INTERNATIONAL STANDARD

ISO 17249

First edition
2004-09-15

Safety footwear with resistance to chain saw cutting

Chaussures de sécurité résistantes aux coupures de scie à chaîne

Reference number
ISO 17249:2004(E)

ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

Published by ISO in 2005

Published in Switzerland

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 17249:2004 was prepared by the European Committee for Standardization (CEN) CEN/TC 161, *Foot and leg protectors*, in collaboration with Technical Committee ISO/TC 94, *Personal safety — Protective clothing and equipment,* Subcommittee SC 3, *Foot protection*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

Throughout the text of this document, read "...this European Standard..." to mean "...this International Standard...".

Annex ZB provides a list of corresponding International and European Standards for which equivalents are not given in the text.

For the purposes of this International Standard, the CEN annex regarding fulfilment of European Council Directives has been removed.

Contents

page

Foreword v
1 Scope 1
2 Normative references 1
3 Terms and definitions 1
4 Classification 1
5 Requirements 1
5.1 General 1
5.2 Design 4
5.3 Construction 5
5.4 Resistance to chain saw cutting 7
6 Marking 7
7 Information to be supplied 8
7.1 General 8
7.2 Protection against chain saw cutting 9
7.3 Electrical properties 9
7.3.1 Antistatic footwear 9
7.3.2 Electrically insulating footwear 10
7.4 Insocks 10
Annex A (normative) Uncertainty of measurement and interpretation of results 11
A.1 Uncertainty of measurement 11
A.2 Interpretation of results 11
A.3 Calculation of uncertainty of measurement 12
Annex ZB (normative) Corresponding International and European Standards for which equivalents are not given in the text 13
Bibliography 14

Foreword

This document (EN ISO 17249:2004) has been prepared by Technical Committee CEN/TC 161 “Foot and leg protectors”, the secretariat of which is held by BSI, in collaboration with Technical Committee ISO/TC 94 “Personal safety - Protective clothing and equipment”.

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 March 2005, and conflicting national standards shall be withdrawn at the latest by March 2005.

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).

Annexes A and ZB are normative.

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

1 Scope

This European Standard specifies requirements for safety footwear with resistance to chain saw cutting.

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 381-3, *Protective clothing for users of hand-held chain-saws — Part 3: Test methods for footwear*

EN ISO 20344:2004, *Personal protective equipment - Test methods for footwear (ISO 20344:2004)*

EN ISO 20345:2004, *Personal protective equipment - Safety footwear (ISO 20345:2004)*

3 Terms and definitions

For the purposes of this European Standard, the terms and definitions given in EN ISO 20345:2004 and the following term and definition apply.

feather line
the line of a shoe where the upper meets the bottom, the part of the bottom involved being the welt, rand, or sole, depending on the method of shoe construction

4 Classification

Safety footwear with resistance to chain saw cutting shall be classified in accordance with Table 1 of EN ISO 20345:2004.

5 Requirements

5.1 General

Four classes of safety footwear with varying resistance to chain saw cutting are specified according to the different chain saw speeds.

The uncertainty of measurement for each test method described in this standard shall be assessed in accordance with annex A.

Safety footwear with resistance to chain saw cutting shall conform to the requirements given in Table 1, Table 2, Table 3 and Table 4.

Table 1 — Requirements

	Requirement	Reference		Classification		Symbol
		EN ISO 20345:2004	This standard	I	II	
Design	Height of upper	5.2.1		X	X	
	Seat region:	5.2.2		X	X	
	Design		5.2	X	X	
	Construction		5.3	X	X	
Whole footwear	Sole performance:	5.3.1				
	Construction	5.3.1.1		X		
	Upper/outsole bond strength	5.3.1.2		X		
	Toe protection:	5.3.2				
	General	5.3.2.1		X	X	
	Internal length of toecaps	5.3.2.2		X	X	
	Impact resistance	5.3.2.3		X	X	
	Compression resistance	5.3.2.4		X	X	
	Behaviour of toecaps	5.3.2.5		X	X	
	Leak proofness	5.3.3			X	
	Specific ergonomic features	5.3.4		X	X	
	Penetration resistance	6.2.1		O	O	P
	Electrical properties:	6.2.2				
	Antistatic footwear	6.2.2.2		*	*	A
	Electrically insulating footwear	6.2.2.3		*	*	I
	Resistance to inimical environments:	6.2.3				
	Heat insulation of sole complex	6.2.3.1		*	*	HI
	Cold insulation of sole complex	6.2.3.2		*	*	CI
	Energy absorption of seat region	6.2.4		*	*	E
	Water resistance	6.2.5		*		WR
	Metatarsal protection	6.2.6		*	*	M
	Ankle Protection	6.2.7		*	*	AN
	Resistance to chain saw cutting		5.4	X	X	
Upper	General	5.4.1		X	X	
	Thickness	5.4.2			X	
	Tear strength	5.4.3		X		
	Tensile properties	5.4.4		X	X	
	Flexing resistance	5.4.5			X	
	Water vapour permeability and coefficient	5.4.6		X		
	pH value	5.4.7		X		
	Hydrolysis	5.4.8			X	
	Chromium VI content	5.4.9		X		
	Water penetration and water absorption	6.3.1		*		
	Upper construction	6.3.2		X		
	Cut resistance	6.3.3		*	*	CR

