SLOVENSKI STANDARD
SIST EN 13763-4:2004

01-januar-2004

Eksplozivi za civilno uporabo – Detonatorji in zakasnilniki – 4. del: Ugotavljanje odpornosti vodnikov in detonacijskih cevk proti abraziji

Explosives for civil uses - Detonators and relays - Part 4: Determination of resistance to abrasion of leading wires and shock tubes

Explosivstoffe für zivile Zwecke - Zünder und Verzögerungselemente - Teil 4: Bestimmung der Widerstandsfähigkeit von Zünderdrähten und Zündschläuchen gegenüber Abrieb

Explosifs a usage civil - Détonateurs et relais - Partie 4: Détermination de la résistance a l'abrasion des fils d'amorce et des tubes a transmission d'ondes de choc

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This European Standard exists 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 Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Slovakia, Spain, Sweden, Switzerland and United Kingdom.

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

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Contents

Foreword

This document (EN 13763-4:2003) has been prepared by Technical Committee CEN/TC 321 "Explosives for civil uses", the Secretariat of which is held by AENOR.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by May 2004, and conflicting national standards shall be withdrawn at the latest by May 2004.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s).

For the relationship with EU Directive(s), see informative annex ZA, which is an integral part of this document.

This European Standard is one of a series of standards with the generic title *Explosives for civil uses – Detonators and relays.* The other parts of this series are listed below:

prEN 13763-1 Part 1: *Requirements.*

EN 13763-2 Part 2: *Determination of thermal stability.*

EN 13763-3 Part 3: *Determination of sensitiveness to impact.*

EN 13763-5 Part 5: *Determination of resistance to cutting damage of leading wires and shock tubes.*

EN 13763-6 Part 6: *Determination of resistance to cracking at low temperatures of leading wires.*

EN 13763-7 Part 7: *Determination of the mechanical strength of leading wires, shock tubes, connections, crimps and closures.*

EN 13763-8 Part 8: *Determination of resistance to vibration of plain detonators.*

EN 13763-9 Part 9: *Determination of resistance to bending of detonators.*

EN 13763-11 Part 11: Determination of resistance to damage by dropping of detonators and relays .

EN 13763-12 Part 12: *Determination of resistance to hydrostatic pressure.*

prEN 13763-13 Part 13: *Determination of resistance of electric detonators against electrostatic discharge.*

prEN 13763-15 Part 15: Determination of equivalent initiating capability.

prEN 13763-16 Part 16: *Determination of delay accuracy.*

prEN 13763-17 Part 17: *Determination of no-fire current of electric detonators.*

prEN 13763-18 Part 18: *Determination of series firing current of electric detonators.*

prEN 13763-19 Part 19: *Determination of firing impulse of electric detonators.*

EN 13763-20 Part 20: *Determination of total electrical resistance of electric detonators.*

prEN 13763-21 Part 21: *Determination of flash-over voltage of electric detonators.*

prEN 13763-22 Part 22*: Determination of capacitance, insulation resistance and insulation breakdown of leading wires.*

EN 13763-23 Part 23: *Determination of the shock-wave velocity of shock tube.*

EN 13763-24 Part 24: *Determination of the electrical non-conductivity of shock tubes.*

prEN 13763-25 Part 25: *Determination of transfer capability of surface connectors and coupling accessories.*

prEN 13763-26 Part 26: *Definitions, methods and requirements for devices and accessories for reliable and safe function of detonators and relays.*

CEN/TS 13763-27 Part 27: *Definitions, methods and requirements for electronic initiation system.*

The annexes A and C are informative, annex B is normative.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Slovakia, Spain, Sweden, Switzerland and the United Kingdom.

Introduction

During usage on site, the insulation on the leading wires of electric detonators and the plastics tubing of shock tube non-electric detonators can be subjected to many forces, including abrasive forces when drawn over rough surfaces and/or cutting forces when drawn over a sharp edge. In the former, the plastics material is worn away gradually by abrasion. In the latter, the sharp edge cuts directly into the material. This standard deals with the former case by determining the ability of leading wire insulation/shock tube to resist the abrasive forces likely to be experienced in normal use.

