
Eksplozivi za civilno uporabo – Detonatorji in zakasnilniki – 7. del: Ugotavljanje mehanske trdnosti vodnikov, detonacijskih cevk, konektorjev, stisnjenih spojev in stisnitev

Explosives for civil uses - Detonators and relays - Part 7: Determination of the mechanical strength of leading wires, shock tubes, connections, crimps and closures

Explosivstoffe für zivile Zwecke - Zünder und Verzögerungselemente - Teil 7: Bestimmung der mechanischen Festigkeit von Zünderdrähten, Zündschläuchen, Verbindungen, Anwürgung und Verschluss

Explosifs à usage civil - Détonateurs et relais - Partie 7: Détermination de la force mécanique des fils d'amorçage, tubes à transmission d'onde de choc, liaisons, sertissages et fermetures

Ta slovenski standard je istoveten z: prEN 13763-7

ICS:

71.100.30

Eksplozivi. Pirotehnika in
ognjemetiExplosives. Pyrotechnics and
fireworks**oSIST prEN 13763-7:2021****en**

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EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

DRAFT
prEN 13763-7

April 2021

ICS 71.100.30

Will supersede EN 13763-7:2003

English Version

Explosives for civil uses - Detonators and detonating cord relays - Part 7: Determination of the mechanical strength of leading wires, shock tubes, connections, crimps and closures

Explosifs à usage civil - Détonateurs et relais pour cordeau détonant - Partie 7: Détermination de la résistance mécanique des fils d'amorçage, tubes à transmission d'onde de choc, liaisons, sertissages et fermeture

Explosivstoffe für zivile Zwecke - Zünder und Sprengschnurverbinder - Teil 7: Bestimmung der mechanischen Festigkeit von Zünderdrähten, Zündschläuchen, Verbindungen, Anwürgung und Verschluss

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.

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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.

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European foreword

This document (prEN 13763-7:2021) 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 13763-7:2003.

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

- a) Clause 1, *Scope*, has been revised:
 - 1) it is now specified which detonators are covered by the document and electronic detonators have been added;
 - 2) it has been added that the document applies to explosives for civil uses;
- b) Clause 4, *Principle*, has been added;
- c) Clause 8, *Expression of results*, has been added;
- d) Annex A, *Range of applicability of the test method*, has been removed;
- e) Annex ZA has been added.

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*
- *Part 8: Determination of resistance to vibration*

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- *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*

Introduction

During normal use on site, the crimps/closures of detonators and their leading wires or shock tubes can be subjected to pulling forces. Such forces can cause a pull-out of internal components of the detonator. For example:

- the shock tube can be pulled out of the detonator through the sealing plug;
- the leading wire, fuse head and sealing plug can be pulled out of the shell as one unit;
- the leading wire with fuse head connected to it can pull-out through the sealing plug;
- the leading wires can break, or the joint between fuse head and wires can break inside the sealing plug, so that the wires pull-out leaving the fuse head loose inside the shell.

A pull-out would either cause the detonator to explode or would render it incapable of functioning.

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1 Scope

This document specifies a method for determining the mechanical strength of electric detonators, electronic detonators and non-electronic detonators, leading wires/shock tubes, and their connections into the crimp/closure or sealing arrangement.

This method is applicable 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 test pieces are subjected to fast and slow tension using specific weights and moveable support table. It is recorded if any test piece initiated, number of test pieces where leading wire breaks or a pull-out occurs and number of test pieces that did not pass the functioning test.

