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**Small craft — Deck safety harness and  
safety line for use on recreational craft —  
Safety requirements and test methods**

*Petits navires — Harnais de sécurité de pont et sauvegardes de  
harnais destinés à la navigation de plaisance — Exigences de sécurité  
et méthodes d'essais*

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## Foreword

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

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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

ISO 12401 was prepared by Technical Committee ISO/TC 188, *Small craft*.

ISO 12401 is almost identical to EN 1095:1998, *Deck safety harness and safety line for use on recreational craft — Safety requirements and test methods*, which was prepared by Technical Committee CEN/TC 160 *Protection against falls from height including working belts*.

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## Introduction

This International Standard has been prepared to meet the needs of persons afloat on recreational craft. Deck safety harnesses and safety lines manufactured according to this standard will give reasonable assurance that the wearer will remain attached to the vessel.

A deck safety harness and safety line does not provide protection from falls from a height. Neither does this International Standard cover the requirements of a dinghy "trapeze" harness, a windsurfing harness, nor those of a seat harness for fast motor boats.

This International Standard is intended to serve as a guide to manufacturers, purchasers and users of such safety equipment, in ensuring that the equipment provides an effective standard of performance in use.

Equally essential is the need for the designer to encourage the wearing of the equipment by making it comfortable and attractive for continuous wear while afloat, rather than for it to be stowed in a locker for emergency use. The principal reason for the existence of this International Standard is the recognition that comfort and mobility are important factors in determining whether deck safety harnesses are worn.

The primary aims in wearing a deck safety harness are the following:

- a) to retain the wearer on the working deck of the vessel;
- b) to prevent the wearer from falling into the water;
- c) to assist in the recovery of the wearer back onto the working deck.

The prevention of the wearer from actually falling into the water is dependent on the attachment point and the length of the safety line. Because a correctly worn deck safety harness and safety line will, in normal circumstances, prevent the wearer from entering the water, no consideration is given to the towing position after a fall. The importance of ensuring a firm fit cannot be overstressed. Unless the harness is fitted with an automatic tensioner, it remains the responsibility of the wearer to correctly adjust the harness to achieve a firm fit.



# Small craft — Deck safety harness and safety line for use on recreational craft — Safety requirements and test methods

## 1 Scope

This International Standard specifies the requirements for performance, sizing, marking and test methods for deck safety harnesses and safety lines.

It is applicable to harnesses and lines in the following sizes of body mass:

- d) size 1 > 50 kg<sup>1)</sup>;
- e) size 2 > 20 kg ≤ 50 kg<sup>1)</sup>;
- f) size 3 ≤ 20 kg<sup>1)</sup>;

which are intended to be worn by all persons when in the exposed cockpit or on the working deck of a recreational vessel afloat.

It is not applicable to dinghy “trapeze” harnesses, windsurfing harnesses, seat harnesses for fast motor boats and harnesses intended to protect against fall from a height.

## 2 Normative references

The following referenced documents are indispensable for the application 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.

EN 354:2002, *Personal protective equipment against falls from a height — Lanyards*

EN 364:1992, *Personal protective equipment against falls from a height — Test methods*

EN 394:1993, *Lifejackets and personal buoyancy aids — Additional items*

EN 892:1996, *Mountaineering equipment — Dynamic mountaineering ropes — Safety requirements and test methods*

ISO 15027-1:2002, *Immersion suits — Part 1: Constant wear suits, requirements including safety*

ISO 15027-2:2002, *Immersion suits — Part 2: Abandonment suits, requirements including safety*

