SLOVENSKI STANDARD
oSIST prEN 13763-24:2021

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Eksplozivi za civilno uporabo – Detonatorji in zakasnilniki – 24. del: Ugotavljanje električne neprevodnosti detonacijskih cevk

Explosives for civil uses - Detonators and relays - Part 24: Determination of the electrical non-conductivity of shock tube

Explosivestoffe für zivile Zwecke - Zünder und Verzögerungselemente - Teil 24: Bestimmung der elektrischen Nichtleitfähigkeit von Zündschläuchen

Explosifs à usage civil - Détonateurs et relais - Partie 24: Détermination de la non-conductivité électrique du tube à transmission d'ondes de choc

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71.100.30	Eksplozivi. Pirotehnika in ognjemeti	Explosives. Pyrotechnics and fireworks

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EUROPEAN STANDARD

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English Version

Explosives for civil uses - Detonators and detonating cord relays - Part 24: Determination of the electrical non-conductivity of shock tube

Explosifs à usage civil - Détonateurs et relais pour cordeau détonant - Partie 24: Détermination de la non-conductivité électrique du tube à transmission d'ondes de choc

Explosivstoffe für zivile Zwecke - Zünder und Sprengschnurverbinder - Teil 24: Bestimmung der elektrischen Nichtleitfähigkeit von Zündschläuchen

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

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European foreword

This document (prEN 13763-24:2021) 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 13763-24:2002.

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

a) Clause 1, *Scope*, has been revised and

   1) electronic detonators have been included;

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

b) the normative references have been updated;

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

d) Clause 6, *Preparation and handling of test samples and test pieces*, has been updated;

e) in Clause 7, *Procedure*, 7.2, *Preliminary test for determination of the length of the test piece*, has been added;

f) Clause 8, *Expression of results*, has been added;

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

h) 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

Electrical insulation resistance (non-conductivity) and the electrical flash-over distance of shock tubes are tested to determine safety levels to secure no inadvertent initiation.

1 Scope

This document specifies methods of determination of electrical insulation resistance (non-conductivity) and the electrical flash-over distance of shock tubes for use with non-electric detonators and electronic detonators.

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*

IEC 62631-3-3:2015, *Dielectric and resistive properties of solid insulating materials — Part 3-3: Determination of resistive properties (DC methods) — Insulation resistance*

3 Terms and definitions

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

4 Principle

Determination of electrical insulation resistance and electrical flash-over distance are measured and recorded on 30 test pieces of shock tube for each test.

5 Apparatus

5.1 Determination of electrical insulation resistance

5.1.1 Meter for measuring electrical insulation resistance, conforming to the requirements in IEC 62631-3-3:2015, 5.3.

5.1.2 Voltage source, capable of applying at least 500 V DC with no more than 2 % deviation.

5.1.3 Conditioning chamber, capable of being maintained at (20 ± 2) °C and (50 ± 5) % relative humidity.

5.2 Determination of electrical flash-over distance

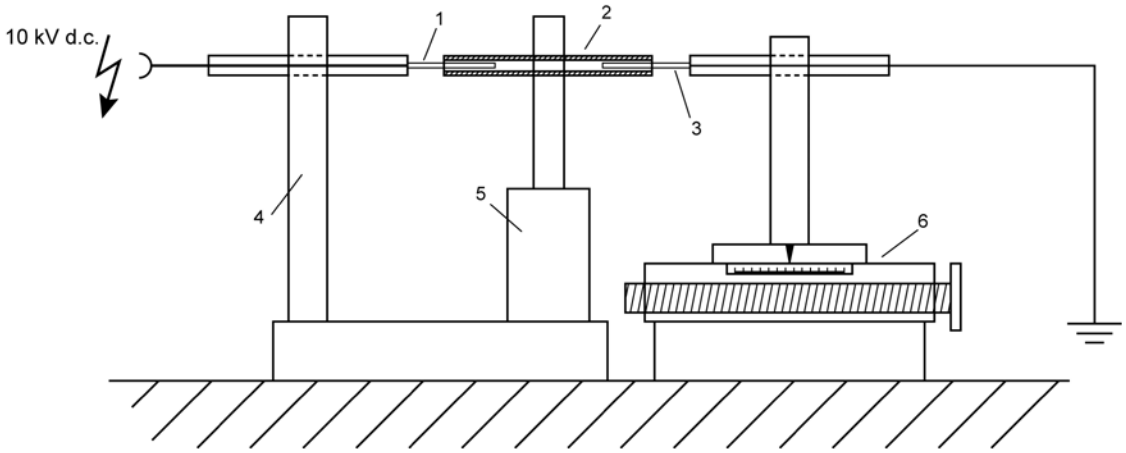
5.2.1 Voltage source, capable of applying 10 kV DC with no more than 3 % deviation and with the current output limited to no more than 5 mA.

5.2.2 Sensing device, to detect when an electrical flash-over has occurred.

5.2.3 Two needle electrodes, with a diameter of 60 % to 80 % of the shock tube's internal diameter, made from stainless steel and having rounded ends.

NOTE The rounded ends are needed to avoid corona discharges, but do not need precise specification.

5.2.4 Test rig, comprising an electrically insulated mounting arrangement to hold the test piece in position, a fixed support for one needle electrode and a moveable support with a linear measuring scale for the other needle electrode, as shown in Figure 1.



Key

1 fixed electrode
2 test piece
3 movable electrode
4 electrode support
5 test piece support
6 movable electrode support

Figure 1 — Test rig

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

6.1 Handling of test samples

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

6.2 Determination of electrical insulation resistance

Select 30 test pieces of shock tube each of (100 ± 10) mm. If the shock tubes are assembled with detonators, the lengths shall be taken from 30 detonators of the same specific type.

6.3 Determination of electrical flash-over distance

Select 30 test pieces of shock tube each of (100 ± 10) mm. If the shock tubes are assembled with detonators, the lengths shall be taken from 30 detonators of the same specific type.

7 Procedure

7.1 Preparation of test pieces

Condition the test pieces for 24 h at (20 ± 2) °C and (50 ± 5) % relative humidity.

7.2 Preliminary test for determination of the length of the test piece

An optional preliminary test to determine the length of the test piece can be performed where the maximum flash-over distance is determined, in which case the length of the test piece should be at least 10 mm longer than this distance.

[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 Determination of electrical insulation resistance

Measure the insulation resistance of the test pieces according to IEC 62631-3-3:2015, Clause 5 by using conducting paint electrodes and by applying a voltage of at least 500 V DC.

7.4 Determination of electrical flash-over distance

Place the test piece in the mounting arrangement and insert a needle electrode at least 5 mm into each end as shown in Figure 1. Apply the test voltage of 10 kV to the needle electrodes. Slowly decrease the distance between the needle electrodes by inserting the movable electrode further into the test piece. Stop moving the needle electrode as soon as electrical flash-over occurs. Record the electrical flash-over distance between the inserted ends of the needle electrodes in millimetres.

8 Expression of results

Record the electrical insulation resistance, in ohms.

Record the electrical flash-over distance, in millimetres.

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 electrical insulation resistance, in ohms;

b) the electrical flash-over distance, in millimetres.