BS 8513:2009

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Personal fall protection equipment – Twin-legged energy-absorbing lanyards – Specification

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Contents

Summary of pages
This document comprises a front cover, an inside front cover, pages i to ii, pages 1 to 12, an inside back cover and a back cover.

Foreword

Publishing information

This British Standard is published by BSI and came into effect on 30 June 2009. It was prepared by Technical Committee PH/5, *Personal fall protection*. A list of organizations represented on this committee can be obtained on request to its secretary.

Information about this document

This standard does not include requirements or testing for resistance of textile materials to UV degradation and abrasion. Tests for these features are under development and it is envisaged that they will be included in a future revision of the standard.

Hazard warnings

WARNING. This British Standard calls for the use of substances and/or procedures that can be injurious to health if adequate precautions are not taken. It refers only to technical suitability and does not absolve the user from legal obligations relating to health and safety at any stage.

Presentational conventions

The provisions of this standard are presented in roman (i.e. upright) type. Its requirements are expressed in sentences in which the principal auxiliary verb is "shall".

Commentary, explanation and general informative material is presented in smaller italic type, and does not constitute a normative element.

Contractual and legal considerations

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

Compliance with a British Standard cannot confer immunity from legal obligations.

1 Scope

This British Standard specifies the requirements, test methods, marking and information to be supplied by the manufacturer for twin-legged energy-absorbing lanyards for users with a mass of up to 100 kg including clothing and equipment. Twin-legged energy-absorbing lanyards conforming to this British Standard can be used as components in the personal fall protection systems specified in BS EN 363.

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.

BS EN 362:2004, *Personal protective equipment against falls from a height – Connectors*

BS EN 364:1993, *Personal protective equipment against falls from a height – Test methods*

BS EN 365:2004, *Personal protective equipment against falls from a height – General requirements for instructions for use, maintenance, periodic examination, repair, marking and packaging*

BS EN ISO 9227, *Corrosion tests in artificial atmospheres – Salt spray tests*

ISO 1835, *Short link chain for lifting purposes – Grade M(4), non-calibrated, for chain slings etc.*

ISO 2232, *Round drawn wire for general purpose non-alloy steel wire ropes and for large diameter steel wire ropes – Specifications*

3 Terms and definitions

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

3.1 twin-legged energy-absorbing lanyard
component of a personal fall protection system comprising an energy absorber and two integral lanyards

NOTE The configuration is illustrated in Figure 1.

3.2 leg
one of the integral lanyards and its connector

NOTE The legs describe the upper parts of a Y-shaped configuration of a twin-legged energy-absorbing lanyard designed to enable a user to attach to a second attachment point. A leg may be of synthetic fibre rope, wire rope, webbing or chain.

3.3 lower limb
that part of a twin-legged energy-absorbing lanyard which incorporates the energy absorber and a connector

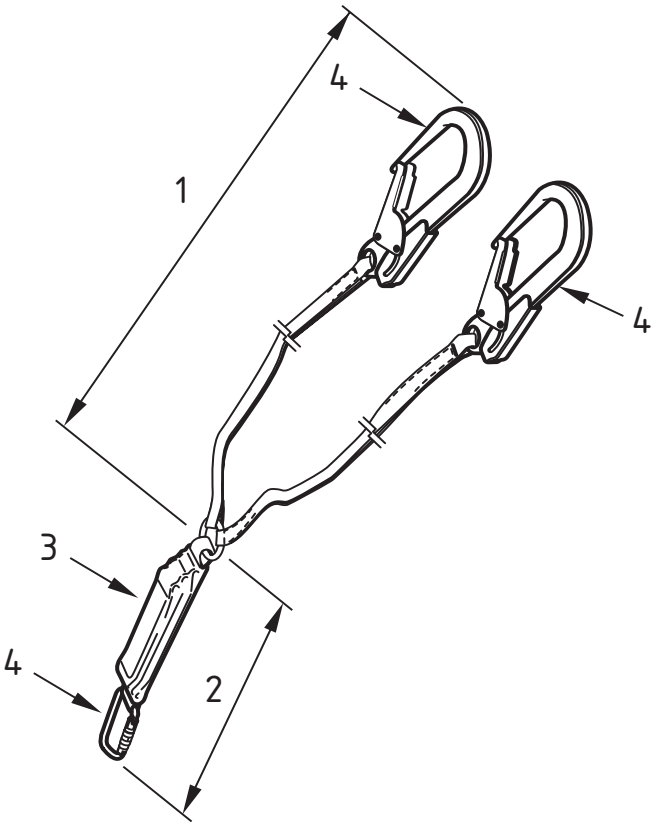
3.4 energy absorber
element or component of a twin-legged energy-absorbing lanyard, which is designed to dissipate the kinetic energy developed during a fall from a height