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1) Multisizing permitted

### 3 Terms and definitions

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

- 3.1 deck safety harness**  
device which provides a strong point of attachment securely fitted to the user
- 3.2 safety line**  
link between the strong point of attachment on the deck safety harness and a strong point of attachment on the vessel
- 3.3 hook**  
means of attachment between the safety line and the strong points on the deck safety harness and the vessel on non-integral safety lines, and between the safety line and the strong points on the deck of the vessel on integral safety lines
- 3.4 automatic tensioner**  
device which allows the harness to be worn looser than desirable for safe operation but which automatically tensions the harness to a safe firm fit when strain is placed on the safety line
- NOTE The deliberate movement of such a device when tensioning the harness is not considered to be slippage of an adjustment device.
- 3.5 reference deck safety harness**  
device used to test a separate safety line
- NOTE This device is represented in tests by the attachment link between the test mass and the safety line under test.
- 3.6 reference safety line**  
device used to test a separate deck safety harness
- 3.7 integrated deck safety harness and safety line**  
combination that cannot be separated without destruction
- 3.8 assessment panel**  
panel consisting of experienced users, who will be used to assess the results of the test
- 3.9 holding-down device**  
crotch and thigh straps, integration or attachment to clothing worn between the legs
- 3.10 integrated combination of safety harness or clothing**  
combination that cannot be separated without destruction nor worn without the holding down in its intended position

## 4 Requirements for safety

### 4.1 General

The original effective maximum length of a safety line, measured between the attachment points, under a load of 10 kg, shall not exceed 2 m including the length of the hooks.

Design of the safety line and its attachments to the wearer shall preclude accidental incorrect attachment resulting in more than 2 m between the strong point on the vessel and the strong point on the wearer.

### 4.2 Materials and construction

**4.2.1** The yarn and sewing thread used for harness and line materials shall comply with EN 354. Sewing threads shall be of a contrasting shade or colour in order to facilitate visual inspection.

**4.2.2** All machining shall have been carried out on a lockstitching machine and securely finished off by back sewing for at least 13 mm, except where sewn by an automatic lockstitching machine, when the first and last stitches shall have been sewn in such a way as not to provide a natural starting point for a break in the stitching. Sewing shall not have been carried out within 2 mm of any edge of the material. However, ends may be oversewn if they are not heat sealed. Sacrificial elements are not required to comply with this method of stitching.

**4.2.3** All fittings shall be smoothly finished, and known to be suitable for use in a marine environment. No part of a deck safety harness, safety line, or hook shall deflect a typical yacht magnetic compass by more than 1° when tested according to 5.1.

**4.2.4** The webbing or equivalent primary elements designed to transfer the shock load to the wearer's body shall have a minimum width of

- a) 45 mm for size 1,
- b) 35 mm for size 2, or
- c) 25 mm for size 3.

NOTE For definition of sizes see Clause 1.

### 4.3 General performance

#### 4.3.1 Donning

Donning of a deck safety harness shall be obvious and simple using the briefest of instructions. This shall be tested according to 5.5, except that assistance shall be permitted in the case of a harness intended for size 3.

#### 4.3.2 Attachment point

The attachment point for a safety line to a deck safety harness shall be positioned within 50 mm of the central axis of the body, front or back, above the lowest point of the rib cage.

If a deck safety harness incorporates more than one point to which the safety line can be attached, then it shall either be demonstrated, using the test in 5.2, that attachment to each single point of attachment in turn meets the requirements of this standard, or the harness shall be marked as described in 6 f).

#### 4.3.3 Comfortable wear

A deck safety harness shall be comfortable to wear for men, women and children as appropriate for the sexes and sizes for which it is intended and when correctly adjusted. Unless fitted with an automatic tensioner, correct adjustment shall be to fit the body firmly. This shall be assessed according to 5.5.

It shall be simple to make adjustments to the size fitting of a deck safety harness in accordance with the manufacturer's instructions.

#### 4.3.4 Detachability of safety lines

A safety line shall be detachable from the deck safety harness or from the vessel or from both, when tested according to 5.4, except in the case of a deck safety harness intended for size 3. In the latter case, the safety line shall either be attached in such a way, or the attachment shall be so positioned, that the wearer cannot detach the line from the harness. However, the safety line shall be detachable from the deck safety harness or from the vessel or from both, when tested according to 5.5, by an adult.

#### 4.3.5 Hooks

The hook provided on a safety line for attachment to the vessel shall be of a self-closing type, the opening of which shall be large enough to accept and fully close on a cylinder of diameter  $(12,5^{+0,1}_0)$  mm. There shall be no tendency for the hook to open by any action, as tested in 5.4, other than deliberate release, except in the case of a single type attachment bracket fitted to the vessel, exempted by the clear and permanent warning label as described in 5.4 and 6 g).

