
Explosives for civil uses — High explosives —

Part 11: Determination of transmission of detonation

The European Standard EN 13631-11:2003 has the status of a
British Standard

ICS 71.100.30

National foreword

This British Standard is the official English language version of EN 13631-11:2003.

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 18 November 2003

Summary of pages

This document comprises a front cover, an inside front cover, the EN title page, pages 2 to 11 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

ICS 71.100.30

English version

Explosives for civil uses - High explosives - Part 11: Determination of transmission of detonation

Explosifs à usage civil - Explosifs - Partie 11: Détermination
de la transmission de la détonation

Explosivstoffe für zivile Zwecke - Sprengstoffe - Teil 11:
Bestimmung der Detonationsweiterleitung

This European Standard was approved by CEN on 1 September 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 Management Centre 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 Management Centre 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

Contents

	page
Foreword.....	3
1 Scope	3
2 Normative references	4
3 Terms and definitions.....	4
4 Principle.....	4
5 Apparatus	4
6 Test pieces.....	5
7 Procedure	6
8 Test report	9
Annex A (informative) Range of applicability of the test method.....	10
Annex ZA (informative) Clauses of this European Standard addressing essential requirements or other provisions of EU Directives.....	11

Foreword

This document (EN 13631-11:2003) 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 May 2004, and conflicting national standards shall be withdrawn at the latest by May 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.

This European Standard is one of a series of standards on Explosives for civil uses – High explosives. The other parts of this series are:

prEN 13631-1	Part 1: Requirements.
EN 13631-2	Part 2: Determination of thermal stability of explosives.
prEN 13631-3	Part 3: Determination of sensitiveness to friction of explosives.
EN 13631-4	Part 4: Determination of sensitiveness to impact of explosives.
EN 13631-5	Part 5: Determination of resistance to water.
EN 13631-6	Part 6: Determination of resistance to hydrostatic pressure.
EN 13631-7	Part 7: Determination of safety and reliability at extreme temperatures.
EN 13631-10	Part 10: Verification of the means of initiation.
prEN 13631-12	Part 12: Specification of booster with different capability.
EN 13631-13	Part 13: Determination of density.
EN 13631-14	Part 14: Determination of velocity of detonation.
prEN 13631-15	Part 15: Calculation of thermodynamic properties.
prEN 13631-16	Part 16: Detection and measurement of toxic gases.

Annex A is informative.

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.

1 Scope

This European Standard specifies a method for the determination of the ability of cartridged explosives to transmit detonation.

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 13631-10:2003, Explosives for civil uses – High Explosives – Part 10: Verification of the means of initiation.

EN 13631-14, Explosives for civil uses – High Explosives – Part 14: Determination of velocity of detonation.

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

EN 10025, Hot rolled products of non-alloy structural steels– Technical delivery conditions.

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

ISO 4200:1991, Plain end steel tubes, welded and seamless -- General tables of dimensions and masses per unit length.

3 Terms and definitions

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

3.1

cap-sensitive explosive

explosive which can be initiated by a single detonator

4 Principle

The transmission of detonation is determined by the ability to transmit the detonation between two unconfined and coaxially suspended cartridges having the same diameter and separated by an air gap.

When the manufacturer claims that the explosive will need confinement in order to properly function, the transmission of detonation is determined by the ability to transmit the detonation between two cartridges having the same diameter and separated by an air gap, confined in a steel tube.

5 Apparatus

5.1 Support, for holding the cartridges, comprising a thin wooden or metal rod or other device which will not affect the velocity of detonation. When confinement of the explosive is required, the support shall hold the cartridges inside a steel tube.

5.2 Steel tube, with dimensions in accordance with ISO 4200:1991, Table 1, range of preferred thickness E.

Table 1 shows some of the listed thicknesses in range E and their corresponding internal diameters, derived from ISO 4200:1991, Table 1.

Table 1 – Dimensions of steel tubes

Internal diameter (mm)	Wall thickness (mm)
17,3	2,0
22,9	2,0
29,1	2,3
37,2	2,6
43,1	2,6
54,5	2,9
70,3	2,9
82,5	3,2
107,1	3,6
131,7	4,0
159,3	4,5
206,5	6,3
260,4	6,3
309,7	7,1

The steel quality shall be S 235 in accordance with EN 10025.

The internal diameter of the steel tube shall be such that the cartridge can be inserted into it without leaving an unnecessarily large annular space between the cartridge and the tube, in order to avoid the channel effect.

5.3 Means of initiation, as specified by the explosives manufacturer in terms of initiating capability according to EN 13631-10:2003, 5.1.

