



SLOVENSKI STANDARD
oSIST prEN 13763-12:2021
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**Eksplzivni za civilno uporabo - Detonatorji in zakasnilniki - 12. del: Ugotavljanje
odpornosti proti hidrostatičnemu tlaku**

Explosives for civil uses - Detonators and relays - Part 12: Determination of resistance to hydrostatic pressure

Explosivstoffe für zivile Zwecke - Zünder und Verzögerungselemente - Teil 12:
Bestimmung der Widerstandsfähigkeit gegen hydrostatischen Druck

Explosifs à usage civil - Détonateurs et relais - Partie 12: Détermination de la résistance
à la pression

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EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

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Will supersede EN 13763-12:2003

English Version

Explosives for civil uses - Detonators and detonating cord relays - Part 12: Determination of resistance to hydrostatic pressure

Explosifs à usage civil - Détonateurs et relais pour
cordeau détonant - Partie 12 : Détermination de la
résistance à la pression

Explosivstoffe für zivile Zwecke - Zünder und
Sprengschnurverbinder - Teil 12: Bestimmung der
Widerstandsfähigkeit gegen hydrostatischen Druck

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 13763-12:2021) 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 13763-12:2003

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

- a) Clause 1, *Scope*, now includes electronic detonators and the document is applicable to explosives for civil uses;
- b) Clause 4, *Principle*, has been added;
- c) Clause 6, *Apparatus*, has been revised;
- d) Clause 7, *Preparation and handling of test samples and test pieces*, has been revised
 - 1) it is now specified that detonators, detonating cord relays and surface connectors shall have the same design and composition according to the manufacturer’s specification;
 - 2) subclause 7.1, *Handling of test samples*, has been added;
- e) Clause 9, *Expression of results*, has been added;
- f) Annex A, *Range of applicability of the test method*, has been removed;
- g) 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*

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- *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

During use on site, detonators can be subjected to bending during the loading of boreholes. This test assesses the ability of detonators to resist the bending forces likely to be experienced in normal use.

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prEN 13763-12:2021 (E)**1 Scope**

This document specifies a method for determination of resistance to hydrostatic pressure of electric detonators, non-electric detonators, electronic detonators, surface connectors and detonating cord relays.

Detonating cord relays, stated by the manufacturer to be used in dry conditions, are excluded.

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 13763-16:2021, *Explosives for civil uses — Detonators and detonating cord relays — Part 16: Determination of delay accuracy*

CEN/TS 13763-27:2003, *Explosives for civil uses — Detonators and relays - Part 27: Definitions, methods and requirements for electronic initiation systems*

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

EN ISO 3696:1995, *Water for analytical laboratory use - Specification and test methods (ISO 3696:1987)*

3 Terms and definitions (standards.iteh.ai)

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

4 Principle

The test piece is subjected to hydrostatic pressure, immersed in water at a pressure or depth establish for 48 h. After the immersion in water, the detonators, surface connectors and detonating cord relays are tested.

5 Reagents

5.1 Water, conforming to grade 3 of EN ISO 3696:1995.

6 Apparatus**6.1 Electric, non-electric and electronic detonators intended for down hole use**

6.1.1 Pressure vessel, capable of maintaining water at a pressure of 0,3 MPa and a temperature equal to the test temperature ± 2 °C. The materials from which the pressure vessel is constructed shall be such that they do not cause galvanic corrosion of the detonator shell during testing.

6.1.2 Thermometer, with an accuracy of $\pm 0,1$ °C.

6.1.3 Chronometer or stopwatch, with and accurate of ± 1 min.

6.1.4 Pressure gauge with an accuracy of $\pm 0,1$ MPa.

6.1.5 Water cooling device, capable of reaching the temperature in 8.1.

6.2 Surface connectors and detonating cord relays intended for use on the surface

6.2.1 Water tank, capable of holding a water level of 0,5 m depth with a water temperature equal to the test temperature ± 2 °C. The materials from which the water tank is constructed shall be such that they do not cause galvanic corrosion of the detonator shell during testing.

6.2.2 Thermometer, with an accurate of $\pm 0,1$ °C.

6.2.3 Chronometer or stopwatch, with and accurate of ± 1 min.

6.2.4 Water heating device, capable of reaching the temperature specified by the manufacturer.

7 Preparation and handling of test samples and test pieces¹⁾

7.1 Handling of test samples

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

7.2 Electric, non-electric and electronic detonators intended for down hole use

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. The testing shall be performed with the shortest standard length of shock tube or leading wire specified by the manufacturer. If the detonators form part of a series with different delay times, use 50 detonators with at least five different delay times distributed as evenly as possible and including the longest delay time in the series.

7.3 Surface connectors and detonating cord relays intended for use on the surface

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Select 50 surface connectors or detonating cord relays 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 testing shall be performed with the shortest standard length of shock tube or leading wire specified by the manufacturer. If the surface connectors or detonating cord relays form part of a series with different delay times, use 50 surface connectors or detonating cord relays with at least five different delay times distributed as evenly as possible and including the longest delay time in the series.

8 Procedure

8.1 Electric, non-electric and electronic detonators intended for down hole use

Fill up the pressure vessel with water. Heat up the water to a temperature of $(T \pm 2)$ °C, where:

- 1) T is 20 °C if the manufacturer does not claim the product can be used at temperatures exceeding 40 °C;
- 2) T is the highest operating temperature specified by the manufacturer if the product is to be used at temperatures exceeding 40 °C.

Immerse the detonators in the water and place the shock tube, if present, in such a way that the open end of the shock tube is never exposed to pressurized air. Do that either by leading the shock tube end from

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.

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the water inside the tank to the outside of the tank through a pressure-safe sealing or by totally immersing the detonator assembly in water using properly sealed shock tube ends according to the manufacturer's specification.

Close the pressure vessel and apply a pressure of $(0,30 \pm 0,01)$ MPa. Unless otherwise specified by the manufacturer, ensure that the free ends of the leading wires remain below the surface of the water during testing.

Keep the detonators in the pressure vessel for 48 h.

Use the water-cooling device to cool down the water so that the water temperature reaches 30 °C within 5 h but not before 3 h.

The total test time for the detonators is 48 h calculated from when the specified pressure has been reached.

After testing, the detonators shall be initiated within 2 h and the delay times shall be measured in accordance with prEN 13763-16:2021 and CEN/TS 13763-27:2003.

8.2 Surface connectors and detonating cord relays intended for use on the surface

Fill up the water tank with water to a depth of $(0,50 \pm 0,01)$ m. Heat up the water to a temperature equal to the highest operating temperature specified by the manufacturer ± 2 °C.

Immerse the surface connectors or detonating cord relays in the water tank

Unless otherwise specified by the manufacturer, ensure that the free ends of the leading wires or shock tubes remain below the surface of the water during testing.

Keep the surface connectors or detonating cord relays in the water tank for 48 h.

After testing, the surface connectors or detonating cord relays shall be initiated within 2 h and the delay times shall be measured in accordance with prEN 13763-16:2021 and CEN/TS 13763-27:2003.

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9 Expression of results

Record the numbers of detonators that did not detonate.

Record the delay time to each initiated detonator after pressure testing.

Record the numbers of surface connectors and detonating cord relays that did not detonate.

Record the delay time to each initiated surface connectors and detonating cord relays after pressure testing.

10 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 results of the delay times;
- b) whether the free ends of the leading wires were held above or under the water surface;
- c) the number of detonators that did not detonate;
- d) the number of surface connectors and detonating cord relays that did not detonate.