BS EN 354:2010

BSI Standards Publication

Personal fall protection equipment — Lanyards

National foreword

This British Standard is the UK implementation of EN 354:2010. It supersedes BS EN 354:2002 which is withdrawn.

The UK Committee advise users that this European Standard does not include requirements or testing for the resistance of textile materials to ultra-violet (UV) degradation and abrasion. Tests for UV and abrasion resistance are under development and it is the UK committee's intention that the results be considered in future revisions of the standard.

There is evidence that UV weakens many man-made fibres. Therefore, users of lanyards conforming to this European Standard are recommended to check with equipment suppliers that equipment made from textiles is protected from the adverse effects of UV (e.g. polyamide, polyester, polyethylene, polypropylene and aramid). Manufacturers are advised to check with suppliers of textile materials for the same. Users of textile equipment should also carefully and regularly inspect their equipment for signs of abrasion (both external and, where possible, internal).

The UK participation in its preparation was entrusted to Technical Committee PH/5, Personal Fall Protection.

A list of organizations represented on this committee can be obtained on request to its secretary.

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

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

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Equipement de protection individuelle contre les chutes de hauteur - Longes

Persönliche Schutzausrüstung gegen Absturz - Verbindungsmittel

This European Standard was approved by CEN on 12 June 2010.

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Foreword

This document (EN 354:2010) has been prepared by Technical Committee CEN/TC 160 “Protection against falls from height including working belts”, the secretariat of which is held by DIN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by January 2011, and conflicting national standards shall be withdrawn at the latest by January 2011.

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

This document supersedes EN 354:2002.

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

For relationship with EU Directive(s), see informative Annex ZA, which is an integral part of this document.

Annex A provides details of significant technical changes between this European Standard and the previous edition EN 354:2002.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and the United Kingdom.

1 Scope

This European Standard specifies the requirements, test methods, marking, information supplied by the manufacturer and packaging for lanyards. Lanyards conforming to this European Standard are used as connecting elements or components in personal fall protection systems (i.e. restraint systems, work positioning systems, rope access systems, fall arrest systems and rescue systems).

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 362, *Personal protective equipment against falls from a height — Connectors*

EN 363:2008, *Personal fall protection equipment — Personal fall protection systems*

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

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

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

EN ISO 9227, *Corrosion tests in artificial atmospheres — Salt spray tests (ISO 9227:2006)*

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 European Standard, the terms and definitions given in EN 363:2008 and the following definitions apply.

3.1
lanyard
flexible connecting element or component of a personal fall protection system with at least two terminations, with or without a length adjustment device

NOTE 1 This includes round slings.

NOTE 2 A lanyard may be made, for example, from synthetic fibre rope or webbing, wire rope or chain.

3.2
termination
part of a lanyard for connecting to other elements or components of a personal fall protection system

NOTE A termination may be, for example, a spliced eye, a sewn loop, or a metal ring.

3.3
personal fall protection system
assembly of components for protection against falls from a height, including a body holding device and an attachment system, which can be connected to a reliable anchorage point

NOTE Excludes systems for professional and private sports activities.

3.4
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

3.5
length adjustment device
element of a lanyard to vary its length

3.6
lanyard length
length in meters from one load bearing point to the other load bearing point, measured in an unloaded but taut condition of the lanyard

4 Requirements

4.1 Design and ergonomics

4.1.1 Lanyards shall be made from smoothly finished materials and shall not have sharp edges or burrs that may cause injury to the user, or that may cut, abrade or otherwise cause damage to the lanyard itself.

4.1.2 When checked in accordance with 5.3.3, lanyards with a length adjustment device shall be adjustable.

4.1.3 Length adjustment devices shall not allow unintentional opening and shall not allow unintentional change in length.

4.1.4 Lanyards with a length adjustment device shall be fitted with an end stop which shall prevent unintentional detachment of the length adjustment device from the lanyard.

4.1.5 Connectors incorporated in lanyards shall conform to EN 362.

4.1.6 The lanyard length, when measured in accordance with 5.3.4, shall be within ± 5% of the length given on the marking of the lanyard.

4.2 Materials

4.2.1 Materials which may come into contact with the skin of a user shall not be known to, or suspected to, adversely affect user hygiene or health, e.g. cause irritating or sensitization effects, during normal use of the lanyard.

