



SLOVENSKI STANDARD
oSIST prEN 13763-13:2021
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Eksplzivni za civilno uporabo - Detonatorji in zakasnilniki - 13. del: Ugotavljanje odpornosti električnih detonatorjev proti razelektritvi

Explosives for civil uses - Detonators and relays - Part 13: Determination of resistance of electric detonators to electrostatic discharge

Explosivstoffe für zivile Zwecke - Zünder und Verzögerungselemente - Teil 13: Bestimmung der Widerstandsfähigkeit elektrischer Zünder gegen elektrostatische Entladungen

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Explosifs à usage civil - Détonateurs et relais - Partie 13: Détermination de la résistance à la décharge électrostatique des détonateurs électriques

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EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

DRAFT
prEN 13763-13

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ICS 71.100.30

Will supersede EN 13763-13:2004

English Version

Explosives for civil uses - Detonators and detonating cord relays - Part 13: Determination of resistance of electric detonators to electrostatic discharge

Explosifs à usage civil - Détonateurs et relais pour
cordeau détonant - Partie 13: Détermination de la
résistance à la décharge électrostatique des
détonateurs électriques

Explosivstoffe für zivile Zwecke - Zünder und
Sprengschnurverbinder - Teil 13: Bestimmung der
Widerstandsfähigkeit elektrischer Zünder gegen
elektrostatische Entladungen

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.

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

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

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European foreword

This document (prEN 13763-13:2021) 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 13763-13:2004.

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

- a) in Clause 1, *Scope*, it is now specified that this document applies to explosives for civil uses;
- b) Clause 4, *Principle*, has been added;
- c) Clause 6, *Procedure*, has been updated;
- 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*
- *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

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Introduction

Detonators can be subjected to many forces, including vibration, during use, handling and transport. This could cause material from the compositions to become loose creating a risk of inadvertent initiation because of friction or other stimuli on the loose explosive.

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prEN 13763-13:2021 (E)**1 Scope**

This document specifies a method for determining of resistance of electric detonators to electrostatic discharge (ESD).

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 13763-17:2021, *Explosives for civil uses — Detonators and detonating cord relays — Part 17: Determination of no-fire current of electric detonators*

prEN 13763-21:2021, *Explosives for civil uses — Detonators and detonating cord relays — Part 21: Determination of flash-over voltage of electric detonators*

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**bridgewire ignition system**

internal components of an electric detonator that convert electrical energy into the first pyrotechnical output by the mean of a resistive bridgewire heated by Joule heating effect

3.2**pins-to-case configuration**

configuration in which the electrostatic discharge occurs between the two short-circuited leading wires ends and the detonator casing

3.3**pin-to-pin configuration**

configuration in which the electrostatic discharge occurs through the bridgewire of the ignition system

4 Principle

The test piece is subjected to electrostatic discharge of a specific energy, checking whether detonation occurs. The discharge is applied to the test piece through the bridgewire, pin-to-pin and between the short-circuited leading wires and the metal shell, pins-to-case. Detonation or no detonation of the test piece is recorded. The detonators are categorized in safety classes depending of the ESD level they can withstand without detonating.

5 Apparatus

5.1 Electrostatic discharge generator (ESD generator), with capacitance ranging from 500pF to 3 500pF and voltage sufficient to give the required impulse according to Table 1.

5.2 Equipment to record the ESD current and calculate the ESD impulse delivered to the detonator.

5.3 Conditioning chamber for maintaining a temperature of (20 ± 5) °C and a relative humidity of not greater than 60 %.

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 Preparation of test pieces

Select 50 electric detonators of the same type, with the same design, compositions and loading configuration according to the manufacturer's specification. Having a bridgewire ignition system and charge composition ignited by a fuse head, whose fuse head has the same design and chemical composition. If the detonators form part of a series with different delay times, select 25 detonators with delay times as evenly distributed throughout the series as possible.

NOTE Protective elements added to the bridgewire ignition system to increase resistance to mechanical, electrostatic or electromagnetic stress, such as a plastics sleeve on the fusehead, are regarded as part of the bridgewire ignition system.

If necessary, remove between 10 mm and 20 mm of insulation from the ends of the leading wires to allow them to be connected to the ESD generator.

6.3 Adjustment of the ESD generator

Adjust the ESD generator for each type of detonator in accordance with Annex A.

The ESD impulse to be applied to the detonator shall be in accordance with Table 1.

Table 1 — ESD impulse

Class of the detonator ^a	Class I	Class II	Class III	Class IV
No-fire current stated by the manufacturer [A]	$0,18 < I_{nf} < 0,45$	$0,45 \leq I_{nf} < 1,20$	$1,20 \leq I_{nf} < 4,00$	$4,00 \leq I_{nf}$
Minimum ESD impulse ^b for the "pin-to-pin" configuration [m]/Ω	0,3	6	60	300
Minimum ESD impulse ^b for the "pins-to-case" configuration [m]/Ω	0,6	12	120	600

^a Based on the manufacturer's stated value of the no-fire current.
^b All values shall have a tolerance of +5 %.

For the pins-to-case configuration, the applied voltage shall be greater than the 99 % flash-over voltage level determined in accordance with prEN 13763-21:2021.

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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WARNING – Class I detonators are very sensitive with regard to ESD and EMI and require precautions in handling risks as defined in prEN 13857-3:2021.

Test 25 electric detonators in each configuration (see 7.2 and 7.3). The detonators selected for testing in the “pins-to-case” configuration shall have leading wires of length $(3,50 \pm 0,05)$ m unless only detonators with shorter leading wires are available from the manufacturer, these may be used at a fixed length of $\pm 0,05$ m.

If the detonators form part of a series with different delay times, test 25 detonators with delay times distributed as evenly as possible throughout the series, with at least one from each delay time, in each configuration.

7 Procedure

7.1 General

Carry out the test at (20 ± 5) °C and at a relative humidity not greater than 60 %.

The leading wires shall be coiled as produced by the manufacturer.

Ensure that the leading wires and cables (if any) are kept at a distance of at least 100 mm from the ground and from any conductive objects that might cause leakage paths to earth.

Ensure that the leading wires and all measuring equipment are kept in the same positions as they were when adjusting the ESD generator in accordance with Annex A.

Monitor the ESD impulse applied each time. If it deviates from the specified value, adjust it as described in Annex A before continuing with the test.

7.2 Pin-to-pin configuration

Apply the ESD impulse between the two separate ends of the leading wires see Figure 1.

Observe whether the detonator detonates.

If the detonator does not detonate, repeat the operation five times successively for each detonator, allowing at least 10 s between each pulse.

Repeat these operations with all the detonators to be tested in this configuration.