If intermediate hooks are fitted in a safety line, the test described in 5.2 shall be repeated using each possible combination of points of attachment. Each repetition shall meet the requirements of this standard.

#### 4.3.6 Holding-down device

All safety harness shall make provision to allow the fitting of a holding-down device, which shall be, as a minimum, half the width of the flexible elements listed in 4.2.4.

#### 4.3.7 Integral combinations

Any integral combination of safety harness and additional items such as lifejackets and immersion suits shall comply with EN 394 or ISO 15027-1 or ISO 15027-2, whichever is relevant, and shall not be rendered inoperative by the dynamic test of the safety harness.

### 4.4 Inspection requirements for deck safety harness sizes 1 and 2 and safety line

When tested as described in 5.2, the deck safety harness and safety line shall comply with the following.

- a) Throughout the test, the dummy shall be restrained securely in the harness clear of the ground.
- b) Throughout the test, no component of the deck safety harness or safety line shall become ineffective. Sacrificial shock-absorbers may rupture, but this shall not affect the security of the dummy in the deck safety harness.
- c) After the first drop test only, the slipping of any adjustment device shall not exceed 25 mm.
- d) After the first drop test only, and with the load of the dummy or test mass relieved from the safety line, the detachability of the safety line shall be checked as in 5.5.4.

#### 4.5 Static loading of deck safety harness of size 3

When tested according to 5.3, the total slippage in the safety harness adjustment devices shall not exceed 25 mm.

### 5 Test methods

#### 5.1 Magnetic properties testing

Place a direct-reading magnetic compass in an undisturbed magnetic area (i.e. an area in which magnetic items and d. c. 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  $10^\circ$  by means of a magnet and then removing the deflecting force, when the card should return to within  $0,5^\circ$  of its original position.

Present the 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  $(300 \pm 10)$  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.

#### 5.2 Dynamic testing

##### 5.2.1 Principle

Dynamic testing includes two tests. One for testing the strength of the complete harness and one for testing the safety lines. For a deck safety harness and safety line which can be separated, each item is tested separately against a reference counterpart, i. e. reference line and dummy for the harness and reference harness and test mass for the safety line.

For an integrated deck safety harness and safety line, the two tests are combined. Unless the harness is part of an integrated combination of safety harness and clothing, the holding-down device shall not be fitted during the dynamic test.

These dynamic tests do not simulate reality on board a craft but represent a strength test under overload conditions in order to ensure sufficient durability of the components tested.

##### 5.2.2 Apparatus

###### 5.2.2.1 Equipment for dynamic testing of deck safety harnesses and safety lines

See Table 1 for a description.

**Table 1 — Equipment for dynamic testing**

Product	Equipment
Deck safety harness of size 1	a) Torso with a mass of $(100 \pm 1)$ kg in accordance with 4.2 of EN 364:1992. b) Single mountaineering rope in accordance with 3.2 of EN 892:1996 (see also 5.2.2.3). The mountaineering rope acts as a reference line and shall be replaced after each drop (cushioning effect).
Deck safety harness of size 2	a) Torso with a mass of $(50 \text{ kg} \pm 1)$ kg according to Figure 1. This torso shall be made from hard wood or plastics. The centre of gravity shall be in accordance with anthropometrical data. NOTE This torso represents the 99 percentile of a male person with a body height of 155 cm and 10 years of age. The suspension devices shall be equivalent to those used for testing size 1. b) Single mountaineering rope in accordance with 3.2 of EN 892 (see also 5.2.2.3)
Safety lines	a) Rigid test mass of $(100 \pm 1)$ kg b) Single mountaineering rope in accordance with 3.2 of EN 892 (see also 5.2.2.4) The mountaineering rope acts as a reference deck safety harness and shall be replaced after each drop (cushioning effect)
Integrated deck safety harness and safety lines of size 1	Torso as used for testing size 1
Integrated deck safety harness and safety lines of size 2	Torso as used for testing size 2