4.2.2 Fibre ropes, webbing and sewing threads for lanyards shall be made from virgin filament or multifilament synthetic fibres suitable for their intended use. The breaking tenacity of the synthetic fibres shall be known to be at least 0,6 N/tex.

4.2.3 Wire ropes for lanyards shall be made from steel. The ferrules of terminations shall be made from ductile metallic material. Wire ropes that are not made from stainless steel shall be galvanized in accordance with ISO 2232.

4.2.4 Chains shall conform to the requirements for chains for at least 6 mm chains given in ISO 1835. Egg-shaped or similar end links and all connecting links shall be compatible with the chain in all respects.

4.3 Terminations

4.3.1 Lanyards shall be terminated in such a manner that they can be connected to other personal fall protection equipment directly or by an appropriate connector.

4.3.2 Spliced terminations on ropes shall be secured to prevent the splice from coming open in use and the materials used for securing shall be compatible with the rope material.

4.3.3 Threads used for sewing shall be of a contrasting shade or colour in order to facilitate visual inspection.

4.3.4 When using a knot for forming a termination, the knot shall be secured so that it cannot be opened without the use of a tool. After the static strength test in accordance with 5.7, the tail end of the knot shall have a minimum length of 100 mm.

4.3.5 Ends of the lanyard shall be prevented from unravelling.

4.3.6 Eye terminations of wire rope lanyards shall not be manufactured with U-bolt clamps.

4.4 Slippage for lanyards with length adjustment device

When tested in accordance with 5.6, the slippage of the lanyard through the length adjustment device shall not be more than 50 mm.

4.5 Static strength

4.5.1 When tested in accordance with 5.7, lanyards including any textile material or textile lanyard elements, e.g. synthetic fibre ropes or webbing, shall sustain a force of at least 22 kN.

4.5.2 When tested in accordance with 5.7, lanyards made entirely of metallic elements shall sustain a force of at least 15 kN.

4.6 Dynamic strength for lanyards with a length adjustment device

When tested in accordance with 5.8, the lanyard shall retain the test mass clear of the ground. Afterwards, the same lanyard shall, when tested in accordance with 5.7.3, withstand a test force of $(3 \pm 0{,}3)$ kN, or an equivalent mass, applied for a period of $(3\ ^{+\ 0{,}25}_{0})$ min.

4.7 Corrosion resistance

Lanyards with metallic elements shall be tested in accordance with 5.9. All metallic elements of the lanyard shall not show evidence of corrosion of the base metal and lanyards shall still function in accordance with 4.1.3. The presence of tarnishing and white scaling is acceptable.

NOTE 1 Care should be taken by the manufacturer not to combine different metals in such a way that there could be adverse galvanic reaction.

NOTE 2 Conformity to this requirement does not imply suitability for use in a marine environment.

4.8 Marking and information

4.8.1 Marking of lanyards shall be in accordance with Clause 6.

4.8.2 Information shall be supplied with lanyards in accordance with Clause 7.

5 Test methods

5.1 General

Carry out all tests at a temperature range of (23 ± 5) °C.

5.2 Conditioning

5.2.1 General conditioning

Store sample lanyards at a temperature of (23 ± 5) °C and a humidity of (65 ± 5) % for at least 24 h.

5.2.2 Conditioning to wet and cold

Immerse the sample lanyard in fresh water for a minimum of 1 h at a temperature of (23 ± 5) °C and then, within 90 s, place the sample lanyard in the refrigerated chamber for at least 4 h at a temperature of (-4+0/-2) °C.

5.2.3 Conditioning to very cold

If the manufacturer claims that the lanyard can be used below -30°C, condition the sample lanyard in accordance with 5.2.1. Place the sample lanyard in the refrigerated chamber for at least 2 h at the minimum temperature claimed by the manufacturer with a maximum temperature of (- 30 ± 2) °C.

5.3 Examination of design

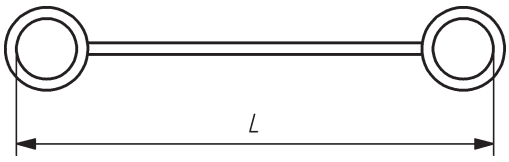
5.3.1 One unused lanyard shall be used for these examinations.