1 Scope

This European Standard specifies a method for determining the resistance to abrasion of plastics used as insulating material for leading wires of electric detonators, or used as base material for the tubing of shock tube non-electric detonators.

2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text, and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

EN 13857-1:2003, *Explosives for civil uses - Part-1 Terminology.*

EN ISO/IEC 17025, *General requirements for the competence of testing and calibration laboratories (ISO 17025:1999).*

3 Terms and definitions

For the purposes of this European Standard, the terms and definitions given in EN 13857-1:2003 apply.

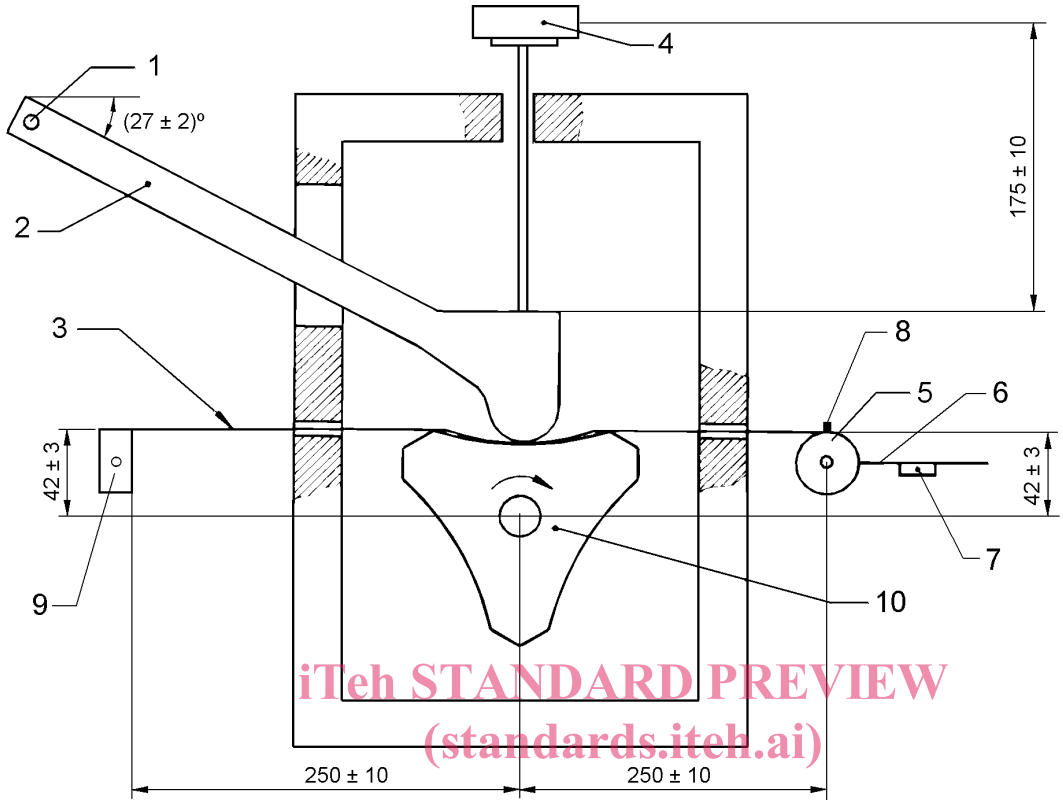
4 Principle

The test piece is subjected to abrasion by an abrasive surface, moving at a specified speed, while a specified load is applied. For leading wires the time taken for the insulation to be penetrated is determined. For shock tubes the functioning of the shock tube after immersion in water is tested.

5 Apparatus

5.1 Abrasion test apparatus, as shown in Figure 1, comprising the following main components.

Dimensions in millimetres



Key

1 Pivot
2 Hinged arm
3 Leading wire/shock tube
4 Weight
5 Pulley
6 Rod
7 Weight
8 Clamp screw for attaching the test piece
9 Clamp for attaching the test piece
10 Rotor

