BRITISH STANDARD

BS EN
353-1:2002
Incorporating
Amendment No. 1

Personal protective equipment against falls from a height —

Part 1: Guided type fall arresters including a rigid anchor line

The European Standard EN 353-1:2002 has the status of a British Standard

ICS 13.340.99

National foreword

This British Standard is the official English language version of EN 353-1:2002. It supersedes BS EN 353-1:1993 which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee PH/5, Industrial safety belts and harnesses, which has the responsibility to:

— aid enquirers to understand the text;

— present to the responsible international/European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;

— monitor related international and European developments and promulgate them in the UK.

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

WARNING The UK, as a member of CEN, is obliged to publish EN 353-1:2002 as a British Standard. However, attention is drawn to the fact that following the publication of this British Standard, a number of recorded incidents in relation to the use of guided type fall arresters including a rigid anchor line, standardized in accordance with EN 353-1:2002, have raised concerns about the safety of this equipment.

BSI Technical Committee PH/5, which mirrors the work of Committee, CEN/TC 160, would strongly advise that the recommendations in National annex NA are followed to avoid further incidents.

Cross-references

The British Standards which implement international or European publications referred to in this document may be found in the BSI Catalogue under the section entitled "International Standards Correspondence Index", or by using the "Search" facility of the *BSI Electronic Catalogue* or of British Standards Online.

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This British Standard, having been prepared under the direction of the Health and Environment Sector Policy and Strategy Committee, was published under the authority of the Standards Policy and Strategy Committee on 4 July 2002

Summary of pages

This document comprises a front cover, an inside front cover, the EN title page, pages 2 to 13 and a back cover.

The BSI copyright date displayed in this document indicates when the document was last issued.

Amendments issued since publication

Amd. No.	Date	Comments
15198	16 February 2005	National foreword amended and National Annex NA added

ISBN 0 580 39971 0

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 353-1

May 2002

ICS 13.340.99

Supersedes EN 353-1:1992

English version

Personal protective equipment against falls from a height - Part 1: Guided type fall arresters including a rigid anchor line

Equipement de protection individuelle contre les chutes de hauteur - Partie 1: Antichutes mobiles incluant un support d'assurage rigide

Persönliche Schutzausrüstungen gegen Absturz - Mitlaufende Auffanggeräte einschließlich fester Führung

This European Standard was approved by CEN on 12 March 2002.

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Ref. No. EN 353-1:2002 E

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Foreword

This document EN 353-1:2002 has been prepared by Technical Committee CEN/TC 160 "Protection against falls from a 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 November 2002, and conflicting national standards shall be withdrawn at the latest by November 2002.

This document supersedes EN 353-1:1992. This new edition contains the old text of the standard and incorporates some urgent amendments that are intended to give additional information and clarify inconsistencies. A comprehensive revision of the standard will follow at a later stage.

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.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, 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 guided type fall arresters including a rigid anchor line usually attached to or integrated in fixed ladders or rungs adequately adjusted to suitable structures. Guided type fall arresters including a rigid anchor line conforming to this European Standard are sub-systems constituting one of the fall arrest systems covered by EN 363, when combined with a full body harness specified in EN 361 including a front attachment point located appropriately in relation to the fall arrester. Other types of fall arresters are specified in EN 353-2 or in EN 360. Energy absorbers are specified in EN 355.

2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text, and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references, the latest edition of the publication referred to applies (including amendments).

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

EN 355:2002, *Personal protective equipment against falls from a height - Energy absorbers.*

EN 362, *Personal protective equipment against falls from a height – Connectors.*

EN 363:2002, *Personal protective equipment against falls from a height - Fall arrest systems.*

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

EN 365:1992, *Personal protective equipment against falls from a height - General requirements for instructions for use and for marking.*

3 Terms and definitions

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

3.1
guided type fall arrester including a rigid anchor line
sub-system consisting of a rigid anchor line, a self-locking guided type fall arrester which is attached to the rigid anchor line and a connector or a connector-terminated lanyard. An energy dissipating function may be installed between the fall arrester and the anchor line or an energy absorber may be incorporated in the lanyard or in the anchor line [EN 363]

3.2
guided type fall arrester
fall arrester with a self-locking function and a guide facility. The guided type fall arrester travels along an anchor line, accompanies the user without requiring manual adjustment during upward or downward changes of position and locks automatically on the anchor line when a fall occurs [EN 363]

3.3
rigid anchor line
connecting element specified for a sub-system with a guided type fall arrester. A rigid anchor line may be a rail or a wire rope and is intended for securing to a structure in such a way that lateral movements of the line are limited [EN 363]

3.4
energy absorber
element or a component of a fall arrest system, which is designed to dissipate the kinetic energy developed during a fall from a height [EN 363]