5.3.2 Verify by reference to appropriate documentation and by normal or corrected vision and/or tactile examination of the lanyard that it conforms to 4.1.1 to 4.1.5 inclusive.

5.3.3 For lanyards with a length adjustment device, verify by functional, visual and tactile examination that the length of the lanyard may be adjusted.

5.3.4 Attach one end of the sample to a suitable fixture. If the lanyard is adjustable, extend it to its maximum length. Apply a load without shock in the form of a mass of (10 ± 0,1) kg, or a corresponding force, to the other end of the lanyard. Maintain the load described above for (60 ± 15) s. Within 10 s, with the load still applied, measure the lanyard length L between the extremity load bearing points, in metres to the nearest 0,01 m (see Figure 1).

If the lanyard has more than two terminations, measure the longest length combination of terminations allowed by manufacturer.



Key

L length

Figure 1 — Measurement of the lanyard length

5.4 Examination of materials

Verify by reference to appropriate documentation and by normal or corrected vision and/or tactile examination of the lanyard that it conforms to 4.2.

5.5 Examination of terminations

Verify by reference to appropriate documentation, by normal or corrected vision and/or tactile examination and by measuring that the terminations of the lanyard conform to 4.3.

5.6 Slippage test for lanyards with a length adjustment device

5.6.1 Adjust the lanyard with a length adjustment device to its mid-length position. Mark the lanyard and the adjusting mechanism so that the marks align and so that a slippage can be assessed.

5.6.2 Condition the lanyard with a length adjustment device in accordance with 5.2.1.

5.6.3 Within 90 s of removal from the conditioning atmosphere, start to apply a static tensile force of $(6{,}0 \pm 0{,}1)$ kN between the two terminations of the lanyard, for a period of $(3\,^{+\,0{,}25}_{\ 0})$ min in a static strength test apparatus which conforms to 4.1 of EN 364:1992. Remove the force and measure any slippage observed.

5.6.4 Carry out the test specified in 5.6.3 after adjusting and marking in accordance with 5.6.1 and conditioning in accordance with 5.2.2.

5.6.5 Carry out the test specified in 5.6.3 after adjusting and marking in accordance with 5.6.1 and conditioning in accordance with 5.2.3.

NOTE A new sample lanyard with a length adjustment device may be used for each test.

5.7 Static strength test

5.7.1 Apparatus

The static strength test apparatus shall conform to 4.1 of EN 364:1992.

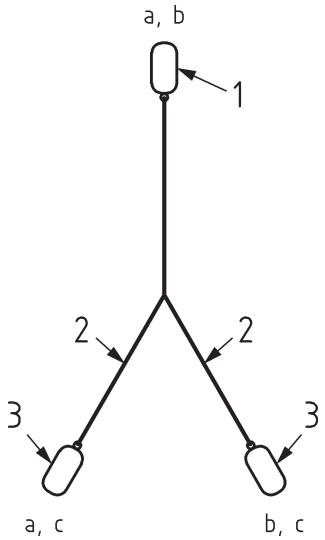
5.7.2 Method

NOTE A new sample lanyard may be used for each test.

5.7.2.1 If a textile lanyard is supplied with a connector conforming to EN 362 inserted in a termination, the connector shall be removed for the test.

5.7.2.2 After conditioning to 5.2, install the lanyard in the test machine within 90 s of removal from the conditioning atmosphere; submit the lanyard to the specified static test force defined in 4.5 between its two end points (supplied terminations). Maintain the force for a period of $(3\,^{+\,0{,}25}_{\ 0})$ min and check if the lanyard sustains the force.

5.7.2.3 If the lanyard has more than two terminations, repeat the test in accordance with 5.7.2.1 for all possible combinations of termination, see Figure 2.



Key

1 Termination used for attachment to a harness (via a connector)

2 Tail

3 Terminations used for attachment to the structure (via a connector)

a Attachment points for test 1 (between *a* and *a*)

b Attachment points for test 2 (between *b* and *b*)

c Attachment points for test 3 (between *c* and *c*)

Figure 2 — Example of a lanyard with more than two terminations, showing the terminations to be tested

5.7.2.4 For lanyards with a length adjustment device, carry out two tests, one with the lanyard adjusted to its minimum length and one with it adjusted to its maximum length.