Table 1 *(continued)* **— Requirements**

	Requirement	Reference		Classification		Symbol
		EN ISO 20345:2004	This standard	I	II	
Vamp lining	Tear strength	5.5.1		X		
	Abrasion resistance	5.5.2		X		
	Water vapour permeability and coefficient	5.5.3		X		
	pH value	5.5.4		X		
	Chromium VI content	5.5.5		X		
Quarter lining	Tear strength	5.5.1		O		
	Abrasion resistance	5.5.2		O		
	Water vapour permeability and coefficient	5.5.3		O		
	pH value	5.5.4		O		
	Chromium VI content	5.5.5		O		
Tongue	Tear strength	5.6.1		O		
	pH value	5.6.2		O		
	Chromium VI content	5.6.3		O		
Outsole	Thickness	5.8.1		X	X	
	Tear strength	5.8.2		X		
	Abrasion resistance	5.8.3		X	X	
	Flexing resistance	5.8.4		X	X	
	Hydrolysis	5.8.5		X	X	
	Interlayer bond strength	5.8.6		O	O	
	Resistance to fuel oil	5.8.7		X	X	
	Cleated area	6.4.1		X	X	
	Thickness of cleated outsoles	6.4.2		X	X	
	Cleat height	6.4.3		X	X	
	Resistance to hot contact	6.4.4		*	*	HRO

NOTE The applicability of a requirement to a particular classification is indicated in this Table by the following:

X the requirement shall be met. In some cases the requirement relates only to particular materials within the classification — e.g. pH value of leather components. This does not mean that other materials are precluded from use.

O if the component part exists, the requirement shall be met.

The absence of X or O indicates that there is no requirement.

* Means that if the property is claimed, the requirement given in the appropriate clause shall be met.

Table 2 — Basic requirements for insoles and/or insocks

Options			Component to be assessed	Requirements of EN ISO 20345: 2004 to fulfil					
				Thickness 5.7.1	pH [a] 5.7.2	Water absorption desorption 5.7.3	Abrasion 5.7.4.1	Chromium VI [a] 5.7.5	Abrasion 5.7.4.2
1	No insole or if present not fulfilling the requirements	Non removable insock	Insock	X	X	X		X	X
2	Insole present	No insock	Insole	X	X	X	X	X	
		Seat sock present							
3		Full insock, non removable	Insock and insole together	X		X			
			Insock		X			X	X
4		Full insock, removable and water permeable [b]	Insole	X	X	X	X	X	
			Insock		X			X	X
5		Full insock, removable, not water permeable [b]	Insole	X	X	X	X	X	
			Insock		X	X		X	X

X the requirement shall be met.

NOTE : For removable insocks see 7.4.

[a] those requirements are only for leather

[b] a water permeable insock is one that, when tested in accordance with EN ISO 20344: 2004, 7.2, lets water through in 60 s or less

5.2 Design

Safety footwear with resistance to chain saw cutting shall only be of design C, D or E as described in Figure 3 of EN ISO 20345:2004.

The minimum height "*l*" of the protective area (see Figure 1) shall be in accordance with Table 3.