**5.2.2.2 Torso**

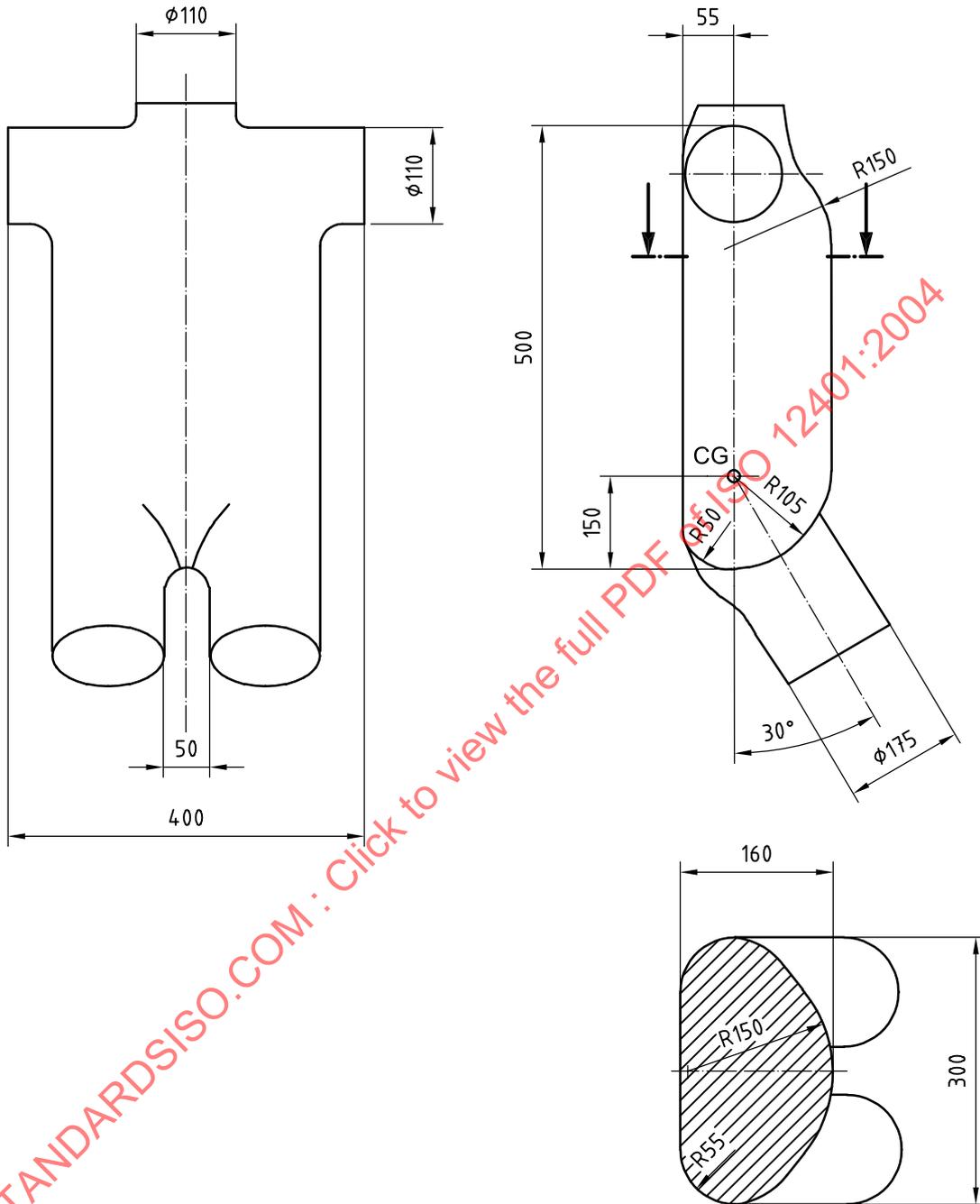
For dimensions of the torso to be used for testing size 2, see Figure 1.

**5.2.2.3 Reference safety line for dynamic testing**

Use a dynamic mountaineering rope in accordance with 3.2 of EN 892:1996, with a minimum elasticity of 8 % and of about 4 000 mm original length, as the reference safety line. It shall be used only once per drop test.