3.5
lanyard
connecting element or component of a fall arrest system. A lanyard may be of synthetic fibre rope, wire rope, webbing or chain [EN 363]

3.6
attachment/detachment point
point on the anchor line where the guided type fall arrester can be fitted or detached [EN 363]

3.7
braking force
maximum force F_{max} in kilonewtons measured at the anchor point or the anchor line during the braking period of the dynamic performance test [EN 363]

3.8
arrest distance
vertical distance *H* in metres measured at the mobile load bearing point of the connecting sub-system from the initial position (onset of the free fall) to the final position (equilibrium after the arrest), excluding the displacements of the full body harness and its attachment element [EN 363]

3.9
horizontal distance
horizontal distance *A* in metres measured between the front side of the anchor line and the load bearing point of the connector intended to be attached to the full body harness [EN 363]

4 Requirements

4.1 Design and ergonomics

The general requirements for the design and ergonomics are specified in 4.1 of EN 363:2002.

4.2 Materials and construction

A rigid anchor line shall be a rail or a wire rope. The material of a rigid anchor wire rope shall conform to 4.2.3 of EN 354:2002 and its minimum diameter shall be 8 mm or of a value giving the equivalent safety.

In order to limit lateral movements, the rigid anchor line shall be secured to a structure at recommended intervals. If the rigid anchor line is a wire rope, it shall be secured to a structure and the wire rope shall be tightened.

The anchor line shall be so designed that it permits movement of the guided type fall arrester in the specified directions only and that it prevents any unintentional separation of the guided type fall arrester from the anchor line.

All attachment/detachment points of the rigid anchor line shall be either fitted with an end stop or be capable of being fitted with an end stop to prevent the guided type fall arrester from running off the anchor line unintended.

A guided type fall arrester shall be equipped with a connector or a connector-terminated lanyard. If the fall arrester is only equipped with a connector, it may be permanently attached to the fall arrester or be detachable from the fall arrester. If the fall arrester is equipped with a lanyard, one end of the lanyard shall be permanently attached to the fall arrester and the other end of the lanyard shall be terminated with a connector. The horizontal distance A shall be specified by the manufacturer and be reported in the information supplied by the manufacturer (see 7 a). A lanyard may be made from synthetic fibre rope, webbing, wire rope or chain. The material of a lanyard shall conform to 4.2.2, 4.2.3 or 4.2.4 of EN 354:2002.

A guided type fall arrester may be equipped with an opening device. If the guided type fall arrester is equipped with an opening device, it shall be so designed that it can only be detached or attached by at least two consecutive deliberate manual actions.

An energy absorber for a sub-system with a guided type fall arrester shall conform to EN 355.

Energy absorbers integrated in the lanyard shall conform to EN 355, but need not be tested in accordance with 5.2 of EN 355:2002.

Connectors for a sub-system with a guided type fall arrester shall conform to EN 362.

4.3 Locking

4.3.1 Locking after conditioning

When the guided fall arrester is conditioned as described in 5.1.2.1 and tested as described in 5.1.2.3 with a test mass of 5 kg, the guided type fall arrester shall in each case lock and remain locked until released.

4.3.2 Locking after optional conditioning

If the information supplied by the manufacturer of the guided type fall arrester (see clause 7) claims a feature concerning the use under specific conditions (see 5.1.2.2), the locking function of the fall arrester shall be tested accordingly

When conditioned as described in 5.1.2.2 and tested as described in 5.1.2.3 with a test mass of 5 kg, the guided type fall arrester shall in each case lock and remain locked until released.

4.4 Static strength

When tested as described in 5.2, the rigid anchor line with the attached guided type fall arrester and the lanyard shall sustain a force of at least 15 kN.

4.5 Dynamic performance

When tested as described in 5.3 with a test mass of 100 kg, the braking force F_{max} shall not exceed 6 kN and the arrest distance H shall not exceed 1 m.

4.6 Corrosion resistance

After the test described in 5.4 has been carried out, the elements of the guided type fall arrester including a rigid anchor line shall be examined. Where necessary to gain visual access to the internal elements, the device shall be dismantled. The test is classed as a failure if any corrosion is evident that could affect the function of the device. (White scaling or tarnishing is acceptable.)

4.7 Marking and information

Marking of the guided type fall arrester including a rigid anchor line shall be in accordance with clause 6.

Information shall be supplied with the guided type fall arrester including a rigid anchor in accordance with clause 7.

5 Test methods

5.1 Locking test after conditioning

5.1.1 Apparatus

5.1.1.1 Apparatus for conditioning

The conditioning apparatus shall conform to 4.8 of EN 364:1992.

5.1.1.2 Apparatus for the locking test

The locking test apparatus consists of a rigid structure and a test mass of 5 kg.

5.1.2 Method

5.1.2.1 Conditioning

The conditioning to heat, to cold and to wet is described in 5.11 of EN 364:1992.