5 Apparatus

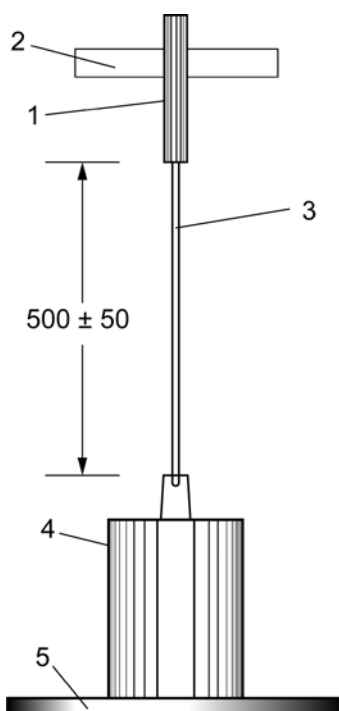
The apparatus shall comprise a fixing point for the detonator, weights and a moveable support table as shown in Figure 1.

5.1 Fixing point for the detonator

5.2 Weight(s) to be attached to the leading wires or shock tubes, suitable for applying forces of 40 N or 100 N.

5.3 Moveable support table

Dimensions in millimetres



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Key

- 1 detonator
- 2 fixing point for detonator
- 3 leading wires or shock tube
- 4 weight(s)
- 5 movable support table

Figure 1 — Test apparatus

6 Preparation and handling of test samples and test pieces¹⁾

6.1 Handling of test samples

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

6.2 Electric detonators and electronic detonators with leading wires

Select 40 assemblies of each specific type, whose dimensions, shell material, leading wires, construction and crimp/closure are of the same design according to the manufacturer's specification.

6.3 Non-electric detonators and electronic detonators with shock tube

Select 20 assemblies of each specific type, whose dimensions, shell material, shock tube, construction and crimp/closure are of the same design according to the manufacturer's specification.

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.

7 Procedure

7.1 General

The tests shall be carried out at the highest operating temperature claimed by the manufacturer.

NOTE 1 The slow-release test is intended to avoid hazardous situations related to fusehead initiations.

NOTE 2 The sudden release test is intended to verify the function during real conditions in boreholes.

7.2 Sudden release test

7.2.1 Electric detonators and electronic detonators with leading wires

Test 20 assemblies. Attach the detonator shell to the fixing point and attach the leading wires to weights of total mass corresponding to a force of $(40 \pm 0,1)$ N. Let the weights rest on the supporting table, in such a manner that a slight tension, of about 5 N, is applied and so that the distance between the detonator and the attachment to the weights is (500 ± 50) mm.

Ensure that the leading wires are attached to the weights in such a manner that the force will be evenly distributed between them. Release the weights so that the full load is applied instantly and maintain the load for (120 ± 5) s.

Record whether or not the detonator explodes during the test. Record whether or not the leading wires break and/or whether a pull-out has occurred.

7.2.2 Non-electric detonators and electronic detonators with shock tube

Test 20 assemblies. Attach the detonator shell to the fixing point and attach the shock tube to weights of total mass corresponding to a force of $(40 \pm 0,1)$ N. Let the weights rest on the supporting table, in such a manner that a slight tension, of about 5 N, is applied and so that the distance between the detonator and the attachment to the weights is (500 ± 50) mm. Release the weights so that the full load is applied instantly and maintain the load for (120 ± 5) s.

Record whether or not the detonator explodes during the test. Record whether or not the shock tube breaks and/or whether a pull-out has occurred.

7.3 Slow release test (electric detonators and electronic detonators with leading wires)

Test 20 assemblies. Attach the detonator shell to the fixing point and attach the leading wires to weights of total mass corresponding to a force of (100 ± 1) N. Let the weights rest on the supporting table, in such a manner that a slight tension of about 5 N is applied, and so that the distance between the detonator and the attachment to the weights is (500 ± 50) mm. Ensure that the leading wires are attached to the weights in such a manner that the force will be evenly distributed between them. Release the weights slowly until the full load is applied and maintain that load for 10 s.

Record whether or not the detonator explodes during the test. Record whether or not the leading wires break or whether a pull-out has occurred.

7.4 Functioning test after sudden release test

After sudden release tests are carried out as specified in 7.2.1 and 7.2.2 and if all leading wires or shock tubes are intact and no pull-out has occurred, initiate each detonator in accordance with the manufacturer's instructions. Record whether the detonators detonate or not.