Table 3 - Minimum height of the protective area

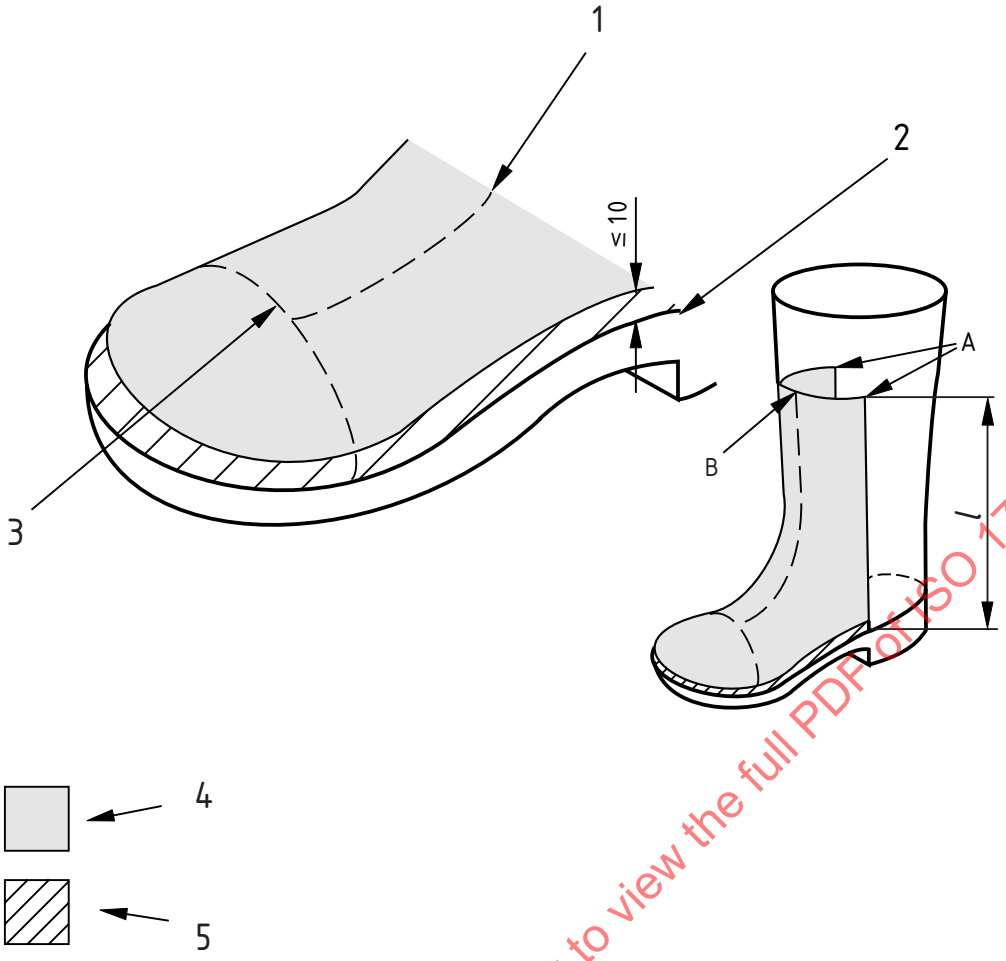
Footwear size		Minimum height, *l* (mm)	
French	**English**	**Design C**	**Designs D, E**
36 and below	Up to 3 ½	172	195
37 and 38	4 to 5	175	195
39 and 40	5 ½ to 6 ½	182	195
41 and 42	7 to 8	188	195
43 and 44	8 ½ to 10	195	195
45 and above	10 ½ and above	195	195

5.3 Construction

Safety footwear with resistance to chain saw cutting shall have a continuous protective area, as shown in Figure 1, comprising the vamp, tongue and toe area of the footwear. It includes:

a) the safety toecap;

b) the area immediately behind the toecap back edge bounded by two vertical lines at least 70 mm on either side of the footwear centre line, measured between point A and point B as shown in Figure 1, and a line parallel to the feather line at a maximum distance of 10 mm above the feather line and with a minimum height as given in Table 3.



Key

1 Footwear centre line
2 Feather line
3 Toecap back edge
4 Protective area
5 Additional protective area for level 3 and level 4 footwear

Figure 1 — Minimum protective area

For level 3 and level 4 footwear (see 5.4), there shall be no gap between the protective area and the feather line.

There shall be no gap between the toecap and the protective material.

All chain saw protective material shall be permanently attached to the footwear. If different chain saw protective materials are used, they shall either be butted together or overlapped so that there are no surface gaps.

If the footwear is designed to provide protection over a larger area than that specified, all parts shall have the same protective quality.

5.4 Resistance to chain saw cutting

When tested in accordance with the method described in EN 381-3, using the test chain speed specified in Table 4 for the appropriate class of footwear, no cut-through shall occur.

NOTE 1 During the set-up procedure the footwear can be covered by a suitable protection in order to avoid surface contamination.

Table 4 — Levels of protection

Levels of protection	Chain speed (m/s)
1	20
2	24
3	28
4	32

NOTE 2 EN 381-3 defines only 3 speeds of chain saw. For the purpose of this footwear standard a fourth speed has been added.

6 Marking

Each item of safety footwear with resistance to chain saw cutting shall be clearly and permanently marked, for example by embossing or branding, with the following:

a) size;

b) manufacturer's identification mark;

c) manufacturer's type designation;

d) year and at least quarter of manufacture;

e) the number and year of this European Standard, i.e. EN ISO 17249:2004;

f) the symbol(s) from Table 1 appropriate to the protection provided which is/are not covered by the pictogram (see Figure 2).

