
Eksplzivni za civilno uporabo – Detonatorji in zakasnilniki – 3. del: Ugotavljanje občutljivosti na udarec

Explosives for civil uses - Detonators and relays - Part 3: Determination of sensitiveness to impact

Explosivstoffe für zivile Zwecke - Zünder und Verzögerungselemente - Teil 3: Bestimmung der Schlagempfindlichkeit

Explosifs à usage civil - Détonateurs et relais - Partie 3: Détermination de la sensibilité au choc

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Ta slovenski standard je istoveten z: prEN 13763-3

ICS:

71.100.30

Eksplzivni. Pirotehnika in
ognjemeti

Explosives. Pyrotechnics and
fireworks

oSIST prEN 13763-3:2021

en

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EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

DRAFT
prEN 13763-3

April 2021

ICS 71.100.30

Will supersede EN 13763-3:2002

English Version

**Explosives for civil uses - Detonators and detonating cord
relays - Part 3: Determination of sensitiveness to impact**

Explosifs à usage civil - Détonateurs et relais pour
cordeau détonant - Partie 3: Détermination de la
sensibilité au choc

Explosivstoffe für zivile Zwecke - Zünder und
Sprengschnurverbinder - Teil 3: Bestimmung der
Schlagempfindlichkeit

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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COMITÉ EUROPÉEN DE NORMALISATION
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European foreword

This document (prEN 13763-3:2021) 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 13763-3:2002.

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

- a) in Clause 1, *Scope*,
 - 1) electronic detonators have been included;
 - 2) it has been specified that the document applies to explosives for civil uses;
- b) in Clause 3, *Terms and definitions*, term 3.2, *drop hammer*, has been inserted;
- c) Clause 4, *Principle*, has been added;
- d) in Clause 6, *Preparation and preservation of test samples and test pieces*,
 - 1) 6.1, *Handling of test samples*, has been added;
 - 2) It is specified that detonators, detonating cord relays, surface connectors and shock tubes shall have the same design and composition according to the manufacturer's specification;
- e) Clause 8, *Expression of results*, has been added;
- 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*

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- *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*
- *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

During usage, detonators, surface connectors and detonating cord relays can be subjected to different shocks or impacts. This test deals with the ability of detonators, surface connectors and detonating cord relays to resist the shocks or impacts they could be exposed to under specified conditions.

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1 Scope

This document specifies methods for determination of the sensitiveness to impact for plain detonators, electric detonators, non-electric detonators, electronic detonators, surface connectors, detonating cord relays and shock tubes used with electronic and non-electric 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.

EN 10025-2:2019, *Hot rolled products of structural steels - Part 2: Technical delivery conditions for non-alloy structural steels*

EN 13763-1:2004, *Explosives for civil uses — Detonators and relays — Part 1: Requirements*

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

EN ISO 683-4:2018, *Heat-treatable steels, alloy steels and free-cutting steels - Part 4: Free-cutting steels (ISO 683-4:2016)*

EN ISO 683-17:2014, *Heat-treated steels, alloy steels and free-cutting steels - Part 17: Ball and roller bearing steels (ISO 683-17:2014)*

EN ISO 4957:2018, *Tool steels (ISO 4957:2018)*

3 Terms and definitions

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

3.1

drop height

distance between the lowest part of the striking head of the drop weight and the uppermost part of the percussion cylinder

3.2

drop hammer

device that allows a controlled drop of a weight to hit the test subject

Note 1 to entry: Drawings can be found in Annex A.

3.3

ignition system

electrical resistance heating wire surrounded by an incendiary material

4 Principle

The test piece is subjected to an impact using specific equipment and weights dropped on the test piece at specific heights, checking whether explosion occurs. The mean height is calculated using the Bruceton method, where it is determined the level of stimulus at which there is a 50 % probability of obtaining a

positive result. The minimum height is determined by the Bruceton method at which a positive result is obtained.

