BRITISH STANDARD

BS EN
13630-5:2003

Explosives for civil uses — Detonating cords and safety fuses —

Part 5: Determination of resistance to abrasion of detonating cords

The European Standard EN 13630-5:2003 has the status of a British Standard

ICS 71.100.30

National foreword

This British Standard is the official English language version of EN 13630-5:2003.

The UK participation in its preparation was entrusted to Technical Committee CII/61, Explosives for civil uses, 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.

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.

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 does not of itself confer immunity from legal obligations.

This British Standard, was published under the authority of the Standards Policy and Strategy Committee on 12 January 2004

Summary of pages

This document comprises a front cover, an inside front cover, the EN title page, pages 2 to 14, an inside back cover and a back cover.

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

Amendments issued since publication

Amd. No.	Date	Comments

ISBN 0 580 43232 7

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 13630-5

December 2003

ICS 71.100.30

English version

Explosives for civil uses - Detonating cords and safety fuses - Part 5: Determination of resistance to abrasion of detonating cords

Explosifs à usage civil - Cordeaux détonants et mèches de sûreté - Partie 5: Détermination de la résistance à l'abrasion des cordeaux détonants

Explosivstoffe für zivile Zwecke - Sprengschnüre und Sicherheitsanzündschnüre - Teil 5: Bestimmung der Widerstandsfähigkeit von Sprengschnüren gegenüber Abrieb

This European Standard was approved by CEN on 10 November 2003.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Central Secretariat has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Slovakia, Spain, Sweden, Switzerland and United Kingdom.

EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

Management Centre: rue de Stassart, 36 B-1050 Brussels

Ref. No. EN 13630-5:2003: E

Contents

Foreword

This document (EN 13630-5:2003) has been prepared by Technical Committee CEN/TC 321 "Explosives for civil uses", the secretariat of which is held by AENOR.

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 June 2004, and conflicting national standards shall be withdrawn at the latest by June 2004.

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.

Annexes A and C are informative.

Annex B is normative.

This European Standard is one of a series of standards on *Explosives for civil uses – Detonating cords and safety fuses.* The other parts of this series are:

EN 13630-1	Part 1: Requirements.
EN 13630-2	Part 2: Determination of thermal stability of detonating cords and safety fuses.
EN 13630-3	Part 3: Determination of sensitiveness to friction of the core of detonating cords.
EN 13630-4	Part 4: Determination of sensitiveness to impact of detonating cords.
EN 13630-6	Part 6: Measurement of the resistance to tension of detonating cords.
EN 13630-7	Part 7: Determination of reliability of initiation of detonating cords.
EN 13630-8	Part 8: Determination of resistance to water of detonating cords and safety fuses
EN 13630-9	Part 9: Determination of transmission of detonation from detonating cord to detonating cord
prEN 13630-10	Part 10: Determination of initiating capability of detonating cords
EN 13630-11	Part 11: Determination of velocity of detonation of detonating cords.
EN 13630-12	Part 12: Determination of burning duration of safety fuses.

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, Hungary, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Slovakia, Spain, Sweden, Switzerland and the United Kingdom.

Introduction

During usage on site, the coating of detonating cords may be subjected to abrasive forces when drawn over rough surfaces. The coating is worn away gradually by abrasion to cause failure, which will affect the performance of the detonating cord. This standard deals with the ability of detonating cords to resist the abrasive forces likely to be experienced in normal use.

1 Scope

This European Standard describes the method for determining the resistance of the coating of flexible plastic-coated detonating cords and flexible fibrous-overbraided detonating cords, for civil use to failure when subjected to abrasion.

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 13857-1:2003, *Explosives for civil uses - Part 1: Terminology.*

EN ISO/IEC 17025, *General requirements for the competence of testing and calibration laboratories (ISO/IEC 17025:1999).*

3 Terms and definitions

For the purposes of this European Standard, the terms and definitions given in EN 13857-1:2003 apply.

