyancy[a,b]	(21 ± 1.2) N	(21 ± 1.2) N	(29 ± 1.2) N
[a] The buoyancy of most foams changes over time with the greatest change occurring in the first several months after manufacture. The exact kind of foam selected needs to be evaluated to determine the amount of additional buoyancy needed at the time of manufacture to achieve the values specified. [b] Buoyancy distribution: (59.2 t ± 1.5) % front.			

Table D.5: List of dimensions shown in Figures D.4 to D.9

Dimension, mm	**Figure D.4**	**Figure D.5**		**Figure D.6**	**Figure D.7**	**Figure D.8**	**Figure D.9**
		Fabric according to No. 1 in the key	**Fabric according to No. 2 in the key**				
a	390	75	80	75	90	950[a]	45
b	195	105	110		40		115
c	85						140
d	220						45
e	245						25
f	241						33
g	482						95
h	260						25
i	490						160
[a] With webbing assembly fully extended.							

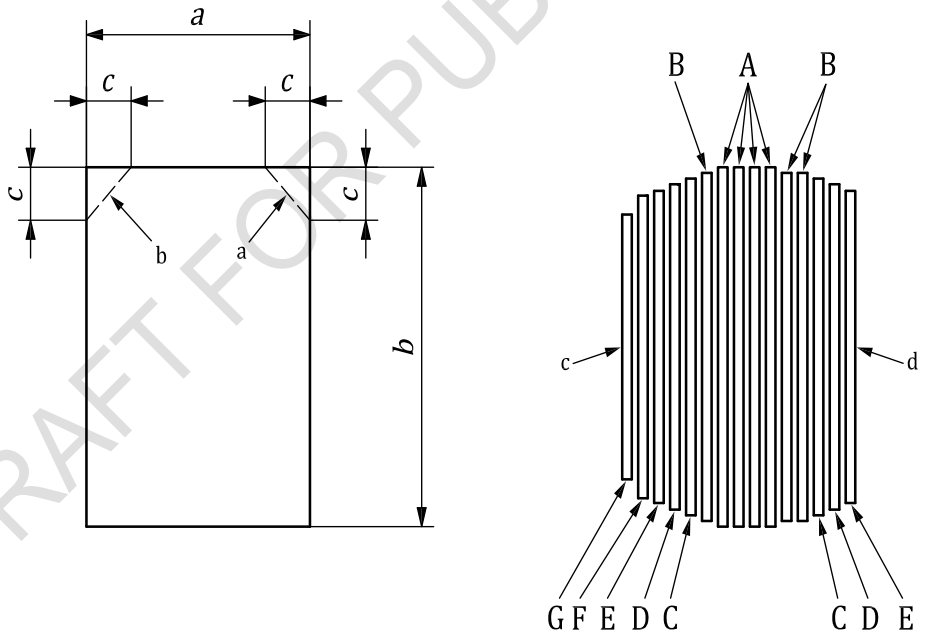
DRAFT FOR PUBLIC COMMENT



Key

1 inside cover fabric
2 outside cover fabric
3 adjustable part of closure
4 zippers for access to front right and left foam compartment
5 waist belt
6 fixed part of chest strap
7 zipper for access to back foam compartment
8 belt loop
9 fixed part of closure
10 10 lock stitch to provide foam compartment separation
11 adjustable part of chest strap F

Figure D.1: General arrangement, right side out (outside and inside)



[a] Trim upper right corner only for left insert layers according to Table D.2.
[b] Trim upper left corner only for right insert layers according to Table D.2.
[c] Outside.
[d] Inside.