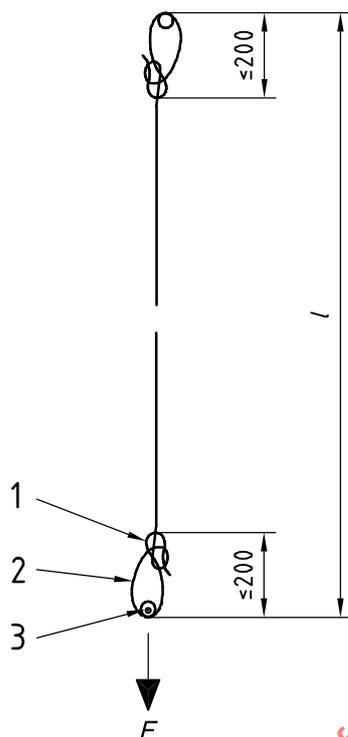
Prepare the rope so that, under the load of the torso dummy or a test mass of 100 kg, the test length  $l$  of the rope, including the eyes to be formed at both ends, is  $(2\,000 \text{ }^{+100}_0)$  mm (see Figure 2).

Dimensions in millimetres



Dimension of all radii not specified: 30 mm

Figure 1 — Dimensions of the torso for testing size 2



**Key**

- 1 bowline knot
- 2 termination loop
- 3 attachment point

$$l = (2\,000^{+100}_0) \text{ mm for reference safety line}$$

$$l = (1\,000^{+100}_0) \text{ mm for reference deck safety harness}$$

$$F = 1 \text{ kN} \pm 10 \text{ N}$$

**Figure 2 — Rope for the dynamic test**

Terminate the rope in eyes produced by tying bowline knots (see Figure 3) and ensure the length of the termination eyes is a maximum of 200 mm.

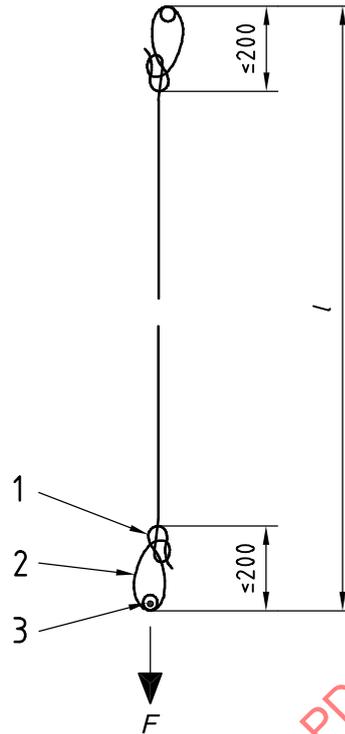


Figure 3 — Bowline knot

#### 5.2.2.4 Reference deck safety harness

Use a single mountaineering rope as defined in 3.2 of EN 892:1996, with a minimum elasticity of 8 % and of about 3 000 mm original length, as the reference deck safety harness.

Prepare the rope so that, under the load of the test mass of 100 kg, the test length  $l$  of the rope, including the eyes to be formed at both ends, is  $(1000^{+100}_0)$  mm, see Figure 2.

#### 5.2.2.5 Anchorage

The anchorage shall be rigid and robust and high enough from the ground so that at no time during the test will the dummy or test mass touch the ground.