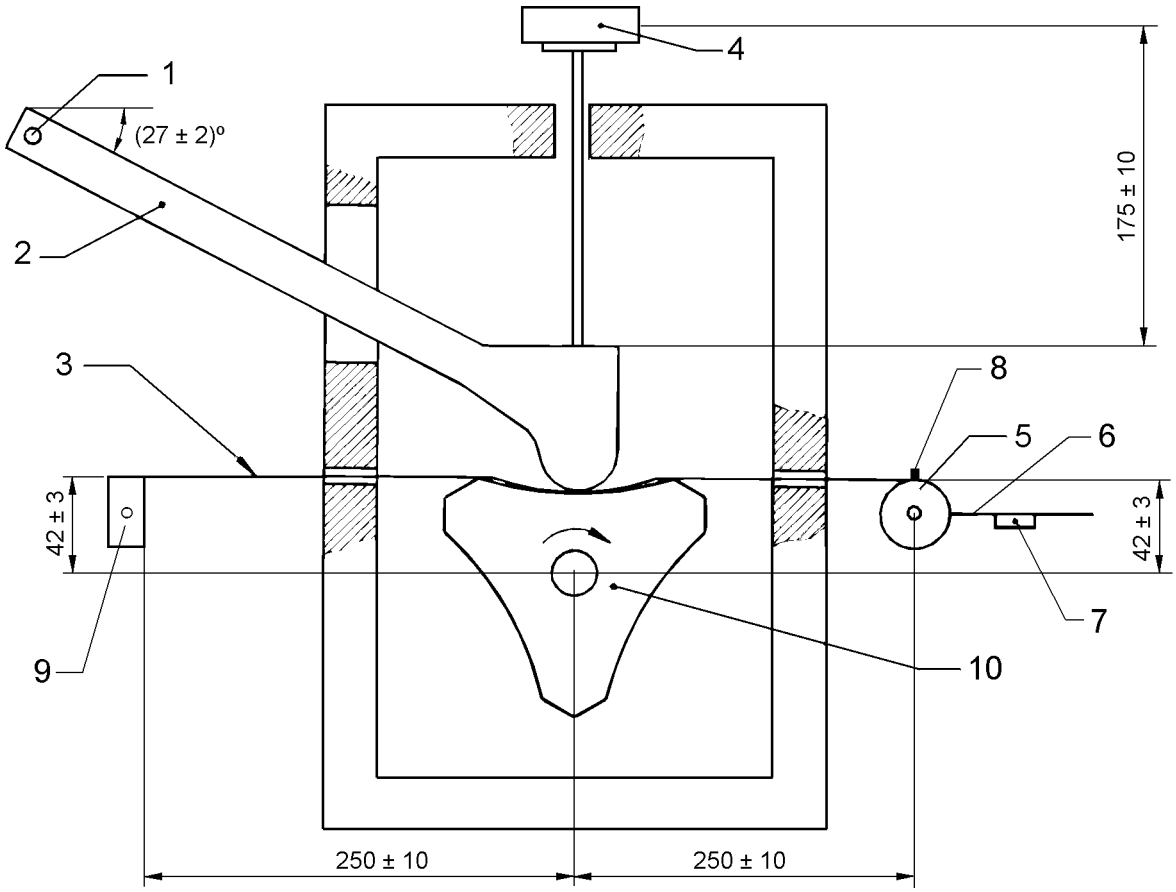
4 Apparatus

4.1 Digital timer with relay output, capable of:

- being set to a predetermined time in the range of (0 to 10) s ± 0,1 s;
- being started (triggered) when the hinged arm is lifted by the test piece;
- automatically stopping the rotor when the predetermined time has elapsed.

4.2 Abrasion test apparatus, as shown in Figure 1, comprising the following main components.

Dimensions in millimetres



Key

1 Pivot
2 Hinged arm
3 Detonating cord
4 Weight
5 Pulley
6 Rod
7 Weight
8 Clamp screw for attaching the test piece
9 Clamp for attaching the test piece
10 Rotor