3.5 braking force
maximum force F_{max} in kilonewtons, measured at the lower limb during the braking period of a dynamic test

3.6 connector
openable device used to connect components, which enables the user to assemble a system in order to link himself/herself directly or indirectly to an anchor [BS EN 362:2004]

3.7 maximum rated load
maximum mass of the user, including tools and equipment carried, with which the twin-legged energy-absorbing lanyard can be used, as specified by the manufacturer

Figure 1 **Twin-legged energy-absorbing lanyard**



Key
1 Leg
2 Lower limb
3 Energy absorber
4 Connectors

4 Requirements

4.1 Materials and construction

4.1.1 General

The two legs shall both be permanently attached to one end of the lower limb.

NOTE 1 The legs may be connected to the lower limb directly, e.g. by stitching, or indirectly, e.g. by means of a closed link, such as a D-ring or O-ring.

NOTE 2 The two legs may be of different lengths.

The free end of the lower limb and each of the legs shall be terminated with an integral connector conforming to BS EN 362.

It shall not be possible to dismantle a twin-legged energy-absorbing lanyard without mutilating it.

The length of a twin-legged energy-absorbing lanyard, when measured with the longest leg and lower limb (including connectors) laid out straight and held taut by hand, shall not exceed 1.5 m.

4.1.2 Fibre ropes and webbing

Fibre ropes, webbing and sewing threads for twin-legged energy-absorbing lanyards shall be made from virgin filament or multifilament synthetic fibres.

The breaking tenacity of the synthetic fibres shall be not less than 0.6 N/tex.

4.1.3 Wire ropes

Wire ropes for twin-legged energy-absorbing lanyards shall be made from steel. The ferrules of the terminations shall be made from a ductile metallic material e.g. aluminium.

Wire ropes, which are not made from stainless steel, shall be galvanized in accordance with ISO 2232.

4.1.4 Chains

Chains shall, as a minimum, conform to the performance requirements of chain made from 6 mm diameter wire as specified in ISO 1835. Egg-shaped or similar end links and all connecting links shall be compatible with the chain in all respects.

4.2 Corrosion resistance

Twin-legged energy-absorbing lanyards with metallic components shall be tested in accordance with **5.8**. When a twin-legged energy-absorbing lanyard with metallic components is tested in accordance with **5.8**, none of the metallic components shall show evidence of corrosion of the base metal. The presence of tarnishing and/or white scaling shall be deemed acceptable.

NOTE Conformity to this requirement does not imply suitability for use in a marine environment.

4.3 Static preloading

When tested in accordance with **5.2**, using a test force of 2 kN, the permanent extension of the energy absorber after preloading shall be not greater than 50 mm.

4.4 Dynamic performance

When each leg in turn is tested in accordance with **5.3**, with a rigid steel mass of 100 kg, the braking force, F_{max}, shall not exceed 6 kN. The arrest distance, H, in metres (m) shall be as given by the formula:

$$H < 2L + 1.75$$

where

L is the length of the leg and lower limb including connectors, in metres (m).

4.5 Dynamic test in Y-configuration

When tested in accordance with **5.4**, with a rigid steel mass of 100 kg, the braking force, F_{max}, shall not exceed 6 kN, neither of the legs or the lower limb shall break and the connectors shall remain attached.