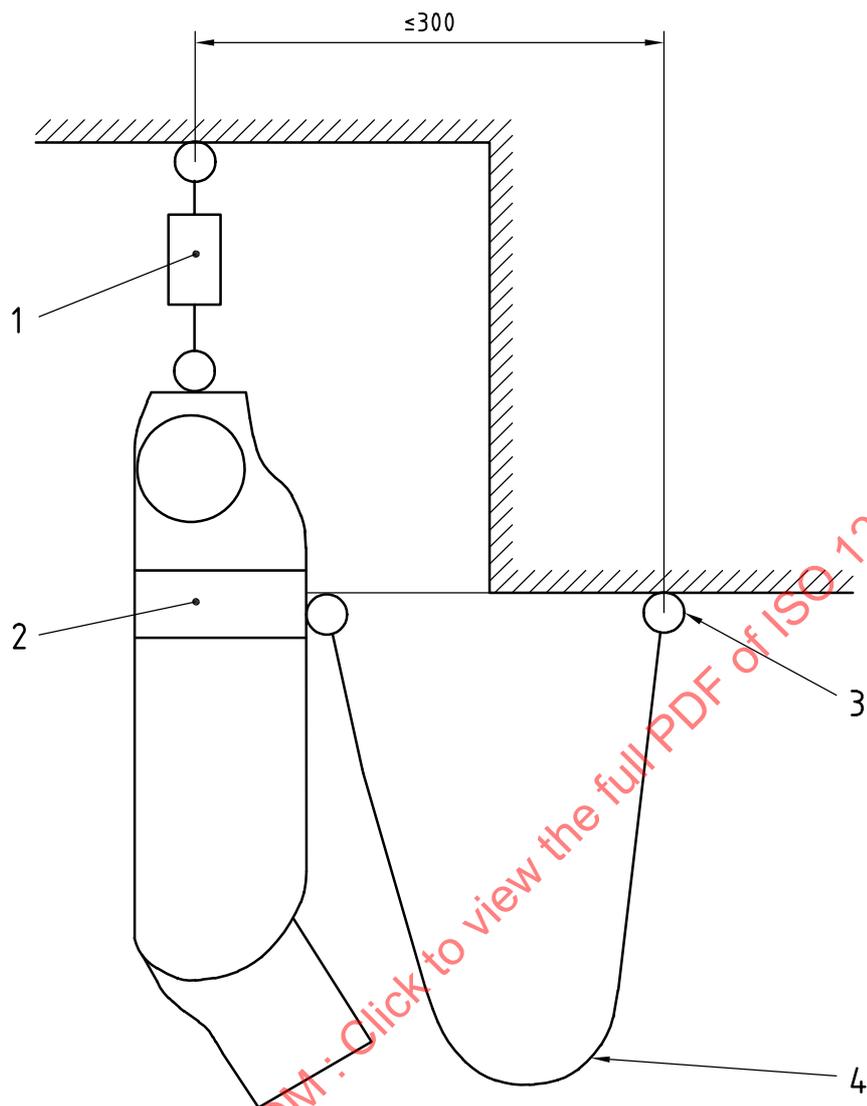
#### 5.2.3 Sampling and conditioning

Conduct the test at the ambient temperature of the test house.

#### 5.2.4 Harness testing

##### 5.2.4.1 Preparation

After conditioning, fit the harness to the dummy of the appropriate size according to the manufacturer's instructions. Connect the dummy via the harness and reference line to the anchorage in accordance with Figure 4. Both ends of the reference safety line shall be on the same horizontal level before releasing and the horizontal distance between the quick-release device and the anchorage shall not exceed 300 mm.



**Key**

- 1 quick-release device
- 2 deck safety harness to be tested
- 3 anchorage
- 4 reference line

**Figure 4 — Test configuration for harnesses**

For those deck safety harnesses fitted with an automatic tensioner, before the drop tests are undertaken the panel shall first examine the operation of the device in controlled slow motion to ensure that, in operation, it achieves a firm fit in the intended position on the body. During the investigation of this matter, the dummy may be lowered in any position. The drop test shall only proceed when the panel is satisfied that the automatic tensioning system achieves the required fit.

#### **5.2.4.2 First drop, feet first**

For the first-drop test, raise the dummy in an upright posture and hold in a feet-first attitude with a quick-release device in such a way that the anchorage of the reference safety line and the quick-release point are as nearly as possible in the same vertical axis but with a maximum of 300 mm horizontal separation.

Operate the quick-release device and allow the dummy to fall freely through a distance of 2 m.

Examine the deck safety harness with regard to 4.4 and note all slippage, breakage or deformation after the drop.

#### **5.2.4.3 Second drop, head first**

Take the same harness and readjust it to the same dummy. Apply a second drop of 2 m but starting the drop from a head-first position of the dummy.

The reference safety line shall be renewed for each test.

Examine the deck safety harness as specified for the first drop.

#### **5.2.5 Safety line testing**

Fit the safety line, after conditioning, to the reference deck safety harness as specified in Table 1. Drop test the safety line twice in each configuration of hook attachment with the drop height corresponding to the length of the line currently under test (see Figure 5). Both ends of the safety line shall be on the same level before releasing and no more than 300 mm apart. The reference deck safety harness shall be changed after each drop. The safety line under test shall be changed between each new configuration.

After each drop, examine the safety line with regard to 4.4 and note any failure or deformation.