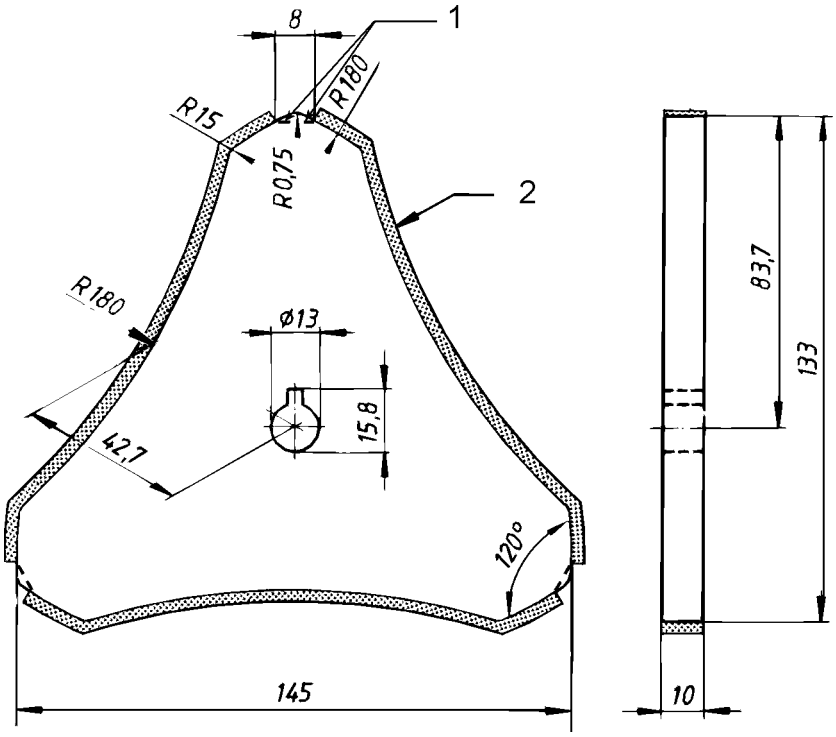
NOTE The weight on the rod to the right of the pulley (diameter 70 mm ± 1 mm) may hang down the right side of the pulley.

Figure 1 – Abrasion test apparatus with rotor in starting position

4.2.1 Steel or brass rotor, as shown in Figure 2, with a perimeter of (453 ± 2) mm to which three abrasive strips (4.2.2) are attached by means of glue or double-sided adhesive tape. It shall be ensured that electrical contact between the abrasive strips and the rotor is made, e.g. at the slits on the rotor where the ends of the abrasive strips are inserted (see Figure 2). The rotor shall rotate at a speed of (9,96 ± 0,18) rpm, producing a mean peripheral speed of (0,075 ± 0,001) m/s.

NOTE Depending on attachment principle (glue or tape) of the abrasive strip to the rotor, the abrasive strip may have to be bent carefully using a suitable tool in order to fit properly against the surface of the rotor.

Dimensions in millimetres



Key

1 Slit for the end of the abrasive strip

2 Abrasive strip

Figure 2 – Rotor

4.2.2 Abrasive strips, three pieces approximately 10 mm x 145 mm each, made of grinding steel as specified in annex B.

4.2.3 Load, to be applied to the test piece through the hinged arm (see 4.2.4).

4.2.4 Hinged arm, made of steel or brass as shown in Figure 3. In the starting position, the hinged arm shall apply a load of (8,35 ± 0,05) N to the test piece.

