SLOVENSKI STANDARD
oSIST prEN 13763-15:2021

01-april-2021

Eksplozivi za civilno uporabo - Detonatorji in zakasnilniki - 15. del: Ugotavljanje sposobnosti iniciranja

Explosives for civil uses - Detonators and relays - Part 15: Determination of equivalent initiating capability

Explosivstoffe für zivile Zwecke - Zünder und Verzögerungselemente - Teil 15: Bestimmung der Zündstärke

Explosifs à usage civil - Détonateurs et relais - Partie 15 : Détermination de la capacité d'amorçage équivalente

Ta slovenski standard je istoveten z: **prEN 13763-15**

ICS:

71.100.30	Eksplozivi. Pirotehnika in ognjemeti	Explosives. Pyrotechnics and fireworks

oSIST prEN 13763-15:2021 **en**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

DRAFT
prEN 13763-15

April 2021

ICS 71.100.30

Will supersede EN 13763-15:2004

English Version

Explosives for civil uses - Detonators and detonating cord relays - Part 15: Determination of equivalent initiating capability

Explosifs à usage civil - Détonateurs et relais pour cordeau détonant - Partie 15: Détermination de la capacité d'amorçage équivalente

Explosivstoffe für zivile Zwecke - Zünder und Sprengschnurverbinder - Teil 15: Bestimmung der Zündstärk

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.

CEN members are the national standards bodies of Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and United Kingdom.

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.

Warning : This document is not a European Standard. It is distributed for review and comments. It is subject to change without notice and shall not be referred to as a European Standard.

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

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

Contents

Page

European foreword

This document (prEN 13763-15:2021) 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 13763-15:2004.

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

a) Clause 1, *Scope*, has been updated:

   1) clarifying the types of detonators included: electric detonators, non-electric detonators and electronic detonators;

   2) it is now specified that this document applies to explosives for civil uses;

b) in Clause 5, *Apparatus*, a profilometer has been added;

c) Clause 6, *Procedure*, has been revised;

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*

— *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

General

When detonated, the explosive charge of detonators must provide enough initiating capability to initiate the explosive or a detonating cord/shock tube, with which they are intended to be used.

In the test procedure described in this document, the output performance of a test piece is compared with a reference of known characteristics and mass of charge. This document describes two tests: an underwater initiating capability test and a functioning test at low and high temperatures.

Underwater initiating capability

This test is based on the principle that the detonation of an explosive charge under water generates a spherical shock-wave and a volume of gas, which expands and then collapses as the bubble rises through the water. The shock-wave and the volume of gas bear a finite relationship to the energy released. Thus, by measuring:

— the shock-wave pressure; and

— the time interval between the shock-wave pressure peak and the first collapse of the gas bubble,

and calculating the parameters proportional to:

— equivalent shock energy; and

— equivalent bubble energy,

the energy output of the test detonators can be compared with the energy output of the reference detonator to which the manufacturer claims equivalence.

Functioning test at high and low temperatures

This test checks that the energy output of the detonators does not vary when they are initiated at high and low temperatures, by initiating detonators in contact with aluminium witness plates at ambient, high and low temperatures and comparing the depths of indentations made in the plates.

1 Scope

This document specifies a method of determining the equivalent initiating capability of electric detonators, non-electric detonators and electronic detonators.

This document specifies a functioning test (after storage) at high and low temperatures.

This document is not applicable to surface connectors or detonating cord relays.

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 573-3:2019, *Aluminium and aluminium alloys - Chemical composition and form of wrought products - Part 3: Chemical composition and form of products*

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 apply.

4 Principle

The test piece is subject to an underwater initiating capability test where equivalent shock pressure peak and rise time and equivalent bubble energy are calculated. The test piece is subject to a functioning test at high and low temperatures. The depth of indentation in each of the witness plates are measured. In both the underwater initiating capability test and functioning test at high and low temperatures a reference detonator is used.

5 Apparatus

5.1 Underwater initiating capability test

5.1.1 Blasting tank (Water tank or outdoor facility), with a volume of at least 500 l, and constructed in such a way that shock-wave reflections from the walls are avoided, for example, in the case of a small tank (as shown in Figure 1), by lining the walls with plastics foam.