4.6 Static strength through leg

When tested in accordance with **5.5**, with a test force of 15 kN, each leg and the fully deployed lower limb energy absorber shall not break.

4.7 Static strength across both legs

When tested in accordance with **5.6**, with a test force of 22 kN, the legs shall not break.

4.8 Static strength in Y-configuration

When tested in accordance with **5.7**, with a test force of 15 kN, the twin-legged energy-absorbing lanyard shall not break.

4.9 Marking and information

Marking of the twin-legged energy-absorbing lanyard shall be in accordance with Clause **6**.

Information shall be supplied with the twin-legged energy-absorbing lanyard in accordance with Clause **7**.

5 Test methods

5.1 Samples

Testing shall be carried out on a minimum of five twin-legged energy-absorbing lanyards in accordance with the scheme given in Table 1.

NOTE Each test may be carried out on a separate twin-legged energy-absorbing lanyard at the manufacturer's discretion.

Table 1 **Testing scheme**

Test	Sample number	Leg number
Static preload (**5.2**)	1	—
Dynamic performance (**5.3**)	2	1
	3	2
Dynamic test in Y-configuration (**5.4**)	4	—
Static strength through leg (**5.5**)	2	1
	3	2
Static strength across both legs (**5.6**)	5	—
Static strength in Y-configuration (**5.7**)	4	—
Corrosion resistance (**5.8**)	1	—

5.2 Static preload test

5.2.1 Apparatus

The static preloading test apparatus shall conform to BS EN 364:1993, **5.3.1**.

5.2.2 Method

Install the twin-legged energy-absorbing lanyard in the test apparatus and submit it to the specified static preloading test force between the end of the longest leg and the end of the lower limb. Maintain the force for a period of 3 min. Measure the length of the energy absorber before and after the test and determine the magnitude of any permanent extension.

Alternatively, install the lanyard in the test frame, suspended from the longest leg and suspend a mass of 204 kg for 3 min from the end of the lower limb. Measure the length of the energy absorber before and after the test and determine the magnitude of any permanent extension.

5.3 Dynamic performance test

5.3.1 Apparatus

The dynamic performance test apparatus, structure and quick release device shall conform to BS EN 364:1993, **4.4** and **4.6**, respectively. The rigid steel mass shall be (100 $\pm$ 1) kg and otherwise shall conform to BS EN 364:1993, **4.5**.