Dimensions in millimetres

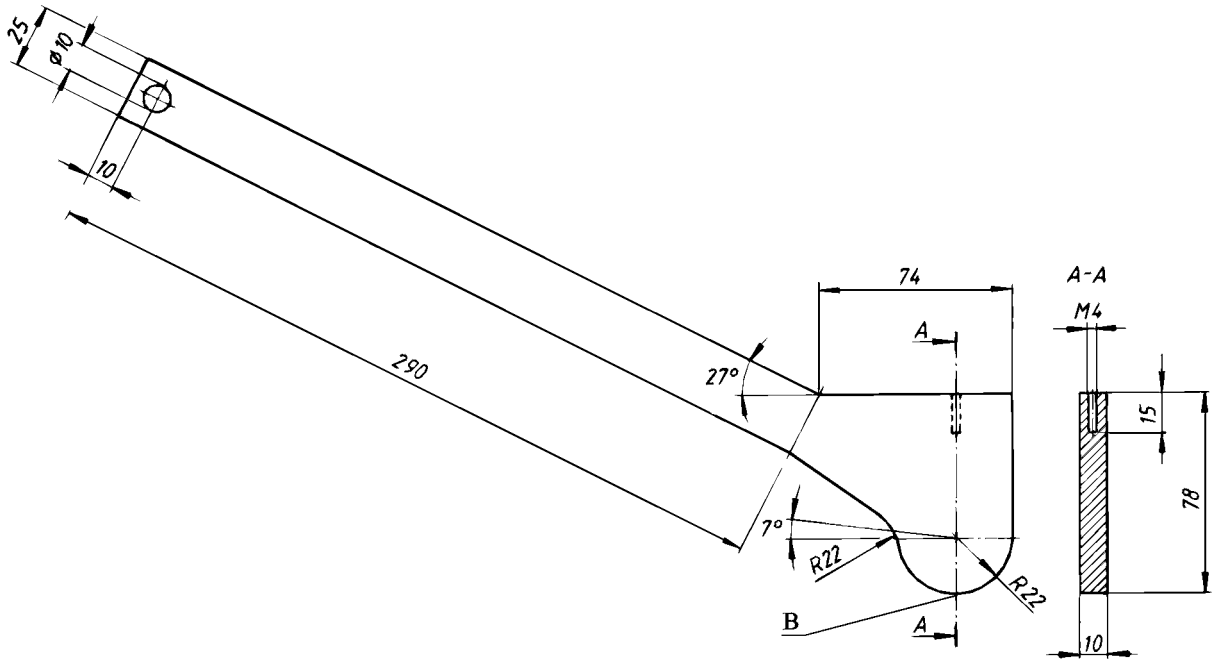


Figure 3 – Hinged arm

4.2.5 Pulley, diameter (70 ± 1) mm, for applying a tensile load of (8,1 ± 0,5) N to the test piece, by means of a rod and a weight.

4.2.6 Motor, capable of maintaining a constant speed of rotation whatever load is applied to the rotor.

NOTE 1 A DC motor with an output power of at least 500 W and with a separate speed control can be used.

The rotor shall reach its specified speed of rotation 0,6 s after starting.

NOTE 2 This requirement can be verified by two electrodes about 20 mm apart, each adjusted to give electrical contact to the tips of the rotor during rotation. The electrodes are connected to a digital counter, counting elapsed time between the pulses from the two electrodes when they are touching the tips of the rotor. Comparison is made between the elapsed time during a continuous run at the specified speed and the elapsed time 0,6 s after start. First the rotor is rotated manually to an appropriate position in order for a tip of the rotor to reach the second electrode after 0,6 s.

The electrodes can also be used for calibrating the specified speed of rotation, e.g. by measuring the time for one revolution. In this case only one electrode is required.

4.3 Conditioning chamber, capable of maintaining the highest temperature ± 2 °C claimed by the manufacturer.

5 Test pieces

Select five pieces of detonating cord with suitable length of a specific type having the same composition and dimensions.

6 Procedure

Attach each test piece to the attachment points as shown in Figure 1, e.g. by suitable clamping in order to prevent the test piece from damage at the attachment points.

Position the rotor as shown in Figure 1, which shows the starting position.

Lift up the hinged arm (72 ± 2) mm above the centre of the rotor and fix it in that position using a retaining pin or similar arrangement.

Adjust the tensile load to 8,1 N.

Load the hinged arm with (12,20 ± 0,02) N (excluding the adjusted load due the hinged arm itself).

Carry out the test at the upper temperature limit stated by the manufacturer ± 2 °C.

Start the motor.

The timing mechanism shall be started automatically as the hinged arm is lifted by the test piece.

Remove the retaining pin.

The rotor shall be stopped automatically by the timing mechanism after (5,00 ± 0,05) s.

Remove the detonating cord from the apparatus. Record any breakage of the detonating cord. Record any exposure of the explosive core of the detonating cord.

NOTE After each test the abrasive strip should be cleaned: for example, by using a brush with plastic bristles. The abrasive strip can be used for several tests but should be changed at suitable intervals based on practical experience of the degradation of the strip. The degradation of the strip can be monitored during routine testing by periodically testing a new set of ten electric wires (e.g. category II leading wires used for detonators) known to give a mean time at failure of approximately 5 s with a new abrasive strip. Then it should be ensured that the mean time at failure for each subsequent set of these wires has not increased by more than 5 % of the mean time at failure for the original set of wires (used with the new abrasive strip).