Figure D.2: Front foam inserts (right and left sides)

DRAFT FOR PUBLIC COMMENT

©ZBS 2026 - All rights reserved

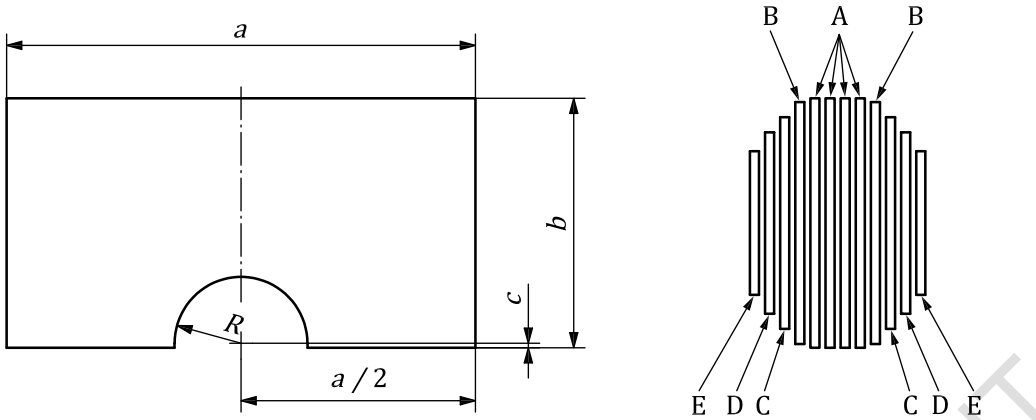


Figure D.3: Back foam insert

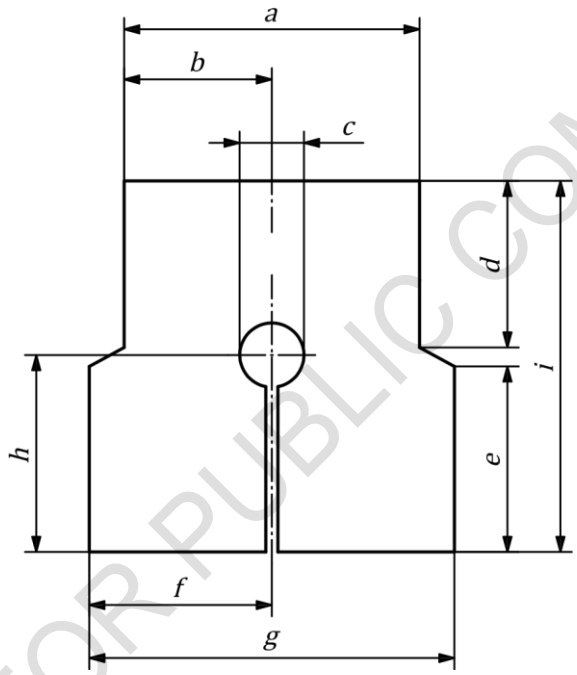
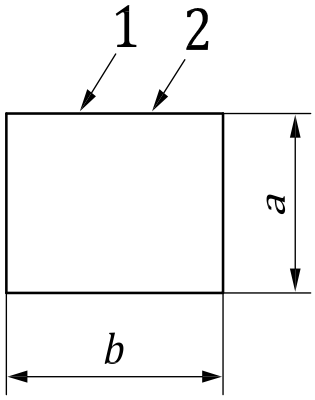


Figure D.4: Cover cut pattern (outside and inside covers)

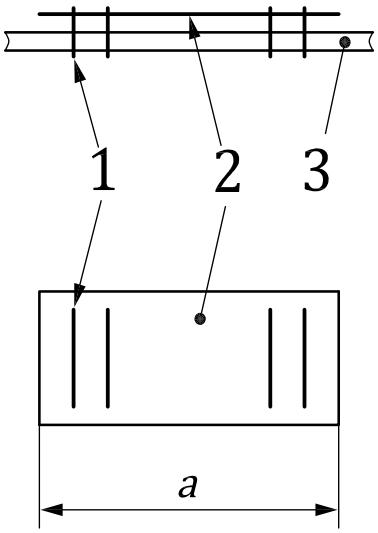


Key

1 fabric reinforcement for chest strap attachments
2 fabric reinforcement for waist belt and belt loop attachments