5.3.2 Method

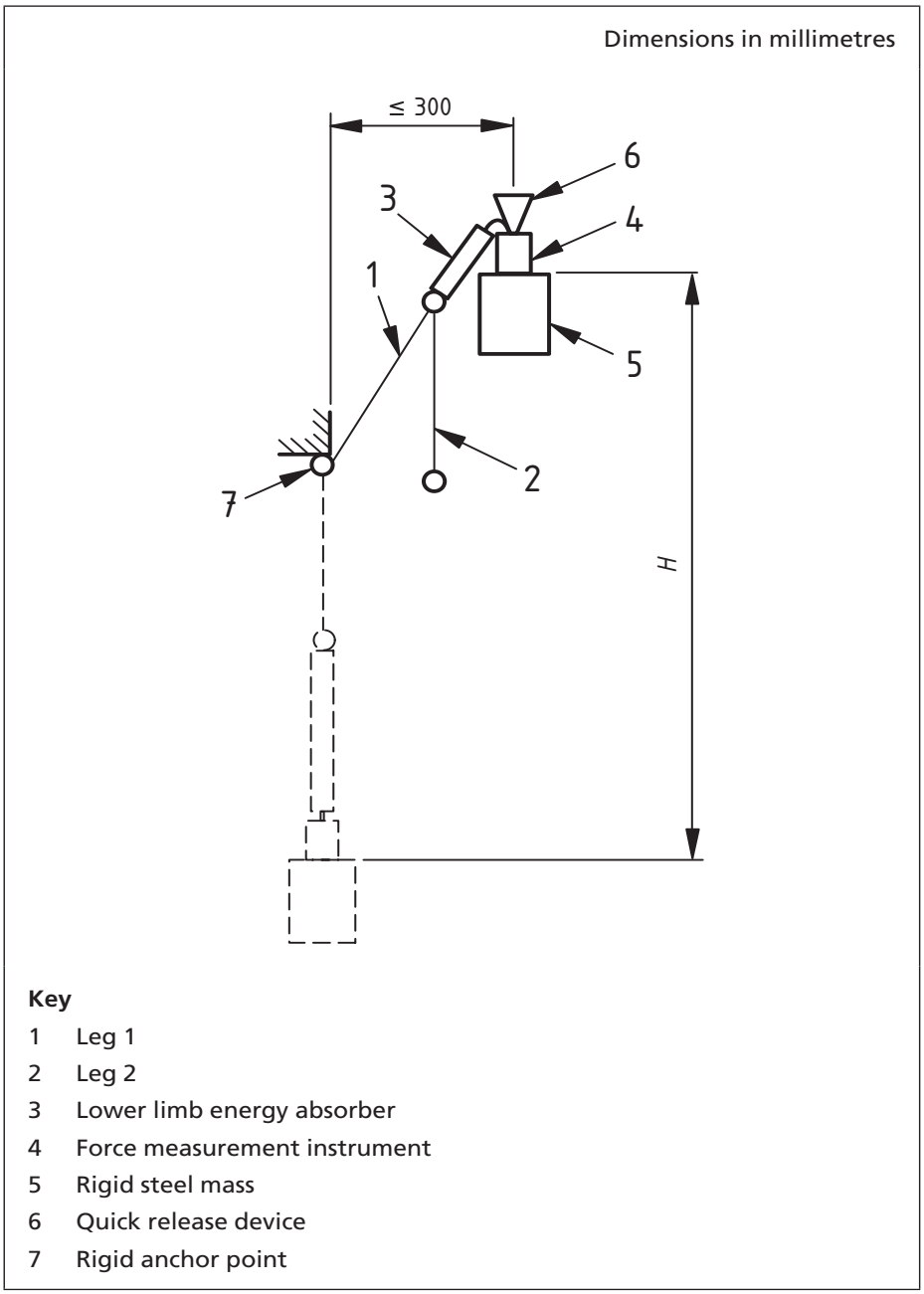
5.3.2.1 Attach the mass incorporating the force measurement instrument to the connector at the lower limb and attach one of the legs by its connector to the rigid structural anchorage point.

5.3.2.2 Raise the mass by the full height of the combined leg and lower limb and at a maximum of 300 mm horizontally from the rigid structural anchorage point. Hold the mass by the quick release device.

5.3.2.3 Let the mass fall and measure the peak force during the fall arrest stage. After the fall and with the mass at rest, measure the displacement, *H*, of the point of attachment of the mass (see Figure 2).

5.3.2.4 Using a new test specimen, repeat the test on the other leg.

Figure 2 **Arrangement for dynamic performance test**



5.4 Dynamic test in Y-configuration

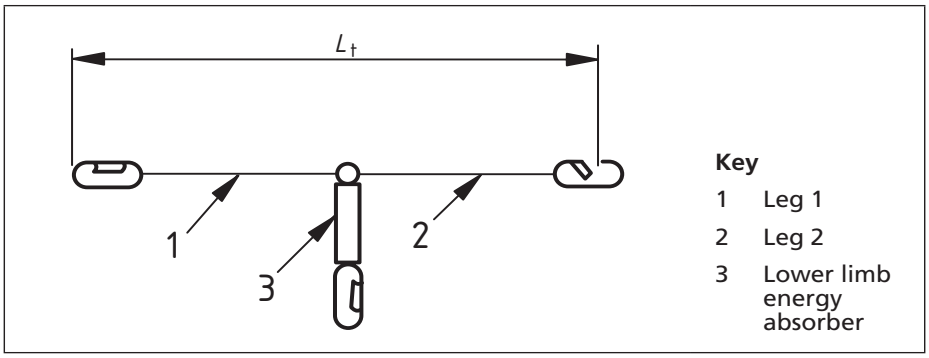
5.4.1 Apparatus

The dynamic test apparatus, structure and quick release device shall conform to BS EN 364:1993, **4.4** and **4.6**, respectively, but with two anchor points positioned in accordance with **5.4.2.1** and **5.4.2.2**. The rigid steel mass shall be (100 ± 1) kg and shall otherwise conform to BS EN 364:1993, **4.5**.

