SLOVENSKI STANDARD
oSIST prEN 13763-17:2021

01-april-2021

Eksplozivi za civilno uporabo - Detonatorji in zakasnilniki - 17. del: Ugotavljanje odpornosti električnih detonatorjev proti blodečim tokom

Explosives for civil uses - Detonators and relays - Part 17: Determination of no-fire current of electric detonators

Explosivstoffe für zivile Zwecke - Zünder und Verzögerungselemente - Teil 17: Bestimmung der Nichtansprechstromstärke elektrischer Zünder

Explosifs à usage civil - Détonateurs et relais - Partie 17: Détermination du courant maximal de non-amorçage des détonateurs électriques

Ta slovenski standard je istoveten z: **prEN 13763-17**

ICS:

71.100.30	Eksplozivi. Pirotehnika in ognjemeti	Explosives. Pyrotechnics and fireworks

oSIST prEN 13763-17:2021 **en**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

DRAFT
prEN 13763-17

April 2021

ICS 71.100.30

Will supersede EN 13763-17:2003

English Version

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

Explosifs à usage civil - Détonateurs et relais pour cordeau détonant - Partie 17: Détermination du courant maximal de non-amorçage des détonateurs électriques

Explosivstoffe für zivile Zwecke - Zünder und Sprengschnurverbinder - Teil 17: Bestimmung der Nichtansprechstromstärke elektrischer Zünder

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 13763-17:2021) 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 13763-17:2003.

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

a) Clause 1, *Scope*, specifies that this document applies to explosives for civil uses;

b) Clause 4, *Principle*, has been added;

c) Clause 7, *Procedure*, has been updated and in 7.2 the duration of the square pulse has been identified for each class of detonators;

d) Annex A, *Range of applicability of the test method*, has been removed;

e) a new Annex A, *Estimation of the normal standard deviation s from the range and sample size*, has been added to adjust the statistical procedure;

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*

— *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

This is a test of electric detonators where statistical methods are used to characterize the sensitivity. The test consists of two parts, one preliminary test to obtain an estimate of the 50 % initiation and one to calculate the no-fire current. The purpose of the test is to prevent untimely or inadvertent initiation or ignition of the detonators.

1 Scope

This document specifies a method for determining the no-fire current of 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.

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
PROBIT test
PBBS test
statistical method used to characterize the sensitivity, to a physical stimulus, of "one shot" pyrotechnical components

Note 1 to entry: The principle of the test is to measure the firing frequency at predefined levels of the physical stimulus. The physical stimulus in this standard is the firing current. Sensitivity levels corresponding to the required probability and confidence limits are then determined by extrapolation.

Note 2 to entry: A detailed description of the test is given in prEN 13763-1, Annex C.

4 Principle

The test pieces are subsequently subjected to a current pulse, and it is recorded whether ignition occurs. In a first step the current for 50 % firing is determined as a starting point for a consecutive PROBIT test. With the results from the PROBIT test the no-fire current is calculated.

5 Apparatus

5.1 Square pulse current supply, with the following characteristics:

a) a stabilized current with a tolerance on the output of ± 1 % of the specified value;

b) a square pulse with a tolerance of ± 1 % of the specified duration;

c) a current overshoot of not more than 10 % of the specified current, and duration not greater than 1 ms (on pure resistive load);

d) a rise time for the current of not more than 1 ms (on pure resistive load).

6 Preparation and handling of test samples and test pieces[1]

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

Select 30 detonators with the same bridge wire ignition system and shell for the preliminary test. Select 20 detonators with the same bridge wire ignition system and shell for each current level in the determination of the no-fire level. If the detonators form part of a series with different delay times, select detonators with delay times distributed as evenly as possible throughout the series.

7 Procedure

7.1 Conditioning

Condition the detonators for at least 2 h at a temperature of (20 ± 2) °C and carry out the test at the same temperature.

7.2 Preliminary testing

Carry out a preliminary test (for example a Bruceton test), using 30 detonators, to obtain an estimate of the current for 50 % firing ($I_{0,5}$) and the standard deviation (s).

The duration of the square pulse shall be set to:

— 10 s for Class I and II;

— 1 min for Class III;

— 5 min for Class IV.

In the case where the test pieces show for one level only no-fire and for the next higher level always initiates, the $I_{0,5}$ shall be calculated by taking the mean between these two levels and the standard deviation s shall be calculated by using the interval between the two levels and the number of trials as given in the Annex A.

7.3 Testing to determine the no-fire current level

7.3.1 Perform the test at (20 ± 2) °C, as follows:

7.3.2 Choose 7 to 11 current levels covering the interval *I0,5* ± 2 *s*. If equipment resolution makes it impossible to distribute the levels in an interval of *I0,5* ± 2 *s*, an interval of *I0,5* ± 3 *s* shall be used.

7.3.3 Connect the current pulse recorder and set the square pulse duration to 10 s for Class I and II; 1 min for Class III; 5 min for Class IV.

7.3.4 Set the current to the first level.

7.3.5 Connect one detonator (or fuse head) to the circuit and apply the current pulse.

7.3.6 Record whether the detonator (or fuse head) initiates.

7.3.7 Repeat steps 7.3.5 to 7.3.6 using the other 19 detonators (or fuse heads).

[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.

7.3.8 Repeat steps 7.3.4 to 7.3.7 for each of the other current levels.

8 Expression of results

For each level tested, determine the number of firings.

Calculate the no-fire current using the PROBIT test. The probability is set at 0,01 % and confidence levels are set at 95 %.

9 Test report

The test report should conform to EN ISO/IEC 17025:2017, 7.8. In addition, the following shall be reported:

— the current levels,

— mean values,

— standard deviations,

— number of ignitions,

— number of non-ignitions and the no-fire current for 0,01 % probability and 95 % confidence level shall be given.