Figure D.5: Fabric reinforcements

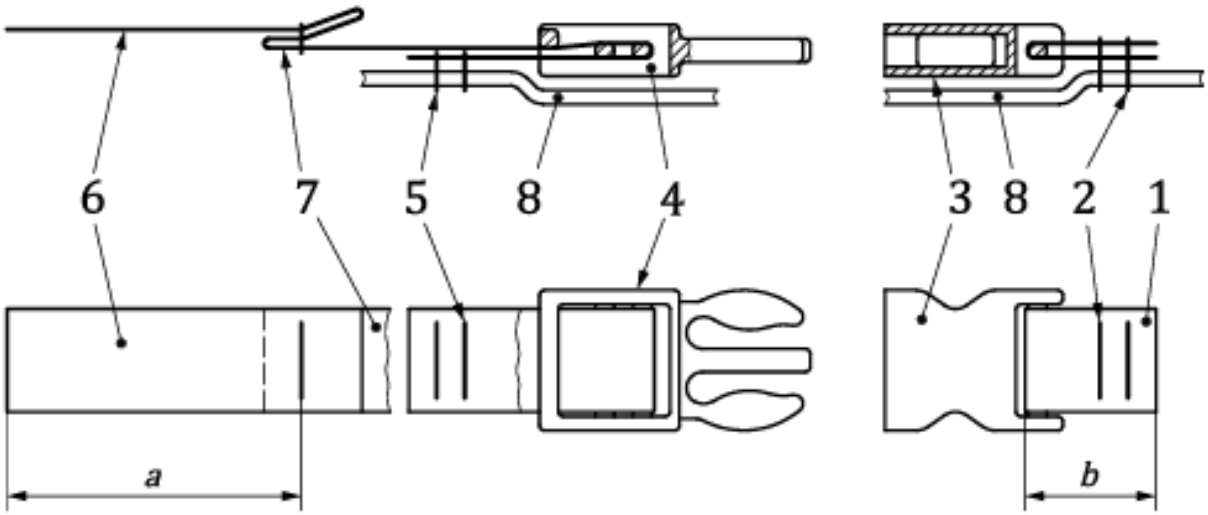
DRAFT FOR PUBLIC COMMENT



Key

1 bar-tack stitch
2 webbing
3 outer cover and reinforcement (shown on lower view only)

Figure D.6: Belt loop



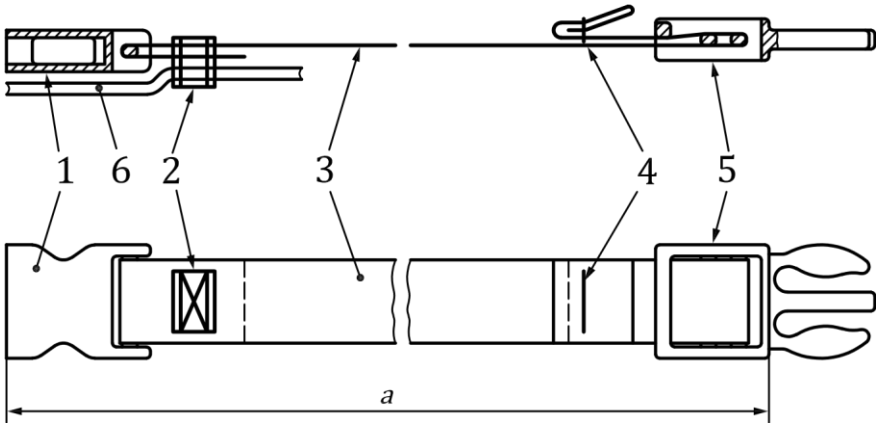
Key

1 webbing
2 double bar-tack (or box-x) stitch
3 fixed part of closure
4 adjustable part of closure
5 double bar-tack (or box-x) stitch
6 webbing
7 tab
8 outer cover and reinforcement (shown on lower view only)

Figure D.7: Chest strap assembly (adjustable part left and fixed part right)