6 Test pieces

The test pieces, donor and acceptor, shall be commercial cartridges of the same diameter and having the smallest diameter placed on the market.

In order to ensure that a stable detonation can be obtained, the length of the donor cartridge shall be at least five times its diameter.

The length of the acceptor cartridge shall be at least five times its diameter (d). This length shall be increased as required if the measurement of velocity of detonation, as described in EN 13631-14, is used to detect proper detonation of the acceptor cartridge.

When the length of the supplied cartridge(s) is less than that required to satisfy the above, a charge shall be prepared by joining two (or more) cartridges. In the case of round-ended cartridges, the end portion of two cartridges shall be cut off and the cartridges joined by butting together and tapping securely.

7 Procedure

Separate the cartridges by a given gap. The length (D) of this gap is measured between the ends of flat-ended cartridges (see Figure 1). For cartridges having rounded ends, the following method shall be used: place the ends of the cartridges in contact, without pressure. Then move one cartridge to the required distance (see Figure 2).

Cartridged explosives which the manufacturer claims that will detonate without confinement, shall be assembled as shown in Figure 3 for non-cap-sensitive explosives in round-ended cartridge, or as shown in Figure 4 for cap-sensitive explosives in flat-ended cartridges.

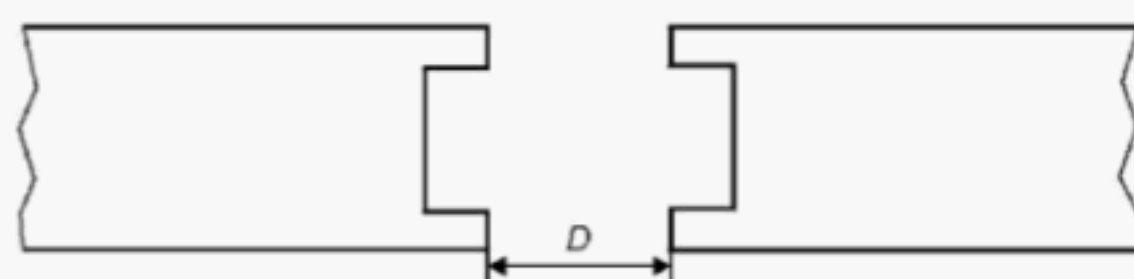


Figure 1 – Gap measurement for flat-end cartridges

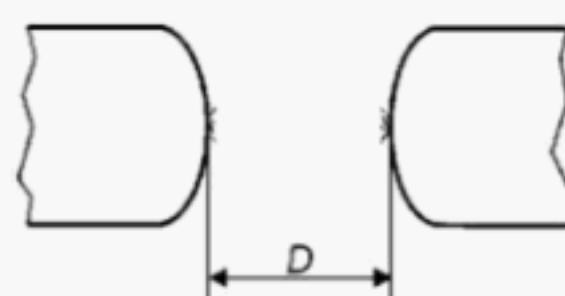
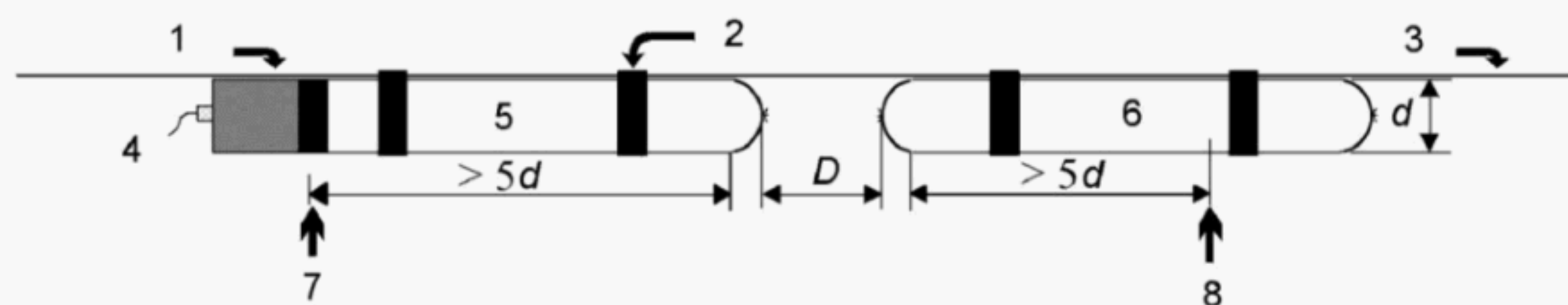


