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**Explosiva varor för civilt bruk – Sprängkapslar  
och överföringsenheter –  
Del 1: Fordringar**

**Explosives for civil uses – Detonators and relays –  
Part 1: Requirements**

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English version

## Explosives for civil uses - Detonators and relays - Part 1: Requirements

Explosifs à usages civil - Cordeaux détonants et mèches  
de sûreté - Partie 1: Exigences

Explosivstoffe für zivile Zwecke - Zünder und  
Verzögerungselemente - Teil 1: Anforderungen

This European Standard was approved by CEN on 24 December 2003.

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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 Central Secretariat has the same status as the official versions.

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## EN 13763-1 :2004 (E)

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## Foreword

This document (EN 13763-1:2004) 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of an identical text or by endorsement, at the latest by September 2004 and conflicting national standards shall be withdrawn at the latest by September 2004.

Annexes A, B and C are normative, annexes D and E are informative.

This European Standard has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of the EU Directive 93/15/EEC

For relationship with EU Directive 93/15/EEC, see informative annex ZA, which is an integral part of this standard.

This European Standard is one of a series of standards on Explosives for civil uses - Detonators and relays. Other parts of this series are listed below:

EN 13763-2	Part 2: Determination of thermal stability.
EN 13763-3	Part 3: Determination of sensitiveness to impact.
EN 13763-4	Part 4: Determination of resistance to abrasion of leading wires and shock tubes.
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 in 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.
EN 13763-13	Part 13: Determination of resistance of electric detonators to electrostatic discharge.
EN 13763-14	Part 14: Determination of resistance of electric detonators to the influence of radio frequency radiation
EN 13763-15	Part 15: Determination of equivalent initiating capability.

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EN 13763-16:2003	Part 16: Determination of delay accuracy.
EN 13763-17	Part 17: Determination of no-fire current of electric detonators.
EN 13763-18	Part 18: Determination of series firing current of electric detonators.
EN 13763-19	Part 19: Determination of firing impulse of electric detonators.
EN 13763-20	Part 20: Determination of total electrical resistance of electric detonators.
EN 13763-21	Part 21: Determination of flash-over voltage of electric detonators.
EN 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 tubes.
EN 13763-24	Part 24: Determination of the electrical non-conductivity of shock tubes.
EN 13763-25	Part 25: Determination of transfer capacity of relays 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 systems.

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

## 1 Scope

This European Standard specifies the requirements for detonators, surface connectors, shock tube and detonating cord relays for civil uses.

This European Standard does not cover electronic initiation systems (see CEN/TS 13763-27) nor the devices and accessories for reliable and safe function of detonators and relays (see prEN 13763-26).

## 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 13763-2, *Explosives for civil uses - Detonators and relays - Part 2: Determination of thermal stability.*

EN 13763-3, *Explosives for civil uses - Detonators and relays - Part 3: Determination of sensitiveness to impact.*

EN 13763-4, *Explosives for civil uses - Detonators and relays - Part 4: Determination of resistance to abrasion of leading wires and shock tubes.*

EN 13763-5, *Explosives for civil uses - Detonators and relays - Part 5: Determination of resistance to cutting damage of leading wires and shock tubes.*

EN 13763-6, *Explosives for civil uses - Detonators and relays - Part 6: Determination of resistance to cracking in low temperatures of leading wires.*

EN 13763-7, *Explosives for civil uses - Detonators and relays - Part 7: Determination of the mechanical strength of leading wires, shock tubes, connections, crimps and closures.*

EN 13763-8, *Explosives for civil uses - Detonators and relays - Part 8: Determination of resistance to vibration of plain detonators.*

EN 13763-9, *Explosives for civil uses - Detonators and relays - Part 9: Determination of resistance to bending of detonators.*

EN 13763-11, *Explosives for civil uses - Detonators and relays - Part 11: Determination of resistance to damage by dropping of detonators and relays.*

EN 13763-12, *Explosives for civil uses - Detonators and relays - Part 12: Determination of resistance to hydrostatic pressure.*