7 Test report

The test report shall conform to EN ISO/IEC 17025. In addition, the following information shall be given:

a) reference to this standard;

b) result of visual inspection in respect of mechanical damage (i.e. breakage or exposure of the explosive core).

Annex A
(informative)

Range of applicability of the test method

Range of applicability of the test method:	- 30 °C to + 80 °C

Annex B
(normative)

Specification of grinding steel

B.1 Type

Grinding steel manufactured by using a chemical etching process.

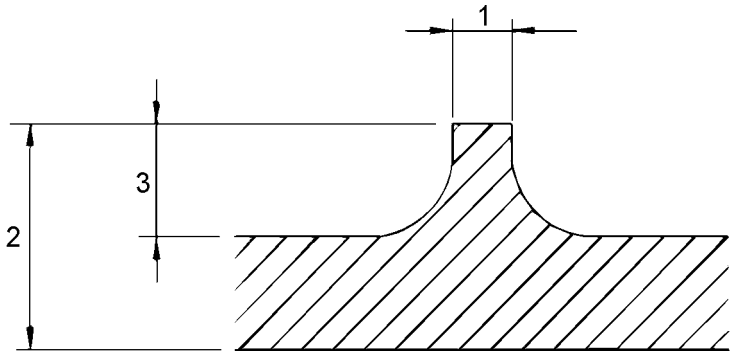
B.2 Material

Martensitic stainless steel

B.3 Dimensions

The cross section dimensions of the grinding steel shall comply with Figure B.1. The values indicated refer to the mean values for the set of abrasive strips required for testing i.e. the mean value for three strips, each with a size of 10 mm x 145 mm.

NOTE The conformity of the strips against the specified tolerances can be verified by selecting an appropriate number of measurement points on a representative area of the grinding steel.



Key

1 Mean value, diameter 0,06 mm to 0,13 mm
2 Mean value, thickness 0,27 mm to 0,35 mm
3 Mean value, depth 0,14 mm to 0,20 mm

Figure B.1 – Cross-section of grinding steel

The cutting point pattern of the grinding steel shall comply with Figure B.2. The cutting points of the grinding steel are distributed in circular sections orientated as in Figure B.2 a). Each section contains seven circular rows around a centre cutting point. The cutting points are placed on these circular rows. The circular diameters and number of cutting points are given in Table B.1.