DRAFT FOR PUBLIC COMMENT

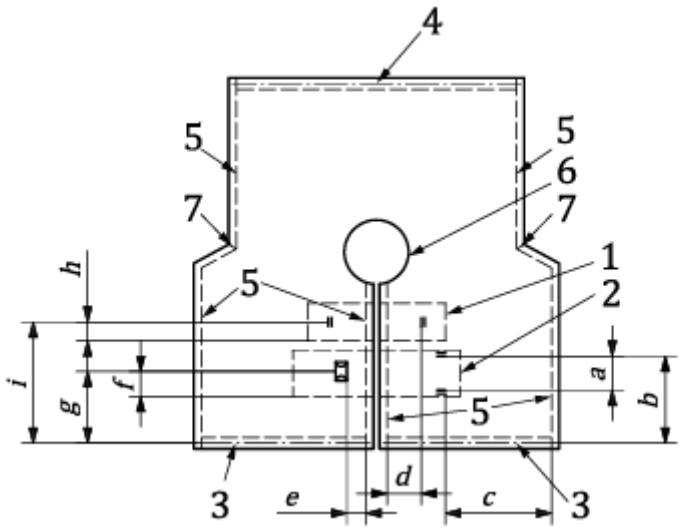
©ZBS 2026 - All rights reserved



Key

1 fixed part of plastic closure
2 box-x (or double bar-tack) stitch
3 webbing
4 tab, webbing double-folded and secured with a bar-tack stitch
5 adjustable part of plastic closure
6 outer left cover and reinforcement (shown on lower view only)

Figure D.7: Waist belt assembly



Key

1 stitching on interior fabric reinforcement for chest strap on right and left sides of outside cover only
2 stitching on interior fabric reinforcement for waist belt and belt loop on right and left sides of outside cover only
3 fabric fold and zipper teeth line of engagement when attached to outside and inside covers
4 fabric fold and zipper teeth line of engagement when attached to outside and inside covers
5 lock-stitch seam (with fabric face-to-face)
6 lock stitch with 5 mm seam allowance and over-edge stitch (with fabric face-to-face)
7 after-stitching cut relief

Figure D.9: Initial assembly (shown right side out, except as noted)

DRAFT FOR PUBLIC COMMENT

Annex E

(normative)

Manikin

E.1 General

It has been shown that infants and children of less than 5 years of age find it difficult to don a lifejacket without assistance, and that they do not follow many instructions during lifejacket tests in water. Whilst it is possible to carry out subjective assessments of comfort, head support and airways protection, it is very difficult to make any objective measurements. More importantly, infants and children do not relax even less so than adults do. An infant child always instinctively lifts its ears clear of the water and this usually helps it turn over when in a face-down position. It is therefore very difficult to separate the performance of the lifejacket from the effect of the physical activity of the infant or child. A test such as a drop test shall not be carried out for obvious safety reasons. Any test that places the child at risk shall generally be regarded as being unethical.

E.2 Choice of manikin for testing

E.2.1 Manikins have thus been developed for the following reasons:

a) to limit the use of infants and children in lifejacket testing;
b) to improve safety; and
c) to improve the objectivity and reproducibility of test procedures used to assess lifejackets designed for infants and children.

E.2.2 Manikins have been designed to test lifejackets intended for infants and children.

E.2.3 The appropriate manikin should be selected from Table 1 and Table 2, fitting within the target mass range of the lifejacket. For example, the 9.4 kg manikin should be used to test a lifejacket designed for infants weighing 5 kg to 10 kg; whilst the 14.5 kg manikin should be used to test a lifejacket designed for infants weighing 10 kg to 15 kg.

E.3 Required performance of manikins

Any manikin developed to meet the design specification defined in this annex shall undergo verification trials to demonstrate that the performance of the manikin can mimic the performance and flotation attitudes of an infant or child of similar mass and body density. When tested using an infant or child reference vest, the manikin shall be shown to perform adequately. It shall also be demonstrated that the manikin is capable of providing reproducible test results with acceptable and recorded levels of uncertainty.

E.4 Manikin design specification

Care should be taken to develop manikins with the correct segment density to ensure that they float in a manner that simulates an infant or child who is fully relaxed or unconscious in the water. The mass distribution and body segment densities of an example manikin are given in Tables E.1 and E.2.