In addition, the pictogram shown in Figure 2 together with the level of protection provided (level 1, level 2, level 3 or level 4), shall be given on a label of dimensions at least 30 mm x 30 mm attached in a visible position on the outside of the footwear.

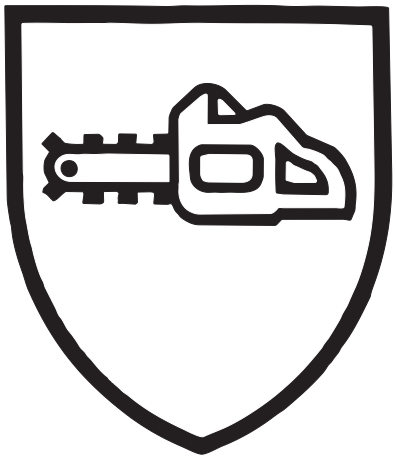


Figure 2 — Pictogram indicating protection against chain saw cutting (Symbol 2416 of ISO 7000: 2004)

7 Information to be supplied

7.1 General

Safety footwear with resistance to chain saw cutting shall be supplied to the customer with information written at least in the official language(s) of the state of destination. All information shall be unambiguous. The following information shall be given:

a) Name and full address of the manufacturer and/or his authorized representative;

b) Notified body involved in type approval; for category III products the notified body involved with article 11;

c) Number of this standard;

d) Explanation of any pictograms, markings and levels of performance. A basic explanation of the tests that have been applied to the footwear, if applicable;

e) Instructions for use:

   1) tests to be carried out by the wearer before use, if required;

   2) fitting; how to put on and take off the footwear, if relevant;

   3) application; basic information on possible uses and, where detailed information is available, the source;

   4) limitations of use (e.g. temperature range; etc.);

   5) instructions for storage and maintenance, with maximum periods between maintenance checks (if important, drying procedures to be defined);

   6) instructions for cleaning and/or decontamination;

   7) obsolescence deadline or period of obsolescence;

   8) if appropriate, warnings against problems likely to be encountered (modifications can invalidate the type approval, e.g. orthopaedic footwear);

9) if helpful, additional illustrations, part numbers etc.

f) Reference to accessories and spare parts, if relevant;

g) The type of packaging suitable for transport, if relevant.

7.2 Protection against chain saw cutting

Each pair of safety footwear with resistance to chain saw cutting shall be supplied with a leaflet containing the substance of the following wording:

“No personal protective equipment can ensure 100% protection against cutting from a hand held chain saw. Nevertheless, experience has shown that it is possible to design equipment which offers a certain degree of protection. Different functional principles, which may be applied in order to give protection, include:

— chain slipping on contact, such that it does not cut the material;

NOTE This type of protection on rubber boots can deteriorate over time.

— clogging fibres drawn by the chain into the drive sprocket to block chain movement;

— chain braking by use of fibres with a high resistance to cutting which absorb kinetic energy, thereby reducing chain speed;

Often more than one principle is applied.

Four levels of protection are available, denoting different levels of chain saw resistance.

It is recommended to select the footwear in line with the chain saw speed.

It is important that there is an overlap between the protective material within the footwear and trousers.”

7.3 Electrical properties

7.3.1 Antistatic footwear

Each pair of antistatic footwear shall be supplied with a leaflet containing the following wording.

”Antistatic footwear should be used if it is necessary to minimize electrostatic build-up by dissipating electrostatic charges, thus avoiding the risk of spark ignition of, for example flammable substances and vapours, and if the risk of electric shock from any electrical apparatus or live parts has not been completely eliminated. It should be noted, however, that antistatic footwear cannot guarantee an adequate protection against electric shock as it introduces only a resistance between foot and floor. If the risk of electric shock has not been completely eliminated, additional measures to avoid this risk are essential. Such measures, as well as the additional tests mentioned below, should be a routine part of the accident prevention programme at the workplace.

Experience has shown that, for antistatic purposes, the discharge path through a product should normally have an electrical resistance of less than 1 000 MΩ at any time throughout its useful life. A value of 100 kΩ is specified as the lowest limit of resistance of a product when new, in order to ensure some limited protection against dangerous electric shock or ignition in the event of any electrical apparatus becoming defective when operating at voltages of up to 250 V. However, under certain conditions, users should be aware that the footwear might give inadequate protection and additional provisions to protect the wearer should be taken at all times.