5.1.2.2 Optional conditioning

The conditioning to dust and to oil is optional and described in 5.11 of EN 364:1992.

5.1.2.3 Locking test

The locking test shall be conducted as described in 5.11.6.1 of EN 364:1992.

5.2 Static strength test

5.2.1 Apparatus

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

5.2.2 Method

The static strength test shall be conducted as described in 5.6.4 of EN 364:1992.

5.3 Dynamic performance test

5.3.1 Apparatus

The dynamic performance test apparatus shall conform to 5.6.1 of EN 364:1992.

5.3.2 Method

The dynamic performance test shall be conducted as described in 5.6.2 of EN 364:1992.

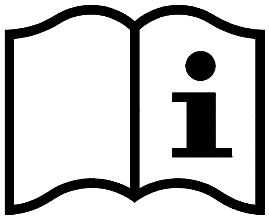
5.4 Corrosion test

The corrosion test shall be conducted as described in 5.13 of EN 364:1992 for a minimum period of 24 h.

6 Marking

Marking on the guided type fall arrester and the rigid anchor line shall conform to 2.2 of EN 365:1992 and any text shall be in the languages of the country of destination. In addition to conforming to 2.2 of EN 365:1992, the marking shall include the following:

a) on the guided type fall arrester, a pictogram to indicate that users shall read the information supplied by the manufacturer (see figure);



b) if appropriate, e.g. if the guided type fall arrester can be removed from the rigid anchor line, an indication on the guided type fall arrester of the correct orientation in use;

c) if appropriate, e.g. if the guided type fall arrester can be removed from the rigid anchor line, an indication that the guided type fall arrester shall only be used on an appropriate rigid anchor line. This shall be either on the guided type fall arrester, the rigid anchor line, or adjacent to the rigid anchor line;

d) the model/type identification mark of the guided type fall arrester;

e) the number of this European Standard, i.e. EN 353-1.

7 Information supplied by the manufacturer

The information supplied by the manufacturer shall be provided in the languages of the country of destination. It shall conform to 2.1 of EN 365:1992 and in addition shall include at least advice or information as follows:

a) the specific conditions, e.g. the horizontal distance *A* (see 3.9), under which the guided type fall arrester including a rigid anchor line may be used;

b) instructions for the installation of the rigid anchor line;

c) on how to connect to a full body harness and other components of the fall arrest system;

d) on how to ensure the compatibility of any components to be used in conjunction with the guided type fall arrester including a rigid anchor line, e.g. by reference to other European Standards;

e) for the guided type fall arrester, that only the recommended diameter and type of rigid anchor line shall be used;

f) if a complete system is supplied, that components of any complete system shall not be substituted;

g) the correct way of operating the guided type fall arrester on the rigid anchor line;

h) if the guided type fall arrester can be removed from the rigid anchor line, how to attach and detach it;

i) that with a mass of 100 kg and a fall factor two situation (worst case) the necessary minimum distance below the feet of the user is 2 m;

j) advice that for the first two metres the user may not be protected against hitting the ground and that extra care should be taken when ascending or descending;

k) on limitations of the materials in the product or hazards which may affect its performance, e.g. temperature, the effect of sharp edges, chemical reagents, electrical conductivity, cutting, abrasion, UV degradation, other climatic conditions;

l) that before and during use, consideration should be given as to how any rescue could be safely and efficiently carried out;

m) that the product should only be used by a trained and/or otherwise competent person or the user should be under the direct supervision of such a person;

n) on how to clean the product, including disinfection, without adverse effect;

o) if information exists, the expected lifespan of the product (obsolescence) or how this may be determined;

p) on how to protect the product during transportation;

q) on the meaning of any markings on the product;

r) the model/type identification mark of the guided type fall arrester or the guided type fall arrester including a rigid anchor line;

s) the number of this European Standard, i.e. EN 353-1.

8 Packaging

If guided type fall arresters incorporate textile materials they shall be supplied wrapped, but not necessarily sealed, in a material that provides some resistance against the penetration of moisture.

Annex ZA
(informative)

Clauses of this European Standard addressing essential requirements or other provisions of EU Directives

This European Standard 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 89/686/EEC.

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

The following clauses of this European Standard are likely to support requirements of Directive 89/686/EEC, Annex II:

EU-Directive 89/686/EEC, Annex II		clauses of this standard
1.1	Design principles	4.1 and 4.2
1.2	Innocuousness of PPE	4.2 and 4.3
1.3.2	Lightness and design strength	4.4, 4.5 and 4.6
1.4	Information supplied by the manufacturer	6 and 7
2.1	PPE incorporating adjustment systems	4.2
2.9	PPE incorporating components which can be adjusted or removed by the user	4.2
2.10	PPE for connection to another, external complementary device	7
2.12	PPE bearing one or more identification or recognition marks directly or indirectly relating to health and safety	6
3.1.2.2	Prevention of falls from height	4 to 8

Compliance with the clauses of this European Standard provides one means of conforming to the specific essential requirements of the Directive concerned and associated EFTA regulations.