Table E.1: Target mass distribution and density of body segments of 14.5 kg manikin

Component	**Mass,** g	**Volume,** cm^3	**Density,** g/cm^3
Head and neck	2 740	2 450	1.118
Torso	6 800	6 545	1.039
Upper leg (× 2)	897	834	1.075

DRAFT FOR PUBLIC COMMENT

 ©ZBS 2026 - All rights reserved

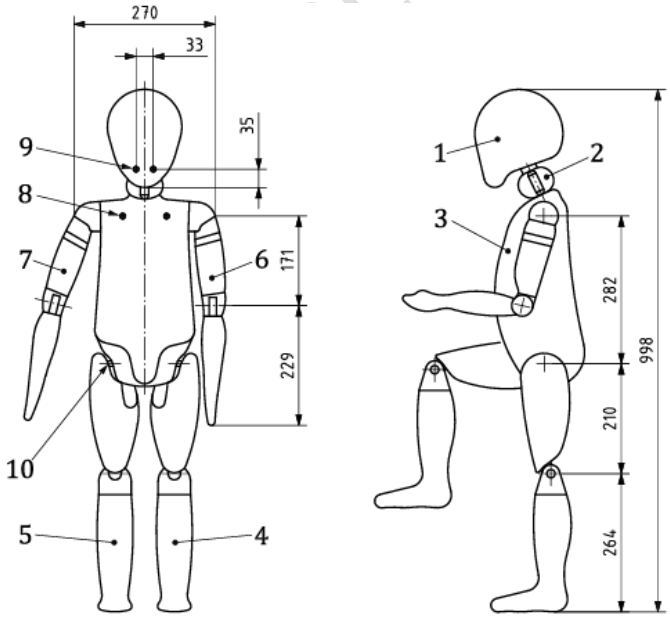
Lower leg (× 2)	859	803	1,070
Upper arm (× 2)	408	382	1,068
Lower arm (× 2)	300	285	1,053
Total	14.5 kg	1 3603 cm^3	1.064 g/cm^3

Table E.2: Target mass distribution and density of body segments of 9.4 kg manikin

Component	**Mass** g	**Volume** cm^3	**Density** g/cm^3
Head and neck	2 070	1 888	1.096
Torso	4 780	4 635	1.031
Upper leg (× 2)	514	480	1.071
Lower leg (× 2)	405	380	1.065
Upper arm (× 2)	202	192	1.052
Right lower arm (× 2)	153	145	1.055
Total	9.4 kg	8 917 cm^3	1.054 g/cm^3

Figures E.1 and E.2 are scale drawings of the 14.5 kg and 9.4 kg manikins, respectively, showing the key body dimensions.