Figure 2 – Gap measurement for round-ended cartridges



Key

- 1 Booster
- 2 Adhesive tape
- 3 Support
- 4 Detonator
- 5 Donor
- 6 Acceptor
- 7 Contact between the booster and a flat-cut of the cartridge
- 8 Starting point of detonation velocity measurement

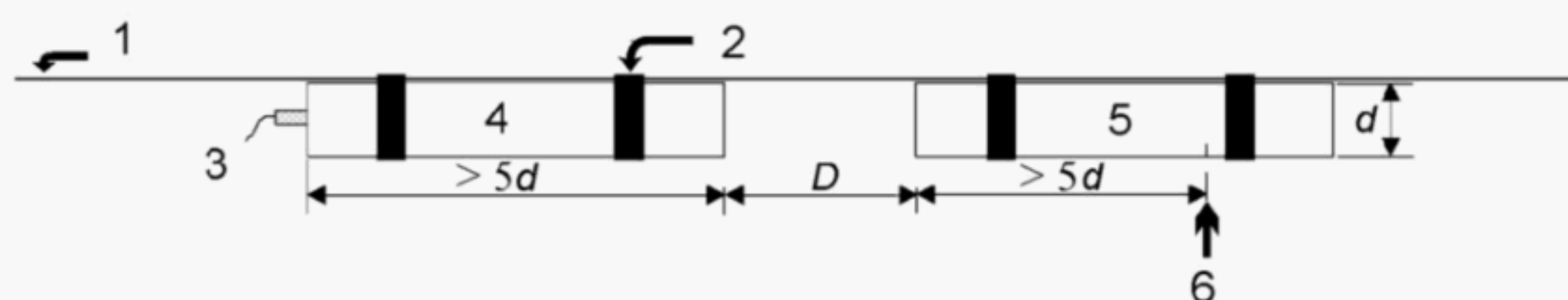
Figure 3 – Test arrangement with non-cap-sensitive explosives in round-ended cartridges without confinement

Cartridged explosives for which the manufacturer claims that confinement is required, shall be assembled as shown in Figure 5 for non-cap-sensitive explosives in rounded-ended cartridges, or as shown in Figure 6 for cap-sensitive explosives in flat-ended cartridges.

Measure the temperature of the test piece.

Fasten the cartridges coaxially to the support with adhesive tape or rope. When the test is carried out without confinement, suspend the assembly freely above the ground as shown in Figures 3 and 4.

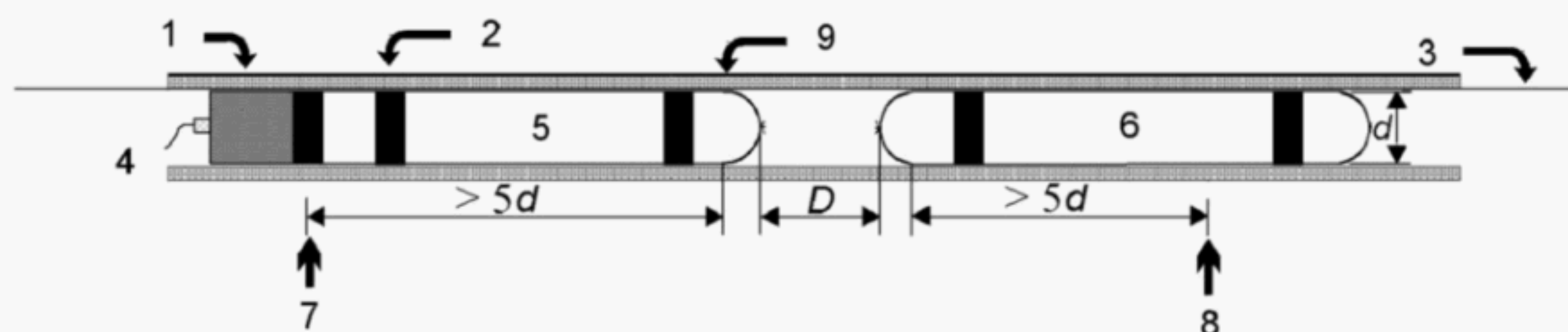
Prime the explosive with a detonator or a booster of the strength specified by the manufacturer in terms of initiating capability according to EN 13631-10:2003, 5.1.



