



SLOVENSKI STANDARD
oSIST prEN 13763-23:2021
01-april-2021

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 à 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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Ta slovenski standard je istoveten z: prEN 13763-23

ICS:

71.100.30	Eksplozivi. Pirotehnika in ognjemeti	Explosives. Pyrotechnics and fireworks
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EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

DRAFT
prEN 13763-23

April 2021

ICS 71.100.30

Will supersede EN 13763-23:2002

English Version

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

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

Explosivstoffe für zivile Zwecke - Zünder und
Sprengschnurverbinder - Teil 23: Bestimmung der
Stoßwellengeschwindigkeit in Zündschläuchen

This draft European Standard is submitted to CEN members for enquiry. It has been drawn up by the Technical Committee CEN/TC 321.

If this draft becomes a European Standard, 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.

This draft European Standard was established by CEN 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 CEN-CENELEC Management Centre has the same status as the official versions.

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Recipients of this draft are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

Warning : This document is not a European Standard. It is distributed for review and comments. It is subject to change without notice and shall not be referred to as a European Standard.



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

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European foreword

This document (prEN 13763-23:2021) has been prepared by Technical Committee CEN/TC 321 “Explosives for civil uses”, the secretariat of which is held by UNE.

This document is currently submitted to the CEN Enquiry.

This document will supersede EN 13763-23:2002.

In comparison with the previous edition, the following technical modifications have been made:

- a) Clause 1, *Scope*, has been updated and
 - 1) electronic detonators have been added;
 - 2) it is specified that this document applies to explosives for civil uses;
- b) Clause 4, *Principle*, has been added;
- c) Clause 6, *Preparation and handling of test samples and test pieces*, has been revised;
- d) Clause 8, *Expression of results*, has been added;
- e) Annex A, *Range of applicability of the test method*, has been removed;
- f) Annex ZA has been updated.

This document has been prepared under a Standardization Request (M/562) annexed to the Commission Implementing Decision C(2019)6634 final as regards Explosives for civil uses given to CEN by the European Commission and the European Free Trade Association, and supports Essential Safety requirements of Directive 2014/28/EU.

For relationship with Directive 2014/28/EU, see informative Annex ZA, which is an integral part of this document.

EN 13763, *Explosives for civil uses — Detonators and detonating cord relays*, is currently composed with the following parts:

- *Part 1: Requirements*
- *Part 2: Verification of thermal stability*
- *Part 3: Determination of sensitiveness to impact*
- *Part 4: Determination of resistance to abrasion of leading wires and shock tubes*
- *Part 5: Determination of resistance to cutting damage of leading wires and shock tubes*
- *Part 6: Determination of resistance to cracking in low temperatures of leading wires*
- *Part 7: Determination of the mechanical strength of leading wires, shock tubes, connections, crimps and closures*

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- Part 8: Determination of resistance to vibration
- Part 9: Determination of resistance to bending of detonators
- Part 11: Determination of drop resistance of detonators and relays
- Part 12: Determination of resistance to hydrostatic pressure
- Part 13: Determination of resistance of electric detonator to electrostatic discharge
- Part 15: Determination of equivalent initiating capability
- Part 16: Determination of delay accuracy
- Part 17: Determination of no-fire current of electric detonators
- Part 18: Determination of series firing current of electric detonators
- Part 19: Determination of firing pulse of electric detonators
- Part 20: Determination of total resistance of electric detonators
- Part 21: Determination of flash-over voltage of electric detonators
- Part 22: Determination of capacitance, insulation resistance and insulation breakdown of leading wires
- Part 23: Determination of the shock-wave velocity of shock tube
- Part 24: Determination of the non-conductivity of shock tube
- Part 25: Determination of transfer capacity of relay and coupling accessories
- Part 26: Definitions, methods and requirements for devices and accessories for reliable and safe function of detonators and relays
- Part 27: Definitions, methods and requirements for electronic initiation system

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Introduction

If the shock wave velocity is lower than the specification according to the manufacturer the energy output might be too small to initiate the detonator and as such influence the correct functioning. Also, a variation in shock-wave velocity can have an impact on the delay time of the detonators. This test is a determination of the shock-wave velocity of shock tubes for use with non-electric and electronic detonators.

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1 Scope

This document specifies a method for determining the shock-wave velocity of shock tubes for use with non-electric detonators and electronic detonators.

This document applies to explosives for civil uses.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

prEN 13857-1:2021, *Explosives for civil uses — Part 1: Terminology*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in prEN 13857-1:2021 apply.