5.7.3 Static test for lanyard with a length adjustment device after the dynamic test

Submit the lanyard with a length adjustment device to a static test force of (3 ± 0,3) kN or an equivalent mass between its two end points (supplied terminations). Maintain the force for a period of $(3\,^{+\,0,25}_{\ 0})$ min and check that the requirements of 4.6 are met.

5.8 Dynamic strength test for lanyards with a length adjustment device

5.8.1 Apparatus

5.8.1.1 Dynamic strength test apparatus

The dynamic strength test apparatus shall conform to 4.4.1, 4.5 and 4.6 of EN 364:1992.

5.8.1.2 Test lanyard

The test lanyard shall be constructed from mountaineering rope conforming to EN 892 for single rope and shall be known to have an impact force of (9 ± 1,5) kN in the first impact force test in that standard. For rope terminations, eyes are formed by means of bowline knots and with a termination loop length of max. 200 mm (see Figures 3 and 4).

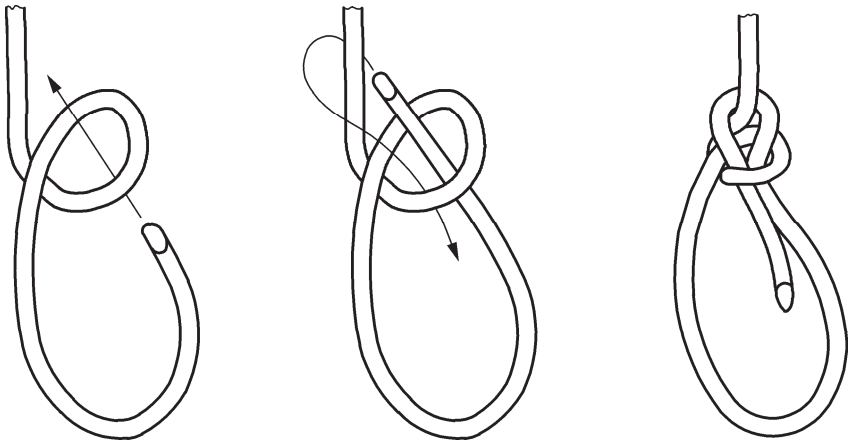
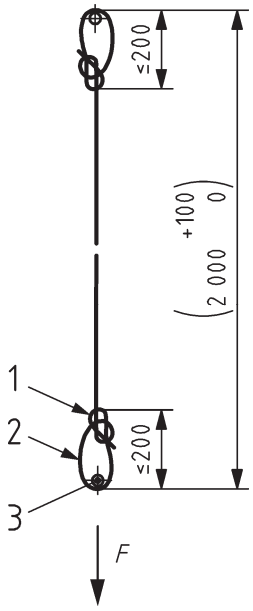


Figure 3 — Bowline knot

Dimensions in millimetres



Key

F Test mass or equivalent force

1 Bowline knot

2 Termination loop

3 Attachment point

Figure 4 — Test lanyard

Prepare the test lanyard so that under the load of the rigid test mass of 100 kg, or equivalent force, the length of the test lanyard including the eyes to be formed at the two ends is $(2\,000\,^{+\,100}_{\ 0})$ mm (see Figure 4).