5.1.2 Positioning system, for the pressure sensor and detonator. The distance between the centre of the sensor and the base charge shall be (400 ± 5) mm. The bottom of the detonator and sensor shall be placed (400 ± 5) mm below the water surface. The distance between any wall and the detonator shall be at least 200 mm.

5.1.3 Pressure sensor, with a rise time ≤ 2 µs.

5.1.4 Amplifier, with suitable gain and facility to connect the sensors and the oscilloscope.

5.1.5 Data acquisition device, with minimum 10 MHz sampling frequency.

5.1.6 Computer, with software for calculation of results.

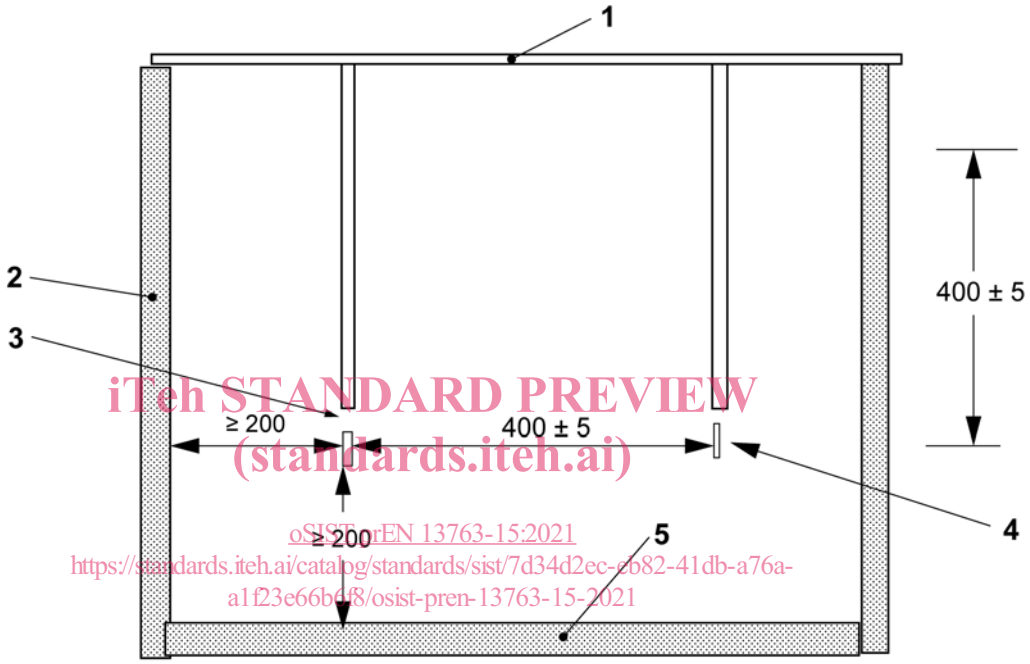
5.1.7 Initiating device, for initiating the submerged detonators.

5.1.8 Thermometer, to measure the water temperature.

5.1.9 Barometer, to measure the atmospheric pressure.

5.1.10 Reference detonators; ten reference detonators of strength equivalent to that claimed by the manufacturer for the detonators to be tested (see Annex A).

Dimensions in millimetres



Key

1 positioning arrangement
2 water tank
3 detonator
4 pressure sensor
5 non-reflecting, energy-absorbing material

Figure 1 — Example of water tank with positioning system for sensor and detonator

5.2 Functioning test at high and low temperatures

5.2.1 Fixture for initiating of detonators against witness plates, forming a free space of 30 mm diameter and 20 mm height below the witness plate, see examples in Figure 2 and Figure 3.

5.2.2 Conditioning chamber, capable of maintaining a temperature 10 °C higher than the highest operating temperature claimed by the manufacturer.

Capable of maintaining a temperature at least 10 °C lower than the lowest operating temperature claimed by the manufacturer.

5.2.3 Witness plates, size (50 ± 3) mm × (50 ± 3) mm with a thickness of (10 ± 0,3) mm, made from aluminium designated EN AW-6082 in accordance with EN 573-3:2019.