EN 13763-13, *Explosives for civil uses - Detonators and relays - Part 13: Determination of resistance of electric detonators to electrostatic discharge.*

EN 13763-15, *Explosives for civil uses - Detonators and relays - Part 15: Determination of equivalent initiating capability.*

EN 13763-16:2003, *Explosives for civil uses - Detonators and relays - Part 16: Determination of delay accuracy.*

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EN 13763-17, *Explosives for civil uses - Detonators and relays - Part 17: Determination of no-fire current of electric detonators.*

EN 13763-18, *Explosives for civil uses - Detonators and relays - Part 18: Determination of series firing current of electric detonators.*

EN 13763-19, *Explosives for civil uses - Detonators and relays - Part 19: Determination of firing impulse of electric detonators.*

EN 13763-20, *Explosives for civil uses - Detonators and relays - Part 20: Determination of total electrical resistance of electric detonators.*

EN 13763-21, *Explosives for civil uses - Detonators and relays - Part 21: Determination of flash-over voltage of electric detonators.*

EN 13763-22, *Explosives for civil uses - Detonators and relays - Part 22: Determination of capacitance, insulation resistance, and insulation breakdown of leading wires.*

EN 13763-23, *Explosives for civil uses - Detonators and relays - Part 23: Determination of the shock-wave velocity of shock tubes.*

EN 13763-24, *Explosives for civil uses - Detonators and relays - Part 24: Determination of the electrical non-conductivity of shock tubes.*

EN 13763-25, *Explosives for civil uses - Detonators and relays - Part 25: Determination of transfer capacity of relays and coupling accessories.*

### **3 Terms and definitions**

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

### **4 Requirements**

#### **4.1 Thermal stability**

When tested in accordance with EN 13763-2:

- for detonators, surface connectors or relays, there shall be no detonation;
- for shock tubes, there shall be no visible evidence of reaction.

#### **4.2 Sensitiveness to impact**

When tested in accordance with EN 13763-3, the mean and minimum heights at which explosion is observed shall be greater than the values listed in the Table below. The mean height is calculated using the Bruceton method as described in annex B. When successive no-explosion events occur at the maximum height during the test, the mean height shall not be calculated and only the minimum height shall be considered as pass criterion.



**Table 1 - Sensitiveness to impact**

	Mean height (m)	Minimum height (m)
Electric, non-electric and plain detonators	0,40	0,20
Detonating cord relays	7,00	5,00
Non-electric surface connectors and shock tubes	9,00	7,00

### 4.3 Resistance to abrasion of leading wires and shock tubes

#### 4.3.1 Leading wires

When tested in accordance with EN 13763-4, the mean and minimum values of testing time at the point of failure shall be larger than the values listed below.

**Table 2 – Resistance to abrasion**

Category	Test loading (N)	Mean value (s)	Minimum value (s)
1	4,0	6,0	5,1
2	12,2	4,5	3,8

#### 4.3.2 Shock tubes

When tested in accordance with EN 13763-4, all shock tubes shall be initiated and shall propagate the detonation along the entire shock tube length during the functioning test.

### 4.4 Resistance to cutting damage of leading wires and shock tubes

#### 4.4.1 Leading wires

When tested in accordance with EN 13763-5, there shall be no electrical contact between the leading wire conductor and the tungsten carbide cutting edge.

#### 4.4.2 Shock tubes

When tested in accordance with EN 13763-5:

- all the shock tubes shall initiate and each shall propagate along its entire length.

### 4.5 Resistance to cracking in low temperatures of leading wires

When tested in accordance with EN 13763-6, there shall be no through cracking of the insulation.

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### 4.6 Mechanical strength of leading wires, shock tubes, connections, crimps, and closures

When tested in accordance with EN 13763-7:

- during the sudden release test and the slow release test, no detonator shall detonate;
- during the sudden release test, no leading wire or shock tube shall break and the plug shall not be pulled out of the shell;
- during the slow release test, no plug or fusehead shall pull out of the shell;
- in the functioning test, all the detonators shall detonate.