The electrical resistance of this type of footwear can be changed significantly by flexing, contamination or moisture. This footwear will not perform its intended function if worn in wet conditions. It is, therefore, necessary to ensure that the product is capable of fulfilling its designed function of dissipating electrostatic charges and also of giving some protection during the whole of its life. The user is recommended to establish an in-house test for electrical resistance and use it at regular and frequent intervals.

Classification I footwear can absorb moisture if worn for prolonged periods, and in moist and wet conditions can become conductive.

If the footwear is worn in conditions where the soling material becomes contaminated, wearers should always check the electrical properties of the footwear before entering a hazard area.

Where antistatic footwear is in use, the resistance of the flooring should be such that it does not invalidate the protection provided by the footwear.

In use, no insulating elements, with the exception of normal hose, should be introduced between the inner sole of the footwear and the foot of the wearer. If any insert is put between the inner sole and the foot, the combination footwear/insert should be checked for its electrical properties".

7.3.2 Electrically insulating footwear

Footwear with insulating properties provides limited protection against the inadvertent contact with damaged electrical apparatus and therefore each pair shall be supplied with the following information:

a) Footwear with insulating properties shall be worn if there is a danger of electric shock, for example from damaged live electrical apparatus.

b) Electrically insulating footwear cannot guarantee 100% protection from electric shock, and additional measures to avoid this risk are essential. Such measures, as well as the additional tests mentioned below, should be part of a routine risk assessment programme.

c) The electrical resistance of footwear should meet the requirements of EN 50321:1999, 6.3, at any time throughout the life of the footwear.

d) This level of protection can be affected during service by:

   1) Footwear becoming damaged by nicks, cuts, abrasions or chemical contamination, regular inspections are necessary, worn and damaged footwear should not be used.

   2) Classification I footwear can absorb moisture if worn for prolonged periods and in moist and wet conditions, and can become conductive.

e) If footwear is worn in conditions where the soling material becomes contaminated for example by chemicals, caution should be taken when entering hazardous areas as this can well affect the electrical properties of the footwear.

f) It is recommended that the users establish an appropriate means of having the electrical insulating properties of footwear inspected and tested whilst in service.

7.4 Insocks

If the footwear is supplied with a removable insock it should be made clear that testing was carried out with the insock in place. A warning shall be given that the footwear shall only be used with the insock in place and that the insock shall only be replaced by a comparable insock supplied by the original footwear manufacturer.

If the footwear is supplied without an insock it should be made clear that testing was carried out with no insock present. A warning shall be given that fitting an insock can affect the protective properties of the footwear.

Annex A
(normative)

Uncertainty of measurement and interpretation of results

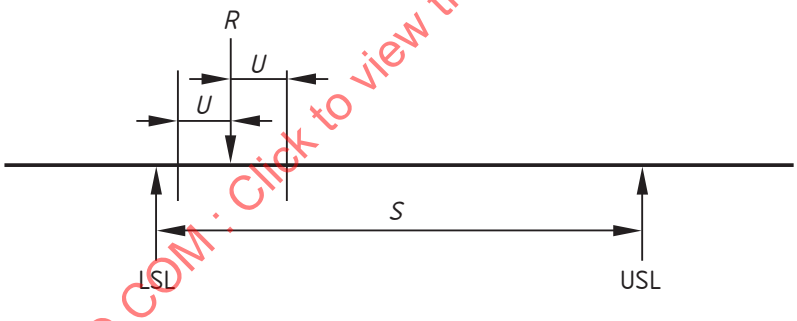
A.1 Uncertainty of measurement

For each of the measurements performed in accordance with this standard, a corresponding estimate of the uncertainty of measurement *U* shall be calculated. This estimate of uncertainty shall be applied in accordance with A.2 and stated when reporting test results, in order to enable the user of the test report to assess the reliability of the data.

A.2 Interpretation of results

The following protocol with regard to uncertainty of measurement shall be applied to test results:

If the mean value of the result from the test data plus/minus the uncertainty of measurement *U* falls between the upper and lower limiting values for the particular parameter specified in the appropriate product performance guidelines, e.g. EN ISO 20345, then the result shall be deemed to be a straightforward pass (see Figure A.1).



Key

R	Result of a measurement	LSL	Lower specified limit
S	Specified performance guidelines	USL	Upper specified limit
		U	Uncertainty of measurement

Figure A.1 — Result pass

If the mean value of the results from the test data plus/minus the uncertainty of measurement *U* falls outside of the upper or lower limiting values for the particular parameter specified in the appropriate product performance guidelines, e.g. EN ISO 20345, then the result shall be deemed to be a straightforward fail (see Figure A.2).