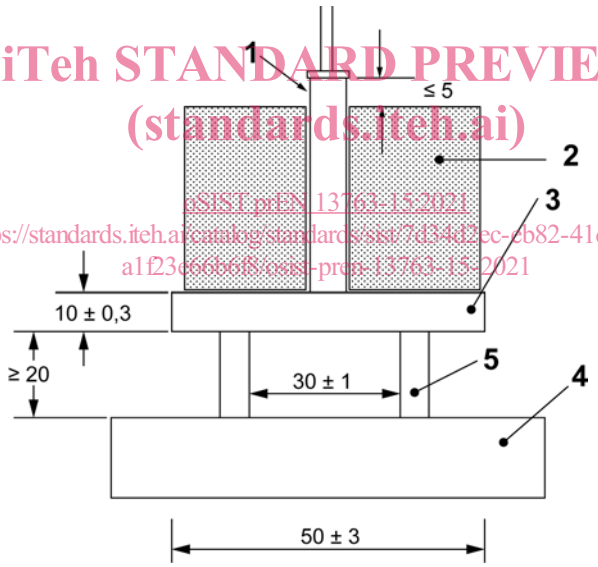
If a hole is obtained in the witness plate, the thickness of the plate may be increased.

5.2.4 Profilometer, with a measuring accuracy of 0,01 mm or

5.2.5 Depth indicator gauge, with a pin point diameter of 0,60 mm and measuring accuracy ± 0,01 mm.

5.2.6 Insulating foam, of expanded polystyrene or similar material, with an outside diameter of at least 50 mm and a hole through the centre with a diameter not more than 1 mm greater than that of the detonator. The height of the foam shall be such that, when the detonator is inserted, not more than 5 mm of detonator shell (at the closure end) remains exposed.

Dimensions in millimetres



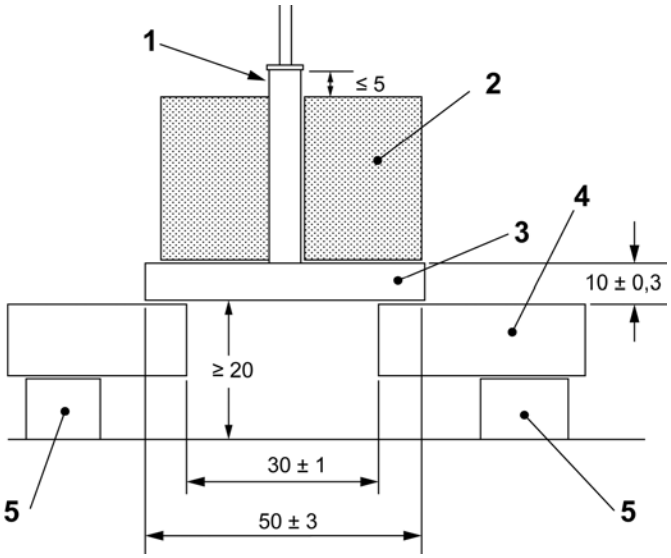
Key

1 detonator
2 expanded PS foam glued or taped to the witness plate
3 witness plate
4 steel plate
5 section of steel tube

NOTE The witness plate is supported by a piece of steel tube, again supported by a thick steel plate.

Figure 2 — Example of fixture for initiation of detonators against witness plates

Dimensions in millimetres



Key

1 detonator
2 expanded PS foam glued or taped to the witness plate
3 witness plate
4 steel plate
5 supports for the steel plate

NOTE The aluminium plate is placed directly on a thick steel plate with a hole in the centre so that there is free space underneath the area where an indentation from the detonation is expected.

Figure 3 — Example of fixture for initiation of detonators against witness plates

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

6.1 Handling of test samples

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

6.2 Underwater initiating capability test

Select 20 detonators of each specific type, having the same construction and shell material and having the same design, amount and type of base charge.

6.3 Functioning test at high and low temperatures

Select 50 detonators from each specific type, having the same construction and shell material and having the same design, amount and type of base charge.

[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.