
Eksplozivi za civilno uporabo – Detonatorji in zakasnilniki – 23. del: Ugotavljanje hitrosti udarnega vala detonacijskih cevk

Explosives for civil uses - Detonators and relays - Part 23: Determination of the shock-wave velocity of shock tube

Explosivestoffe für zivile Zwecke - Zünder und Verzögerungselemente - Teil 23: Bestimmung der Stoßwellengeschwindigkeit in Zündschläuchen

Explosifs a usage civil - Détonateurs et relais - Partie 23: Détermination de la vitesse d'ondes de choc du tube conducteur d'ondes de choc

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English version

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Stoßwellengeschwindigkeit in Zündschläuchen

This European Standard was approved by CEN on 1 August 2002.

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

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
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Foreword

This document (EN 13763-23:2002) has been prepared by the 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of an identical text or by endorsement, at the latest by March 2003, and conflicting national standards shall be withdrawn at the latest by March 2003.

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 the EU Directive(s).

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

This European Standard is one of a series of standards with the generic title *Explosives for civil uses - Detonators and relays*. The other parts of this series are listed below:

- prEN 13763-1 *Part 1: Requirements.*
- EN 13763-2 *Part 2: Determination of thermal stability.*
- EN 13763-3 *Part 3: Determination of sensitiveness to impact.*
- prEN 13763-4 *Part 4: Determination of resistance to abrasion of leading wires and shock tubes.*
- prEN 13763-5 *Part 5: Determination of resistance to cutting damage of leading wires and shock tubes.*
- prEN 13763-6 *Part 6: Determination of resistance to cracking in low temperatures of leading wires.*
- prEN 13763-7 *Part 7: Determination of the mechanical strength of leading wires, shock tubes, connections, crimps and closures.*
- prEN 13763-8 *Part 8: Determination of resistance to vibration of plain detonators.*
- prEN 13763-9 *Part 9: Determination of resistance to bending of detonators.*
- prEN 13763-10 *Part 10: Determination of resistance to torsion of sealing plugs.*
- prEN 13763-11 *Part 11: Determination of drop resistance of detonators and relays.*
- prEN 13763-12 *Part 12: Determination of resistance to hydrostatic pressure.*
- prEN 13763-13 *Part 13: Determination of resistance of electric detonator to electrostatic discharge.*
- prEN 13763-14 *Part 14: Determination of resistance of electric detonator to the influence of radio frequency radiation.*
- prEN 13763-15 *Part 15: Determination of equivalent initiating capability.*
- prEN 13763-16 *Part 16: Determination of delay accuracy.*
- prEN 13763-17 *Part 17: Determination of no-fire current of electric detonators.*
- prEN 13763-18 *Part 18: Determination of series firing current of electric detonators.*
- prEN 13763-19 *Part 19: Determination of firing pulse of electric detonators.*

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prEN 13763-20 *Part 20: Determination of total resistance of electric detonators.*

prEN 13763-21 *Part 21: Determination of flash-over voltage of electric detonators.*

prEN 13763-22 *Part 22: Determination of capacitance, insulation resistance and insulation breakdown of leading wires.*

EN 13763-24 *Part 24: Determination of the non-conductivity of shock tube.*

prEN 13763-25 *Part 25: Determination of transfer capacity of relay and coupling accessories.*

prEN 13763-26 *Part 26: Definitions, methods and requirements for devices and accessories for reliable and safe function of detonators and relays.*

prCEN/TS 13763-27 *Part 27: Definitions, methods and requirements for electronic initiation system.*

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

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1 Scope

This European Standard specifies a method for determining the shock-wave velocity of shock tubes for use with non-electric detonators.

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).

prEN 13857-1, *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 prEN 13857-1 apply.

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4 Apparatus

4.1 *Means of initiating the shock tube*, either an initiating device (percussion cap, spark, etc.) or an initiating detonator provided that the shock tube and measuring equipment are protected against the fragments from the initiated detonator.

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4.2 *System for monitoring and recording the propagation of the shock wave*, equipped with two optical sensors (e.g. optical fibres, see A and B in Figure 1) and capable of measuring the time taken for the shock wave to travel between the two sensors, to an accuracy of $\pm 1 \mu\text{s}$.

4.3 *Conditioning chamber*, which can maintain a temperature of $(20 \pm 2) \text{ }^\circ\text{C}$.

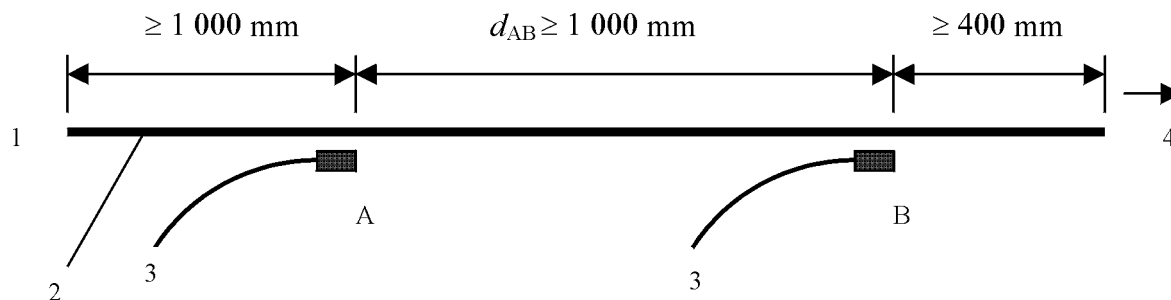
5 Test pieces

Select 20 lengths of shock tube, each at least 2,4 m long. If the shock tubes are assembled with detonators, the lengths shall be taken from 20 detonators of the same specific type. If the detonators form part of a series with different delay times select detonators with delay times distributed as evenly as possible throughout the series

6 Procedure

Cut the required lengths of shock tube and immediately seal the cut ends, e.g. by adhesive tape or other suitable means. Condition the sealed lengths for at least 2 h at $(20 \pm 2) \text{ }^\circ\text{C}$ prior to testing.

Install the two sensors in contact with the shock tube as in Figure 1. The distance between the sensors d_{AB} shall be at least 1 000 mm, measured to an accuracy of $\pm 5 \text{ mm}$. Remove the seal if necessary and initiate the shock tube.



Key

- 1 Initiator location
- 2 Shock tube
- 3 Optical sensors (A and B)
- 4 Direction of shock wave propagation

Figure 1 – Test arrangement

Record the time t_{AB} of the shock-wave propagation from A to B.

Record the individual values of d_{AB} and t_{AB} for each of the 20 determinations.

Calculate the shockwave velocity, v , expressed in metres per second (m/s), for each determination, from the following equation. Round the value in m/s to the nearest whole number.

$$v = \frac{d_{AB}}{t_{AB}}$$

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Calculate the mean value of v in m/s and report this value, rounded to the nearest whole number, as the result of the test.

7 Test report

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

- a) the individual values of the shock-wave velocity, in m/s;
- b) the mean value of the shock-wave velocity, in m/s.

Annex A
(informative)

Range of applicability of the test method

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

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