5.4.2 Method

5.4.2.1 With the connector gate closed on leg 1, measure the distance, L_t, across the legs and across the opening of the connector gate on leg 2 when the legs are extended at a force of (50 ± 5) N (see Figure 3).

Figure 3 **Arrangement for measurement across legs and across the opening of the connector gate**

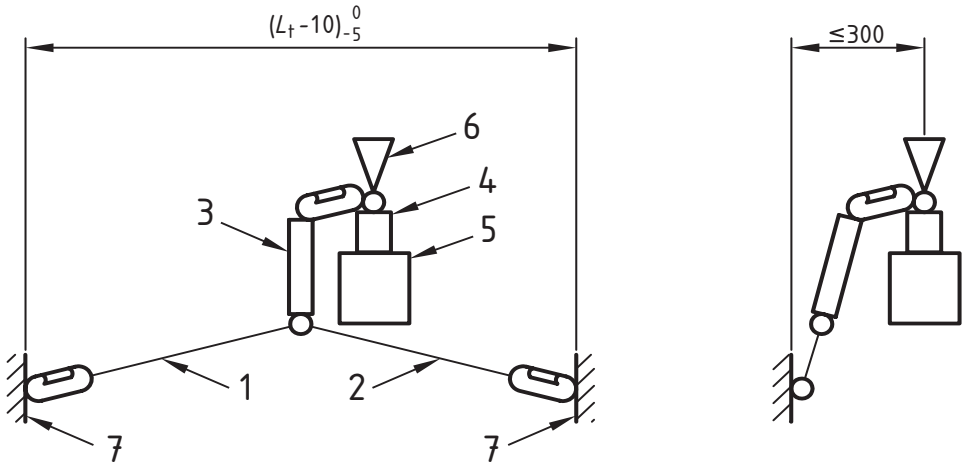


5.4.2.2 Secure compatible anchor points distanced $(L_t - 10)\,^{0}_{-5}$ mm (outer dimension) apart in the test apparatus. Install the twin-legged energy-absorbing lanyard in a Y-configuration in the test apparatus, ensuring that all connector gates are closed. Attach the rigid steel mass to the free end of the lower limb.

5.4.2.3 Raise the mass as far as the lower limb allows without deploying the energy absorber. Hold the mass by the quick release device at a maximum distance of 300 mm away from the line of the anchor points (see Figure 4). Allow the mass to fall and measure the peak force at the fall arrest stage.

Figure 4 **Arrangement for dynamic test in Y-configuration**

Dimensions in millimetres



a) Front view b) Side view

Key

1 Leg 1
2 Leg 2
3 Lower limb
4 Force measurement instrument
5 Rigid steel mass
6 Quick release device
7 Rigid anchorage points

5.5 Static strength test through leg

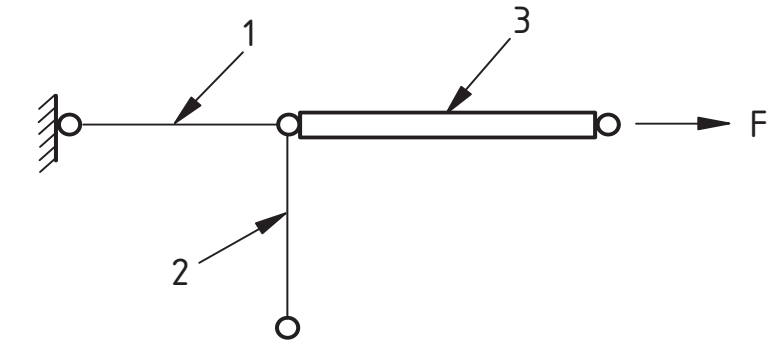
5.5.1 Apparatus

The static strength test apparatus shall conform to BS EN 364:1993, **4.1**.

