



SLOVENSKI STANDARD
oSIST prEN 13763-11:2021
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Eksplzivni za civilno uporabo - Detonatorji in zakasnilniki - 11. del: Ugotavljanje odpornosti detonatorjev in zakasnilnikov proti padu

Explosives for civil uses - Detonators and relays - Part 11: Determination of resistance to damage by dropping of detonators and relays

Explosivstoffe für zivile Zwecke - Zünder und Verzögerungselemente - Teil 11: Bestimmung der Widerstandsfähigkeit von Zündern und Verzögerungselementen gegen Fall

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Explosifs à usage civil - Détonateurs et relais - Partie 11: Détermination de la résistance des détonateurs et relais à la chute

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EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

DRAFT
prEN 13763-11

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ICS 71.100.30

Will supersede EN 13763-11:2003

English Version

Explosives for civil uses - Detonators and detonating cord relays - Part 11: Determination of resistance to damage by dropping of detonators and relays

Explosifs à usage civil - Détonateurs et relais pour cordeau détonant - Partie 11: Détermination de la résistance des détonateurs et relais à la chute

Explosivstoffe für zivile Zwecke - Zünder und Sprengschnurverbinder - Teil 11: Bestimmung der Widerstandsfähigkeit von Zündern und Verzögerungselementen gegen Fall

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 COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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European foreword

This document (prEN 13763-11:2021) 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 13763-11:2003

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

- a) Clause 1, *Scope*, has been revised and now specifies that it is applicable to explosives for civil uses;
- b) Clause 3, *Terms and definitions*, the terms 3.1 and 3.2 have been added;
- c) Clause 5, *Apparatus*, has been updated;
- d) Clause 4, *Principle*, has been added;
- e) subclause 6.1, *Handling of test samples*, has been added;
- f) Clause 7, *Procedure*, has been revised
 - 1) in 7.1, *Test conditions*, the requirement of an ambient temperature has been removed and a requirement to cut off the leading wires or the shock tubes or connection to the assembly's casing has been added;
 - 2) 7.3, *Guided drop test for detonators*, the position of the metal tubes lower end has been changed;
- g) Clause 8, *Expression of results*, has been added;
- h) Annex A, *Range of applicability of the test method*, has been removed;
- i) 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*

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- *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*
- *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

Non-electric detonators, electric detonators, electronic detonators, plain detonators, detonating cord relays and surface connectors might be accidentally dropped from a loading basket, from the edge of a bench, or down an unloaded borehole. This test assesses the ability of detonators, relays and surface connectors to withstand being dropped without detonating.

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prEN 13763-11:2021 (E)**1 Scope**

This document specifies methods for determination of resistance to damage by dropping onto a hard surface for non-electric detonators, electric detonators, electronic detonators, plain detonators, detonating cord relays or surface connectors.

This document 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 and the following apply.

3.1**free fall drop test**

test piece being dropped and freely fall from a predefined height onto a concrete floor

3.2**guided drop test**

test piece being dropped onto a steel plate through a vertical guidance tube with a predefined length

4 Principle

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The test piece is subjected to dropping in free fall drop test and guided drop test from a specific height onto a hard surface. The number of test pieces that did not explode during the test shall be recorded and the number of test pieces that did not explode during the functioning test after dropping shall be recorded.

5 Apparatus**5.1 Free-fall drop test**

5.1.1 Clamp, with release mechanism.

5.1.2 Concrete floor, solid.

5.1.3 Temperature measuring device, with the accuracy of 1 °C.

5.2 Guided drop test

5.2.1 Metal tube (5 ± 0,05) m long with an inner diameter of between 1,5 times to 2,0 times the diameter of the detonator being tested.

5.2.2 Steel plate, measuring 100 mm × 100 mm × 10 mm.

5.2.3 Temperature measuring device, with the accuracy of 1 °C.

6 Preparation and handling of test samples and test pieces¹⁾

6.1 Handling of test samples

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

6.2 Non-electric detonators and electric detonators

Select 100 detonators of a specific type, with the same design, compositions and loading configuration according to the manufacturer's specification and whose fuse head has the same design and chemical composition. The shortest wire length/shock tube length delivered from the manufacturer shall be used. 50 detonators are tested according to 7.2 and 50 detonators are tested according to 7.3.