Dimensions in millimetres



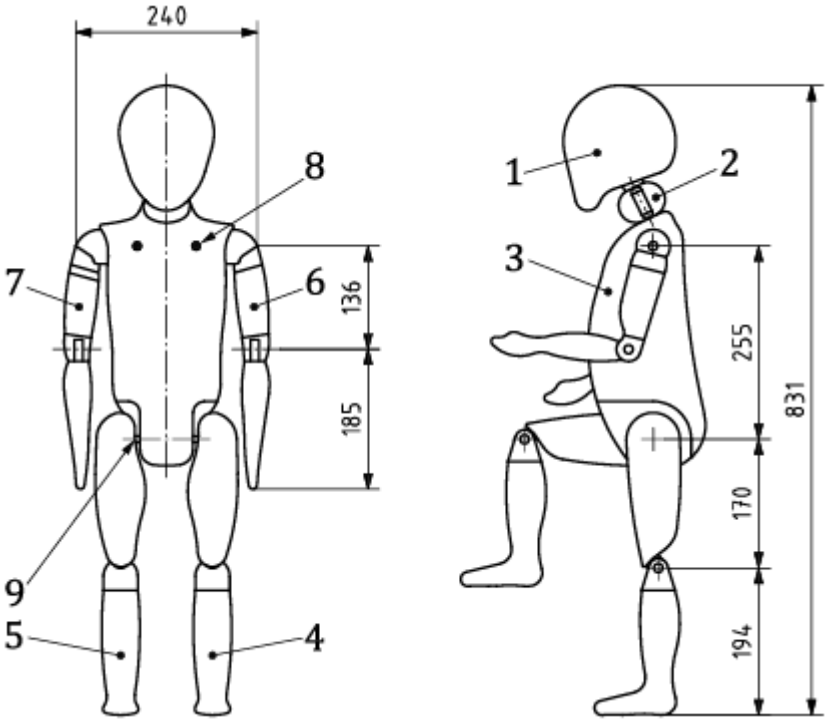
Key

1	head assembly	6	left arm assembly
2	neck assembly	7	right arm assembly
3	torso assembly	8	shoulder fixing pin
4	left leg assembly	9	mouth position pin
5	right leg assembly	10	hip fixing pin

Figure E.1: Scale drawing of 14.5 kg manikin

DRAFT FOR PUBLIC COMMENT

Dimensions in millimetres



Key

1	head assembly	6	left arm assembly
2	neck assembly	7	right arm assembly
3	torso assembly	8	shoulder fixing pin
4	left leg assembly	9	hip fixing pin
5	right leg assembly		

Figure E.2: Scale drawing of 9,4 kg manikin

E.5 Details of harness and swimsuit requirements

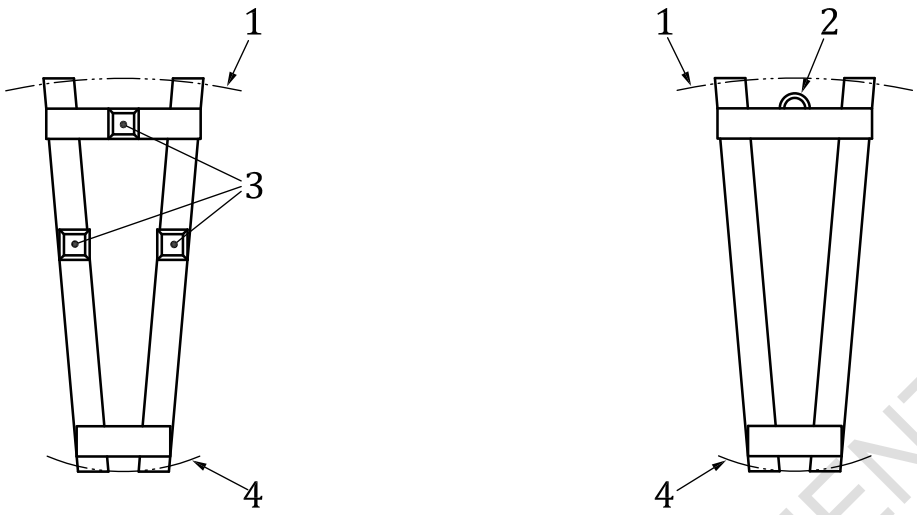
The manikin shall be dressed in a short-sleeved and short-legged swimsuit to prevent slippage of the lifejacket. This swimsuit shall be made from a knitted fabric containing elastane fibres.

A harness shall be used to allow the manikin to be dropped from a height in the ‘forward-bent’ position. The harness shall be made from webbing with a D-ring fitted behind the neck at the mid-point between the shoulders. The harness shall be worn over the swimsuit. Care shall be taken to ensure that the performance of the lifejacket, when worn over the harness, is not hindered in any way by the harness and release system.

The harness, see Figure E.3, is constructed from (20 ± 5) mm webbing, running from each shoulder to the crutch. A D-ring (≤20 mm) is fitted at the back of the neck, allowing connection to a quick-release system.

DRAFT FOR PUBLIC COMMENT

©ZBS 2026 - All rights reserved



a) Front view **b) Back view**

Key

1 shoulder of manikin
2 attach line incorporating quick release mechanism, to the D-ring
3 belt clips
4 crutch of manikin

Figure E.3: Harness

DRAFT FOR PUBLIC COMMENT