5.5.2 Method

5.5.2.1 Install one of the legs and the lower limb (with the energy absorber fully deployed) in the test apparatus and submit them to the specified test force (see **4.6**) between the two end points (see Figure 5). Maintain the force for a period of (180 ± 15) s.

Figure 5 **Arrangement for static strength test through leg**



Key

1 Leg 1
2 Leg 2
3 Lower limb energy absorber (fully deployed)
F Direction of test force

5.5.2.2 Repeat **5.5.2.1** using the other leg.

5.6 Static strength test across both legs

5.6.1 Apparatus

The test apparatus shall conform to BS EN 364:1993, **4.1**.

5.6.2 Method

Install the legs in the test apparatus and submit them to the specified test force (see **4.7**) between the two end points (see Figure 6). Maintain the force for a period of (180 ± 15) s.

5.7 Static strength test in Y-configuration

5.7.1 Apparatus

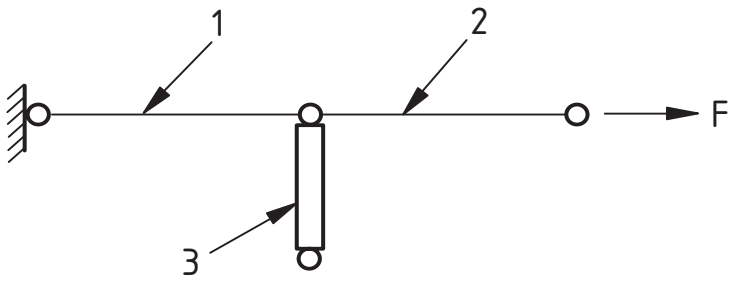
The test apparatus shall conform to BS EN 364:1993, **4.1**.

5.7.2 Method

5.7.2.1 With the connector gate closed on leg 1, measure the distance, L_t, across the legs and across the opening of the connector gate on leg 2 when the legs are extended at a force of (50 ± 5) N (see Figure 3).

5.7.2.2 Secure compatible anchor points distanced $(L_t - 10)\,^{0}_{-5}$ mm (outer dimension) apart in the test apparatus (see Figure 7). Install the twin-legged energy-absorbing lanyard, with fully deployed energy absorber, in a Y-configuration in the test apparatus, ensuring that all connector gates are closed, and submit it to the test force specified in **4.8**. Maintain the force for a period of (180 ± 15) s.