4 Principle

The shock-wave velocity is measured on 20 test pieces of at least 2,4 m of shock tube. Individual velocity (in m/s) and mean value (in m/s) are recorded.

5 Apparatus

5.1 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.

5.2 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 $\pm 1 \mu\text{s}$.

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

6 Preparation and handling of test samples and test pieces¹

Test samples for shock tubes should be handled according to EN ISO/IEC 17025:2017, 7.4.

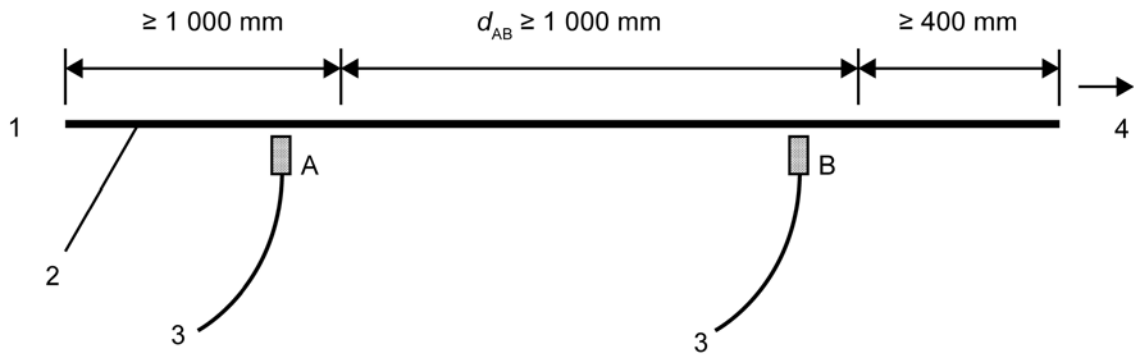
Select 20 test pieces of shock tube, each at least 2,4 m long. If the shock tubes are assembled with detonators, the lengths shall be taken from 20 detonators of the same specific type.

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

7 Procedure

Install the two optical 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 ± 5 mm. Remove the seal and initiate the shock tube.

¹ The choice of sample size is based on acceptable failure rate for the kind of defects that have to be avoided. The defects have been classified according to ISO 2859-1, ISO 2859-2, ISO 2859-3, ISO 2859-4 and ISO 2859-5.

**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 optical sensor A to optical sensor B.

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

8 Expression of results

Calculate the shockwave velocity, v , expressed in metres per second (m/s), for each determination according to Formula (1). Round the value in m/s to the nearest whole number.

$$v = \frac{d_{AB}}{t_{AB}} \quad (1)$$

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.

9 Test report

The test report should conform to EN ISO/IEC 17025:2017, 7.8. In addition, the following information shall be given:

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

Annex ZA (informative)

Relationship between this European Standard and the essential safety requirements of Directive 2014/28/EU relating to the making available on the market and supervision of explosives for civil uses aimed to be covered

This European Standard has been prepared under a standardization request M/562 annexed to Commission Implementing Decision C(2019)6634 final as regards explosives for civil uses to provide one voluntary means of conforming to essential safety requirements of Directive 2014/28/EU relating to the making available on the market and supervision of explosives for civil uses.

Once this standard is cited in the Official Journal of the European Union (OJEU), under Directive 2014/28/EU, compliance with the normative clauses of this standard given in Table ZA.1 confers, within the limits of the scope of this standard, a presumption of conformity with the corresponding essential safety requirements of that Directive 2014/28/EU, and associated EFTA regulations.

Table ZA.1 — Correspondence between this European Standard and Directive 2014/28/EU

Essential Safety Requirements ¹⁾ of Directive 2014/28/EU Annex II	Clause(s)/sub-clause(s) of this EN	Remarks/Notes
II.1.(a)	7	This test shows that the design is stable and the homogeneity of the shock tubes. The grain size distribution of the shock tube is indirectly tested.
II.1.(j)	7	If the shock wave velocity is outside specification the energy output might be too small to initiate the detonator and as such influence the correct functioning
II.3.3.(d)	7	A variation in shock-wave velocity can have an impact on the delay time of the detonators.

¹⁾ The Essential Safety Requirements are fulfilled together with the requirements in prEN 13763-1.

WARNING 1 — Presumption of conformity stays valid only as long as a reference to this European Standard is maintained in the list published in the Official Journal of the European Union. Users of this standard should consult frequently the latest list published in the Official Journal of the European Union.

WARNING 2 — Other Union legislation may be applicable to the product(s) falling within the scope of this standard.