5.8.2 Test procedure

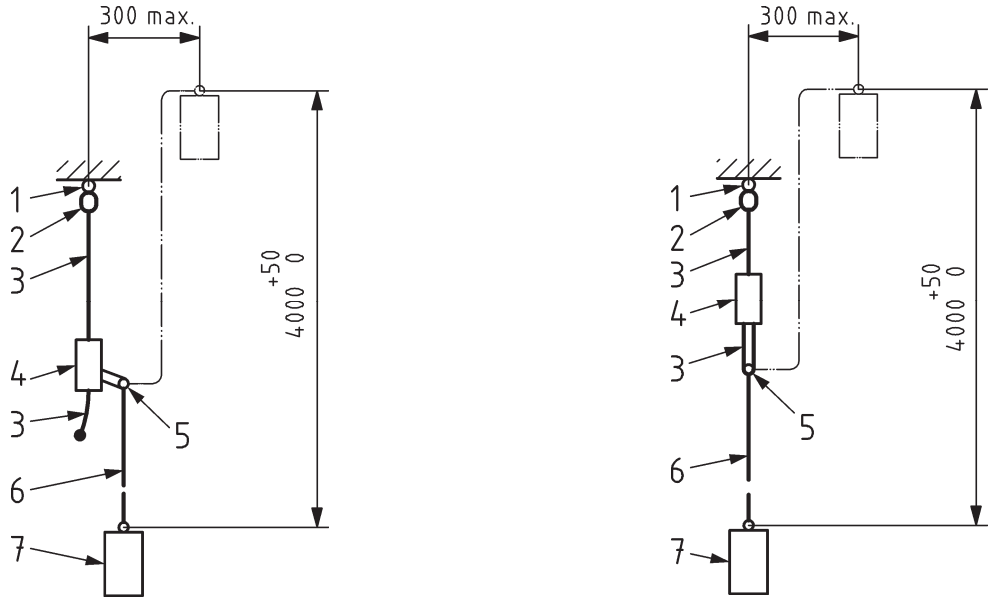
5.8.2.1 Condition the lanyard in accordance with 5.2.1, then connect the termination of the lanyard to the rigid anchor point of the test structure, using an appropriate connector if necessary.

See Figure 5 for test arrangement.

5.8.2.2 Adjust the lanyard with a length adjustment device so that the distance from its connection to the rigid anchor point of the test structure to the movable termination of the lanyard is (500 ± 5) mm. If the minimum adjustable length is greater than 500 mm, carry out the test at the minimum adjustable length. If the maximum adjustable length is smaller than 500 mm, carry out the test at the maximum adjustable length.

5.8.2.3 Attach one end of the test lanyard to the movable termination of the lanyard, using an appropriate connector if necessary. Connect the 100 kg mass specified in 5.8.1.1 to the other end of the test lanyard.

Dimensions in millimetres



a) Attachment point on the length adjustment device

b) Attachment point not on the length adjustment device

Key

1	Anchor point	2	Termination
3	Lanyard	4	Length adjustment device
5	Attachment point at movable termination	6	Test lanyard
7	100 kg mass		

Figure 5 — Dynamic strength test for lanyards with a length adjustment device

5.8.2.4 Raise the test mass ($4\,000^{+\,50}_{\ 0}$) mm and at a maximum of 300 mm horizontally from the rigid anchor point of the test structure. Hold it by the quick release device specified in 5.8.1.1.

5.8.2.5 Let the mass fall and observe if the mass is retained clear of the ground.

5.9 Corrosion resistance test

Expose a sample lanyard to the neutral salt spray test in accordance with EN ISO 9227 for a period of $(24^{+0,5}_{0})$ h. Dry for (60^{+5}_{0}) min at (20 ± 2) °C. Repeat the procedure, so that the lanyard is subjected in total to 24 h exposure and (60^{+5}_{0}) min drying plus another $(24^{+0,5}_{0})$ h exposure and (60^{+5}_{0}) min drying.

Examine the specimen in accordance with 4.7.

6 Marking

Marking on the lanyard shall conform to EN 365 and, in addition, shall include at least the following:

a) the maximum lanyard length, in accordance with 4.1.6;

b) the month and year of manufacture.

7 Information supplied by the manufacturer

The information supplied by the manufacturer shall conform to EN 365 and, in addition, shall include at least advice or information as follows:

a) that the user should read and understand the information supplied by the manufacturer before using the lanyard;

b) that a lanyard shall not be used for fall arrest purposes without any energy absorption, e.g. an energy absorber;

c) that the total length of a lanyard connected to an energy absorber (including terminations and connectors) shall not exceed 2 m;

d) the material from which the lanyard is made;

e) the number of this European Standard, i.e. EN 354:2010;

f) that, if the risk assessment carried out before the start of work shows that loading in the case of a use over an edge is possible, appropriate precautions should be taken;

g) that the user should minimise the amount of slack in the lanyard near a fall hazard;

h) when adjusting the length of a lanyard to avoid the risk of fall, the user should not move into an area where there is a fall hazard;

i) the useable life of the product and recommendations/information where the life expectancy could be reduced;

j) information on whether the lanyard may be used choke hitched;

k) information on the allowed/disallowed arrangements/configuration of lanyards when combined with an energy absorber.