Figure 6 **Arrangement for static strength test across both legs**

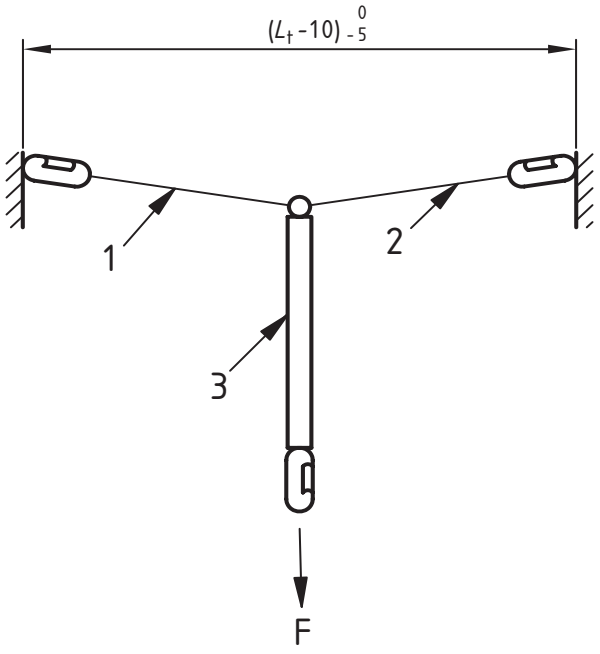


Key

1	Leg 1	3	Lower limb energy absorber
2	Leg 2	F	Direction of test force

Figure 7 **Arrangement for static strength test in Y-configuration**

Dimensions in millimetres



Key

1	Leg 1	3	Lower limb energy absorber (fully deployed)
2	Leg 2	F	Direction of test force

5.8 Corrosion resistance test

Expose the twin-legged energy-absorbing lanyard to a neutral salt spray test in accordance with BS EN ISO 9227 for a period of $24\,^{+0.5}_{0}$ h. Dry the lanyard for $60\,^{+5}_{0}$ min at (20 ± 2) °C. Subject the same specimen to a second exposure of $24\,^{+0.5}_{0}$ h. Dry for $60\,^{+5}_{0}$ min at (20 ± 2) °C.

6 Marking

6.1 The twin-legged energy-absorbing lanyard shall be clearly, indelibly and permanently marked by the manufacturer by any suitable method not having a harmful effect on the material so marked, with at least the following information:

a) number and date of this British Standard (i.e. BS 8513:2009[1)]);

b) maximum rated load;

c) the following wording at the free end of the energy absorber: "WARNING. Only attach this end to harness attachment point";

d) manufacturer's or supplier's name or trademark;

e) manufacturer's production batch or serial number or other means of ensuring traceability;

f) model and type;

g) pictogram or other marking to indicate the necessity for users to read the instructions for use.

6.2 The characters in the markings shall be a minimum of 2 mm high.

7 Information to be supplied by the manufacturer

7.1 Instructions for use

Instructions for use shall be provided which conform to BS EN 365:2004, **4.2**, under the following heading:

"WARNING: Make sure that you have read and understood these instructions before using the equipment"

The following additional warnings and information shall be given:

a) a warning to the user to connect only the free end of the energy absorber to their harness attachment point;

b) a warning to the user that if only one of the legs is connected to the anchor point, not to connect the other leg to their harness or to their belt or clothing unless there is a specially designed parking point for this purpose, which has been designed to separate from the harness, belt or clothing during a fall;

c) a warning to the user to use the shortest twin-legged energy-absorbing lanyard suitable for the task;

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1) Marking BS 8513:2009 on or in relation to a product represents a manufacturer's declaration of conformity, i.e. a claim by or on behalf of the manufacturer that the product meets the requirements of the standard. The accuracy of the claim is solely the claimant's responsibility. Such a declaration is not to be confused with third-party certification of conformity.

d) detailed information and guidance, including diagrams, relating to the minimum clearance distance required, so that the user can determine whether or not there is sufficient clearance available on site to prevent a collision with the ground or structure should a fall from a height occur;

e) a warning that the twin-legged energy-absorbing lanyard should not be used in a situation where it could be stressed over an edge in the event of a fall;

f) a warning that the user should minimize the amount of slack in the twin-legged energy-absorbing lanyard when near a potential fall hazard;

g) information on the hazards that could affect the performance of the twin-legged energy-absorbing lanyard, e.g. extremes of temperature, UV degradation and abrasion of textile materials, and corresponding safety precautions that have to be observed.

7.2 Instructions for maintenance

Instructions for maintenance shall be provided which conform to BS EN 365:2004, **4.3**.

7.3 Instructions for records

Instructions for the keeping of records shall be provided which conform to BS EN 365:2004, **4.6**.

7.4 Instructions for periodic examination

Instructions for periodic examination shall be provided which conform to BS EN 365:2004, **4.4** and which also include the following:

a) a warning that fading of textile colours and any powdering of the surfaces can be signs of UV degradation and that if textile components of the twin-legged energy-absorbing lanyard show these signs, the lanyard should be taken out of service;

b) a recommendation that the textile components of the twin-legged energy-absorbing lanyard should be carefully and regularly inspected for signs of abrasion. Also a recommendation that, if significant signs of abrasion are found, the lanyard should be taken out of service.

8 Packaging

Packaging shall conform to the requirements for packaging given in BS EN 365:2004.

Bibliography

For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

BS EN 363, *Personal fall protection equipment – Personal fall protection systems*

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