For detonators containing delay element, select those in the series which contain the longest delay element.

6.3 Electronic detonators

Select 100 detonators of a specific type, with the same design, composition and loading configuration according to the manufacturer's specification, and whose fuse head has the same design and chemical composition. The shortest wire length/shock tube length delivered from the manufacturer shall be used. 50 detonators are tested according to 7.2 and 50 detonators are tested according to 7.3.

6.4 Plain detonators

Select 50 detonators of a specific type, with the same design, composition and loading configuration according to the manufacturer's specification, and whose fuse head has the same design and chemical composition. 50 detonators are tested according to 7.3.

6.5 Surface connectors and detonating cord relays

Select 50 surface connectors and 50 detonating cord relays of a specific type, with the same design, composition, loading configuration according to the manufacturer's specification, and whose materials of construction have the same design and dimensions. 50 surface connectors are tested according to 7.4. 50 detonating cord relays are tested according to 7.4.

7 Procedure

7.1 Test conditions

The free-fall drop test and the guided drop test shall be carried out at a temperature of $(20 \pm 5) ^\circ\text{C}$.

In the free-fall drop test, the assemblies of electric detonators, electronic detonators and non-electric detonators shall be tested as delivered from the manufacturer, with assembled wires or shock tube but without packaging.

In the guided drop test for electric detonators, electronic detonators and non-electric detonators cut the leading wires or the shock tubes $(2 \pm 0,5)$ mm from the crimp or connection to the assembly's casing.

In the guided drop test for surface connectors, remove the housing and cut off the leading wires or the shock tubes $(2 \pm 0,5)$ mm from the crimp or connection to the assembly's casing.

In the free-fall drop test the housing of the detonating cord relays shall be removed.

Photograph the arrangement of the test pieces immediately before the drop.

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.

prEN 13763-11:2021 (E)**7.2 Free-fall drop test for detonators (excluding plain detonators)**

Fix the clamp at a vertical height of $(5 \pm 0,02)$ m above a solid concrete floor. The detonator is fixed in the clamp facing downwards, and the height is measured between the floor and the lowest point of the detonator. Open the release mechanism of the clamp to drop the detonator. Repeat the test on 50 detonators.

Record the number of detonators that did not explode during the free fall drop test.

In a function test all detonators that did not explode during the free-fall drop test shall be initiated one at a time. They shall be initiated according to the manufacturer's specified series firing current for the specific type, or in accordance with the manufacturer instruction for other devices. Record the number of detonators that did not explode during the function test.

7.3 Guided drop test for detonators (including plain detonators)

Fix the metal tube vertically so that the lower end is positioned centrally and (the length of a detonator ± 1) mm above the steel plate placed on the floor. The metal tube's deviation from the vertical shall not exceed the outer diameter of the metal tube.

Drop 25 detonators from the top of the metal tube with the base charge of the detonator facing downwards.

Drop 25 detonators from the top of the metal tube with the base charge of the detonator facing upwards.

Record the number of detonators that did not explode during the test.

7.4 Drop test for surface connectors and detonating cord relays

For surface connectors, perform the guided drop test as described in 7.3.

For detonating cord relays, perform the guided drop test without their housing as described in 7.3. If the detonating cord relay housing cannot be disassembled without destroying the detonating cord relay, a free-fall drop test, as described in 7.2, shall be carried out instead of the guided drop test.

Record the number of test pieces that did not explode during the test.

8 Expression of results

Calculate the number of non-electric detonators, electric detonators, electronic detonators, plain detonators, surface connectors and detonating cord relays that did not explode during the drop tests;

Calculate the number of non-electric detonators, electric detonators, electronic detonators, plain detonators, surface connectors and detonating cord relays that did not detonate during the function 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 temperature during the test;
- b) the length of the leading wires or shock tubes on the test pieces;
- c) the number of non-electric detonators, electric detonators, electronic detonators, plain detonators, surface connectors or detonating cord relays that did not explode during the drop tests;
- d) description or photographs of the arrangement of the test pieces immediately before the drop;
- e) the number of non-electric detonators, electric detonators, electronic detonators, plain detonators, surface connectors or detonating cord relays that did that did not detonate during the function test.