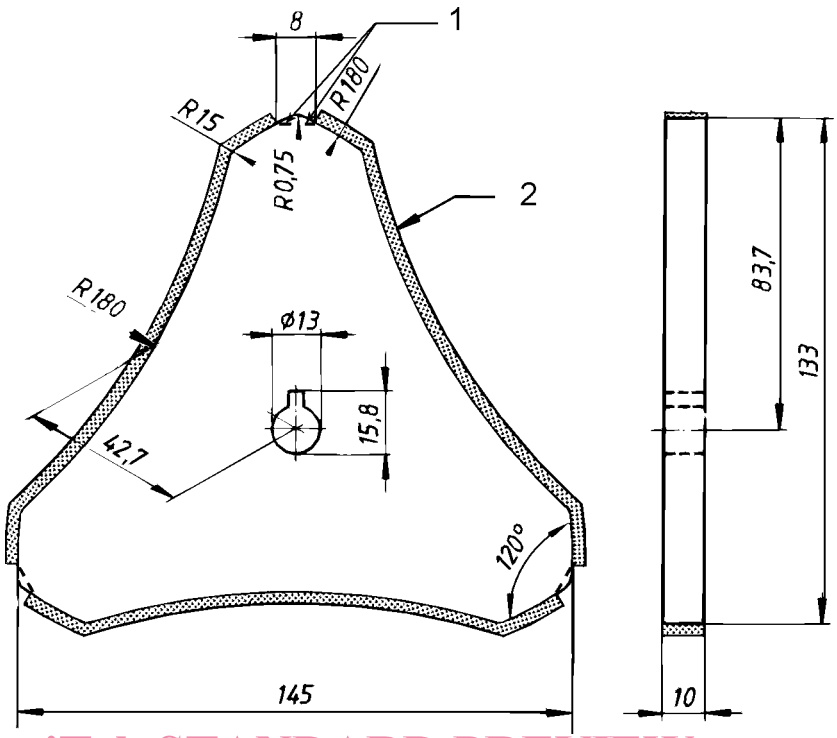
NOTE The weight on the rod to the right of the pulley (diameter 70 mm ± 1 mm) may hang down the right side of the pulley.

Figure 1 – Abrasion test apparatus with rotor in starting position

5.1.1 Steel or brass rotor, as shown in Figure 2, with a perimeter of (453 ± 2) mm to which three abrasive strips (see 5.1.2) are attached by means of glue or double-sided adhesive tape. It shall be ensured that electrical contact between the abrasive strips and the rotor is made, e.g. at the slits on the rotor where the ends of the abrasive strips are inserted (see Figure 2). The rotor shall rotate at a speed of (9,96 ± 0,18) rpm, producing a mean peripheral speed of (0,075 ± 0,001) m/s.

NOTE Depending on attachment principle (glue or tape) of the abrasive strip to the rotor, the abrasive strip may have to be bent carefully using a suitable tool in order to fit properly against the surface of the rotor.

Dimensions in millimetres



Key

1 Slit for the end of the abrasive strip

2 Abrasive strip

Figure 2 – Rotor

5.1.2 Abrasive strips, three pieces approximately 10 mm × 145 mm each, made of grinding steel as specified in annex B.

5.1.3 Load, to be applied to the test piece through the hinged arm (see 5.1.4).

5.1.4 Hinged arm, made of steel or brass as shown in Figure 3. In the starting position, the hinged arm shall apply a load of (8,35 ± 0,05) N to the test piece.

5.1.5 Pulley, diameter (70 ± 1) mm, for applying a tensile load of (8,1 ± 0,5) N to the test piece, by means of a rod and a weight.

5.1.6 Motor, capable of maintaining a constant speed of rotation whatever load is applied to the rotor.

NOTE 1 A DC motor with an output power of at least 500 W and with a separate speed control can be used.

The rotor shall reach its specified speed of rotation 0,6 s after starting.

NOTE 2 This requirement can be verified by two electrodes about 20 mm apart, each adjusted to give electrical contact to the tips of the rotor during rotation. The electrodes are connected to a digital counter, counting elapsed time between the pulses from the two electrodes when they are touching the tips of the rotor. Comparison is made between the elapsed time during a continuous run at the specified speed and the elapsed time 0,6 s after start. First the rotor is rotated manually to an appropriate position in order for a tip of the rotor to reach the second electrode after 0,6 s.

The electrodes can also be used for calibrating the specified speed of rotation, e.g. by measuring the time for one revolution. In this case only one electrode is required.