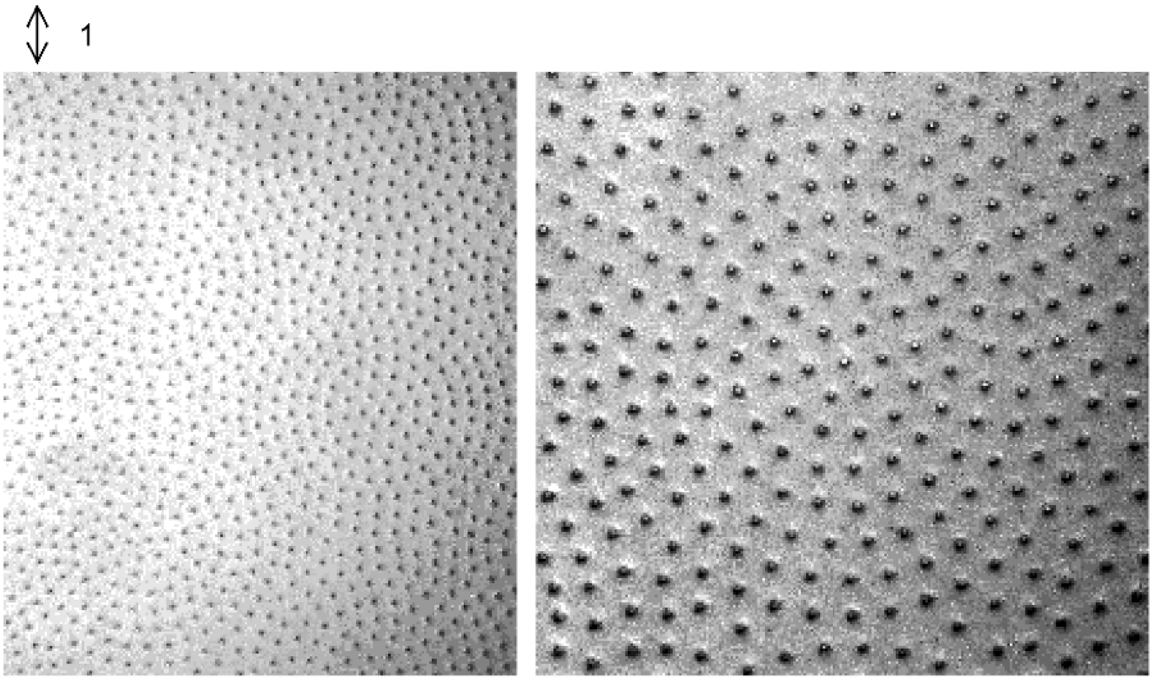


Figure B.2 a) – Cutting point pattern for circles related to the length direction of strips

Figure B.2 b) – Cutting point pattern for one circle

Key

1 Length direction of cut abrasive strip (10 mm x 145 mm)

Figure B.2 – Cutting point pattern of grinding steel

Abrasive strips shall be cut to size (see 4.2.2) from the grinding steel. The strips shall be cut in the direction indicated in Figure B.2 a) related to the cutting point pattern. The centres of the circles shall coincide with the centre of the strip indicated in Figure B.2 b).

Table B.1 – Circular diameters and number of cutting points

Row number	Diameter (± 5 %) mm	Number of cutting points
1	1,6	6
2	3,1	12
3	4,7	18
4	6,2	24
5	7,8	30
6	9,3	35
7	10,9	41

Annex C
(informative)

Availability of abrasive strips

Though the commercial availability of the grinding steel required for the abrasive strips, specified in annex B has been checked, it has been considered convenient to provide a contact point for obtaining such material:

SP – Swedish National Testing and Research Institute
Department of Electronics
Box 857
S-501 15 Borås
Sweden
Tel. : +46 33 16 50 00
Fax: +46 33 13 55 02
E-mail: info@sp.se

This information is given for the convenience of the user of this European Standard and does not constitute an endorsement by CEN of this provider.

Annex ZA
(informative)

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

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 93/15/EEC.

Compliance with this standard provides one means of conforming with the specific essential requirements of the Directives concerned and associated EFTA regulations.

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

The clauses of this document are likely to support requirements I.1, I.2, and II.2.B.(a) of Directive 93/15/EEC.

blank

BSI — British Standards Institution

BSI is the independent national body responsible for preparing British Standards. It presents the UK view on standards in Europe and at the international level. It is incorporated by Royal Charter.

Revisions

British Standards are updated by amendment or revision. Users of British Standards should make sure that they possess the latest amendments or editions.

It is the constant aim of BSI to improve the quality of our products and services. We would be grateful if anyone finding an inaccuracy or ambiguity while using this British Standard would inform the Secretary of the technical committee responsible, the identity of which can be found on the inside front cover. Tel: +44 (0)20 8996 9000. Fax: +44 (0)20 8996 7400.

BSI offers members an individual updating service called PLUS which ensures that subscribers automatically receive the latest editions of standards.

Buying standards

Orders for all BSI, international and foreign standards publications should be addressed to Customer Services. Tel: +44 (0)20 8996 9001. Fax: +44 (0)20 8996 7001. Email: orders@bsi-global.com. Standards are also available from the BSI website at http://www.bsi-global.com.

In response to orders for international standards, it is BSI policy to supply the BSI implementation of those that have been published as British Standards, unless otherwise requested.

Information on standards

BSI provides a wide range of information on national, European and international standards through its Library and its Technical Help to Exporters Service. Various BSI electronic information services are also available which give details on all its products and services. Contact the Information Centre. Tel: +44 (0)20 8996 7111. Fax: +44 (0)20 8996 7048. Email: info@bsi-global.com.

Subscribing members of BSI are kept up to date with standards developments and receive substantial discounts on the purchase price of standards. For details of these and other benefits contact Membership Administration. Tel: +44 (0)20 8996 7002. Fax: +44 (0)20 8996 7001. Email: membership@bsi-global.com.

Information regarding online access to British Standards via British Standards Online can be found at http://www.bsi-global.com/bsonline.

Further information about BSI is available on the BSI website at http://www.bsi-global.com.

Copyright

BSI
389 Chiswick High Road
London
W4 4AL