   Non exhaustive examples are:

   1) Two separate lanyards each with an energy absorber should not be used side by side (i.e. parallel);

2) The free tail of a twin tail lanyard combined with energy absorber should not be clipped back on the harness.

8 Packaging

Packaging shall conform to EN 365.

Annex A
(informative)

Significant technical changes between this European Standard and the previous edition EN 354:2002

Table A.1— Significant technical changes

Clause/ Paragraph / Table / Figure	Change
1 *Scope*	**The scope of this European Standard has been enlarged: "Lanyards conforming to this European Standard are used as connecting elements or components in all personal fall protection systems (not only fall arrest systems).**
2 *Normative references*	**EN 892 and EN ISO 9227 have been added.**
3 *Terms and definitions*	**The definitions of "lanyard", "lanyard length", "termination" and "connector" have been changed.** **Definitions for "personal fall protection system" and "length adjustment device" have been incorporated.**
4.1 *Design and ergonomics*	**This subclause has been revised.**
4.2 *Materials*	**This subclause has been revised.**
4.3 *Terminations*	**A new subclause regarding "terminations" has been added.**
4.4 *Slippage for lanyards with length adjustment device*	**A new requirement concerning the slippage of lanyards with a length adjustment device has been introduced.**
4.6 *Dynamic strength for lanyards with a length adjustment device*	**An additional requirement has been introduced.**
4.7 *Corrosion resistance*	**Requirements for corrosion resistance have been added.**
5 *Test methods*	**This clause has been re-structured: Several new subclauses have been incorporated:**
5.1 *General*	**New.**
5.2 *Conditioning*	**New.**
5.3 *Examination of design*	**New.**
5.4 *Examination of materials*	**New.**
5.5 *Examination of terminations*	**New.**
5.6 *Slippage test for lanyards with a length adjustment device*	**New.**
5.7 *Static strength test*	**This subclause has been modified.**
5.8 *Dynamic strength test for lanyards with a length adjustment device*	**This subclause has been modified.**
5.9 *Corrosion resistance test*	**This test has been incorporated for the examination of the requirements in Subclause 4.7.**

Table A.1 *(continued)*

Figure 1, Figure 2, Figure 3, Figure 4, Figure 5	**Figures have been added for the description of the test procedures.**
6 *Marking*	**This clause has been revised.**
7 *Information supplied by the manufacturer*	**This clause has been revised.**
Annex ZA	**Annex ZA regarding the correspondence between this European standard and Directive 89/686/EEC has been adapted to the new structure of the standard.**
Bibliography	**The bibliography of EN 354:2002 has been deleted.**

Annex ZA
(informative)

Relationship between this European Standard and the Essential Requirements of EU Directive 89/686/EEC

This European Standard has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association to provide a means of conforming to Essential Requirements of the New Approach Directive 89/686/EEC.

Once this standard is cited in the Official Journal of the European Union under that Directive and has been implemented as a national standard in at least one Member State, compliance with the clauses of this standard given in Table ZA.1 confers, within the limits of the scope of this standard, a presumption of conformity with the corresponding Essential Requirements of that Directive and associated EFTA regulations.

Table ZA.1 — Correspondence between this European Standard and Directive 89/686/EEC

Clause(s)/sub-clause(s) of this EN	Essential Requirements (ERs) of Directive 89/686/EEC	Qualifying remarks/Notes
4.1.1; 4.1.4; 4.3.2; 4.3.4; 4.3.5; 4.4;	1.2.1 Absence of risks and other inherent nuisance factors	
4.2.1	1.2.1.1 Suitable constituent materials	
4.1.1	1.2.1.2 Satisfactory surface conditions of all PPE parts in contact with the user	
4.5.1; 4.5.2, 4.6;	1.3.2 Lightness and design strength	
6 and 7	1.4 Information supplied by the manufacturer	
6	2.12 PPE bearing one or more identification or recognition marks directly or indirectly relating to health and safety	

WARNING — Other requirements and other EU Directives may be applicable to the product(s) falling within the scope of this standard.

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