Key

- 1 Support
- 2 Adhesive tape
- 3 Detonator
- 4 Donor
- 5 Acceptor
- 6 Starting point of detonation velocity measurement

Figure 4 – Test arrangement with cap-sensitive and flat-ended cartridged explosives without confinement



Key

- 1 Booster
- 2 Adhesive tape
- 3 Support
- 4 Detonator
- 5 Donor
- 6 Acceptor
- 7 Contact between the booster and a flat-cut of the cartridge
- 8 Starting point of detonation velocity measurement
- 9 Steel tube

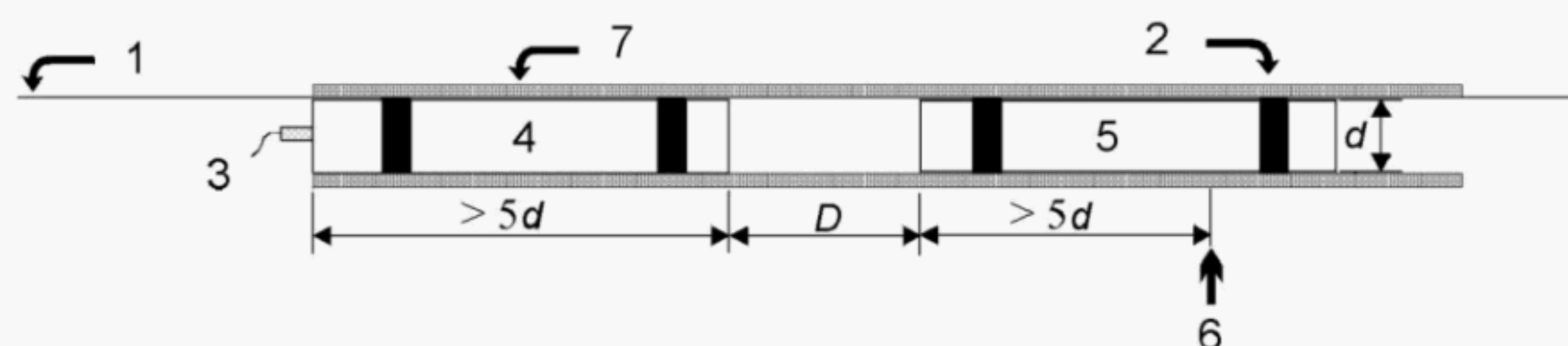
Figure 5 – Test arrangement with non-cap-sensitive explosives in round-ended cartridges with confinement

Insert the detonator into the first cartridge or, if a booster is used, insert the detonator into the booster (see Figure 7) and fasten the booster to the flat end of the first cartridge, which shall be cut flat if necessary (see Figures 3 and 5). The diameter of the booster shall be less or equal the diameter of the cartridge.

Initiate the donor and detect detonation of the acceptor by suitable means.

Increase or decrease the distance between the cartridges, D , by steps as appropriate. The step may be larger in the beginning and 1 cm at the end of the procedure. There is no need to start with the cartridges in contact.

The result of the test is the maximum value D (D_{\max}) at which detonation is transmitted three times out of three shots.



Key

- 1 Support
- 2 Adhesive tape
- 3 Detonator
- 4 Donor
- 5 Acceptor
- 6 Starting point of detonation velocity measurement
- 7 Steel tube

Figure 6 – Test arrangement with cap-sensitive and flat-ended cartridged explosives with confinement



Key

- 1 Detonator inserted into a cavity in the booster

Figure 7 – Illustration of the booster with a detonator in place

8 Test report

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

- a) a reference to this European Standard;
- b) the temperature of the test piece;
- c) the shape of the cartridges ends;
- d) the cartridges diameter and length;
- e) steel pipes internal diameter, length and thickness, if used;
- f) means of initiation used;
- g) means of detecting proper detonation used;
- h) the value of D_{\max} in centimetres.

Annex A (informative)

Range of applicability of the test method

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

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 93/15/EEC.

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 standard are likely to support requirements I.2, II.1(j) and II.2.A.(b) of Directive 93/15/EEC.

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

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

Copyright subsists in all BSI publications. BSI also holds the copyright, in the UK, of the publications of the international standardization bodies. Except as permitted under the Copyright, Designs and Patents Act 1988 no extract may be reproduced, stored in a retrieval system or transmitted in any form or by any means – electronic, photocopying, recording or otherwise – without prior written permission from BSI.

This does not preclude the free use, in the course of implementing the standard, of necessary details such as symbols, and size, type or grade designations. If these details are to be used for any other purpose than implementation then the prior written permission of BSI must be obtained.

Details and advice can be obtained from the Copyright & Licensing Manager. Tel: +44 (0)20 8996 7070. Fax: +44 (0)20 8996 7553. Email: copyright@bsi-global.com.