5 Apparatus

5.1 General

There are two apparatus used in this test for different products, a drop hammer and an impact testing apparatus. The drop hammer is used for testing of plain detonators, electric detonators, non-electric detonators and electronic detonators. The impact testing apparatus is used for tests of surface connectors, detonating cord relays and shock tubes used with electronic and non-electric detonators.

The drop hammer comprising a cast steel block as a base, a main anvil and an intermediate anvil, a locating plate, a guide piece, a percussion cylinder, a column, guides and a drop weight with a release mechanism and a striking head see Figures A.1 to A.4.

The impact testing apparatus comprising a cast steel block as a base, an anvil, two plates, a guide tube and a hammer with a release mechanism see Figure A.5.

5.1.1 Drop hammer designed to be secured to a concrete block, with minimum dimensions of (0,6 m × 0,6 m × 0,6 m).

5.1.2 Steel block casted with base.

5.1.3 Main anvil and an intermediate anvil made of hardened steel of type 90 MnCrV8 according to EN ISO 4957:2018.

5.1.4 Locating plate.

5.1.5 Percussion cylinder a roller bearing with polished surfaces and rounded edges. Made of steel type B1 100Cr6 as defined by EN ISO 683-17:2014.

5.1.6 Column made from a seamless drawn steel tube.

5.1.7 Guides with a moveable graduated scale for adjusting the drop weight.

5.1.8 Drop weight with a mass of (2 000 ± 2) g, with two locating grooves, a suspension spigot, a removable cylindrical striking head and a rebound catch. The removable striking head shall be made from hardened steel conforming to type 90 MnCrV8 in EN ISO 4957:2018 with polished surface and a diameter of 25 mm.

5.2 Impact testing apparatus

5.2.1 Impact testing apparatus with a steel hammer, anvil, plates and guide tube.

5.2.2 Anvil made of steel of type 46 S 20 as defined by EN ISO 683-4:2018.

5.2.3 Hammer with a mass of (5 000 ± 10) g and made of steel of type B1 100Cr6 as defined by EN ISO 683-17:2014.

5.2.4 Plates made of steel of type E295 as defined by EN 10025-2:2019.

5.2.5 Guide tube.

6 Preparation and handling of test samples and test pieces¹⁾

6.1 Handling of test samples

Test samples for detonators, detonating cord relays, surface connectors and shock tubes should be handled according to EN ISO 17025:2017, 7.4.

6.2 Electric detonators

Select 50 detonators of the same type, with the same design, compositions and loading configuration according to the manufacturer's specification, whose fuse heads or other ignition systems have the same design and chemical composition according to the manufacturer's specification. If the detonators form part of a series with different delay times, select 50 detonators with delay times distributed as evenly as possible throughout the series.

6.3 Non-electric detonators

Select 25 detonators of the same type, with the same design, compositions and loading configuration according to the manufacturer's specification. If the detonators form part of a series with different delay times, select 25 detonators with delay times distributed as evenly as possible throughout the series.

6.4 Electronic detonators

Select 50 detonators of the same type having the same circuitry, design, compositions and loading configuration according to the manufacturer's specification, whose fuse heads or other ignition systems have the same design and composition according to the manufacturer's specification.

If detonators consist of parts when influenced by impact could cause an unintended initiation (e.g. piezoelectric), select additional 25 detonators. In this case, instead of complete detonators, equivalent samples without electronic parts can be used.

6.5 Plain detonators

Select 25 detonators of the same type, with the same design, compositions and loading configuration according to the manufacturer's specification.

6.6 Detonating cord relays and surface connectors

Select 25 detonating cord relays or surface connectors of the same type, with the same design, dimensions, materials of construction, compositions and loading configuration according to the manufacturer's specification. If the detonating cord relays or surface connectors form part of a series with different delay times, select 50 detonating cord relays or surface connectors with delay times as evenly distributed throughout the series as possible.

6.7 Shock tube

Select 25 shock tubes of the same type having the same dimensions, materials of construction and chemical composition according to the manufacturer's specification, each with a length of at least 0,20 m.

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.