Bibliography

EN 353-2, *Personal protective equipment against falls from a height – Part 2: Guided type fall arresters including a flexible anchor line.*

EN 360, *Personal protective equipment against falls from a height - Retractable type fall arresters.*

EN 361, *Personal protective equipment against falls from a height - Full body harnesses.*

National Annex NA (informative)

Recommendations on the testing and safe use of guided type fall arresters including a rigid anchor line

NA.1 Dynamic performance testing of guided type fall arresters including a rigid anchor line

Experience has indicated that using the test method specified in BS EN 364:1993, **5.6.2.2**, which is normatively referenced in BS EN 353-1, **5.3**, for a guided type fall arrester including a rigid anchor line that is a wire rope will permit unmeasured forces (unmeasured at type test) at the structural anchorage to far exceed the force measured at the test mass.

It is recommended that the testing of a guided type fall arrester including a rigid anchor line that is a wire rope should include the use of force measurement instruments at both the structural anchorage and the test mass to ensure that the peak force (the braking force F_{max}) does not exceed 6 kN as required in BS EN 353-1, **4.5**.

NA.2 Guided type fall arresters including a rigid anchor line that is a vertical rail

NA.2.1 This standard was prepared on the assumption that a user attaches and/or detaches to the guided type fall arrester including a rigid anchor line that is a vertical rail from a place of safety, e.g. at ground level or from a working platform, and remains connected to it for the duration of its use. However, this may not always be the case in practice, [albeit **7**a) does require the manufacturer to provide at least advice or information on the specific conditions under which the guided type fall arrester including a rigid anchor line may be used] for example when:

a) guided type fall arresters including a rigid anchor line that is a vertical rail are installed on pylons or masts and start at a raised level to prevent unauthorized access; or

b) guided type fall arresters including a rigid anchor line that is a vertical rail are installed at a height to facilitate the cleaning of windows or the external fabric of buildings.

Where it is possible to fall from the bottom of a vertical rail (as in the situations described above), the manufacturer should be consulted and an end stop (as referred to in **4.2**) designed and fitted to ensure that the guided type fall arrester cannot run off the end of the rail.

NA.2.2 The guided type fall arrester (and, for example, a lanyard and connector comprises the connection between the vertical rail and the user's harness. The guided type fall arrester is sometimes referred to as a mobile anchor point. There are safety concerns associated with:

a) the use of the guided type fall arrester for work positioning, where the user leans back and relies on it for support;

b) the position of the harness attachment point to which the guided type fall arrester is connected, when this is different from that recommended by the manufacturer.

In both cases, the guided type fall arrester's locking mechanism may be adversely affected, by either malfunctioning or failing.

A guided type fall arrester should not be used for work positioning unless the manufacturer, in the advice given in its user instructions, permits this.

In addition to the advice or information provided by the manufacturer in accordance with Clause **7**, it is recommended that:

a) the connection between the user's harness and the vertical rail should not be extended in length e.g. with an additional connector or lanyard;

b) the manufacturer, in the user instructions, should indicate the specific requirements for the attachment of a full body harness to the user, e.g. high or low relative to the sternum, and the user should adhere to this advice.

NA.2.3 If a horizontal force is applied to the connection between the guided type fall arrester and the user's harness in a situation when a fall occurs, e.g. when the user of a guided type fall arrester falls backwards, this may prevent engagement of the locking mechanism of the guided type fall arrester at the moment that it is required to lock onto the vertical rail, and lead to excessive fall distances.

The test procedures in BS EN 364, **5.6.2**, to which the dynamic performance test requirements in this standard make normative reference, "let the mass fall", but do not make any specific mention of any interference, during this fall, with a fixed ladder or other structure to which the vertical rail may be attached. If, in addition, the user of a guided type fall arrester falls backwards, before falling wholly downwards, they may fall further than the 1,0 m arrest distance specified in the dynamic test in **4.5**. Where it is possible to fall backwards from a ladder, unless the manufacturer has stated otherwise, the manufacturer should be consulted as to the performance of the guided type fall arrester in such circumstances and, if necessary, specific testing should be carried out to confirm that excessive arrest distances do not occur.

NA.2.4 4.3 of this standard specifies the essential requirements for when the guided type fall arrester is required to operate in the event of a fall. In addition to meeting these essential requirements, some guided type fall arresters may be fitted with an overriding or releasing facility to deactivate the locking function. Engaging a fall arrester's release function, or handling it during ascent/descent, can hinder the safe operation of the braking mechanism. The fall arrester should not require manual adjustment during normal use. Such a facility should not be activated when there is any danger that a fall or a further fall might occur.

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