### 4.7 Resistance to vibration of plain detonators

When tested in accordance with EN 13763-8, no detonator shall lose a mass greater than 10 mg.

### 4.8 Resistance to bending of detonators

When tested in accordance with EN13763-9, no detonator shall initiate and there shall be no cracks or breaks in any of the shells.

### 4.9 Resistance to damage by dropping

When tested in accordance with EN 13763-11:

- none of the test pieces shall detonate during the drop tests;
- during the functioning test, at the end of the free-fall drop test, all the test pieces shall fire.

### 4.10 Resistance to hydrostatic pressure

a) When tested in accordance with EN 13763-12, all detonators shall detonate and all single values of delay times shall lie within  $t_{nomadj,k} \pm 2s_{kmax}$ , where:

$t_{nomadj,k}$  is defined according to EN 13763-16:2003, clause B.2

$s_{kmax}$  is defined according to EN 13763-16:2003, clause B.6, Table B.2, with a  $c_{min}$  of 2,12

b) When tested in accordance with EN 13763-12, all surface connectors and non-electric detonators intended to be combined with surface connectors shall detonate and all single values of delay times shall lie within  $t_{nom,k} \pm 2r_{kmax}$ , where:

$t_{nom,k}$  is defined according to EN 13763-16:2003, clause 8(f)

$r_{kmax}$  is defined according to EN 13763-16:2003, clause 8(e)

c) When tested in accordance with EN 13763-12, all relays shall detonate.

### 4.11 Resistance of electric detonator to electrostatic discharge

When tested in accordance with EN 13763-13, no test piece shall detonate at a minimum impulse of 0,3 mJ/ $\Omega$  or 0,6 mJ/ $\Omega$ , depending on the configuration, i.e. 'pin to pin' or 'pins to case', respectively.

When tested in accordance with EN 13763-13, for the appropriate class of detonator claimed by the manufacturer, no detonator shall detonate at the minimum impulse (pin to pin and pins to case, respectively) as given in Table A.1 annex A.

#### 4.12 Equivalent initiating capability

When tested in accordance with EN 13763-15:

- the mean shock energy of the test detonators shall be not less than the mean shock energy of the reference detonators that the manufacturer claims to be equivalent and all single values of the shock energy shall be greater than 90% of the mean value of the reference detonators;
- the mean bubble energy of the test detonators shall be not less than the mean bubble energy of the reference detonators that the manufacturer claims to be equivalent and all single values of the bubble energy shall be greater than 90% of the mean value of the reference detonators;
- during the functioning test, all detonators shall detonate;
- the ratio  $d_l/d$  shall be not less than 0,75 and the ratio  $d_h/d$  shall be not less than 0,70.

#### 4.13 Delay accuracy

When tested in accordance with EN 13763-16:

- all detonators shall fire;
- there shall be no outliers;
- except for surface connectors, the calculated c-factor ( $c_k$ ) of each tested interval number shall not be less than 2,12 ( $c_{min}$ );
- for surface connectors and non-electric detonators intended to be combined with surface connectors,  $r_k$  shall not be higher than  $r_{k\ max}$  of each tested interval number.

#### 4.14 No-fire current of electric detonators

When tested in accordance with EN 13763-17, the no-fire current shall be calculated according to annex C and shall correspond to the class claimed by the manufacturer, according to the classification given in Table A.1, annex A.

#### 4.15 Series firing current of electric detonators

When tested in accordance with EN 13763-18, there shall be no misfire in the series firing test.

#### 4.16 Firing impulse of electric detonators

When tested in accordance with EN 13763-19, the all-fire impulse shall be not greater than the value stated by the manufacturer.

The no-fire impulse shall be not less than the value given in Table A.1 for the class of detonator claimed by the manufacturer.

#### 4.17 Total electrical resistance of electric detonators

When tested in accordance with EN 13763-20, each test result for the total electrical resistance shall be within  $\pm 10\%$  of the nominal value stated by the manufacturer.