SLOVENSKI STANDARD

SIST EN 13938-7:2004

01-november-2004

Eksplozivi za civilno uporabo - Smodniki in raketna goriva - 7. del: Dolo anje lastnosti rnega smodnika

Explosives for civil uses - Propellants and rocket propellants - Part 7: Determination of properties of black powder

Explosivstoffe für zivile Zwecke - Treibladungspulver und Raketentreibstoffe - Teil 7: Bestimmung der Eigenschaften von Schwarzpulver

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Explosifs a usage civil - Poudre propulsive et propergol pour fusée - Détermination des propriétés de la poudre noire

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EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 13938-7

August 2004

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English version

Explosives for civil uses - Propellants and rocket propellants - Part 7: Determination of properties of black powder

Explosifs à usage civil - Poudre propulsive et propergol pour fusée - Détermination des propriétés de la poudre noire

Explosivstoffe für zivile Zwecke - Treibladungspulver und Raketentreibstoffe - Teil 7: Bestimmung der Eigenschaften von Schwarzpulver

This European Standard was approved by CEN on 21 June 2004.

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. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CEN member.

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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EUROPEAN COMMITTEE FOR STANDARDIZATION
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Foreword

This document (EN 13938-7:2004) 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of an identical text or by endorsement, at the latest by February 2005, and conflicting national standards shall be withdrawn at the latest by February 2005.

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

This document is one of a series of standards with the generic title *Explosives for civil uses – Propellants and rocket propellants.* The other parts of this series are listed below:

prEN 13938-1 Part 1: Requirements

prEN 13938-2 Part 2: Determination of resistance to electrostatic energy

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EN 13938-3 Part 3: Determination of deflagration to detonation transition

EN 13938-4 Part 4: Determination of burning rate under ambient conditions

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EN 13938-5 Part 5: Determination of voids and fissures

EN 13938-6 Part 6: Guide for the determination of integrity of inhibitor coatings

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 document specifies the test methods for black powder in pellets, granular form, compressed (press-moulded cylinders with central hollow space) or as a meal for use as propellant, blasting explosive, pyrotechnic or in safety fuses.

2 Normative references

The following referenced documents are indispensable for the application 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 13631-2, *Explosives for civil uses - High explosives - Part 2: Determination of thermal stability of explosives*

EN 13631-3, *Explosives for civil uses - High explosives - Part 3: Determination of sensitiveness to friction of explosives.*

EN 13631-4, *Explosives for civil uses - High explosives - Part 4: Determination of sensitiveness to impact of explosives*

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

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EN 13938-4, *Explosives for civil uses - Propellants and rocket propellants - Part 4: Determination of burning rate under ambient conditions*

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

3 Terms and definitions

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

3.1
bulk density
mass of a free-flowing substance poured into a measuring cylinder divided by its corresponding volume

3.2
free-flowing substance
substance in such a form that it can be readily transferred from one cylinder to another by pouring to give one continuous, homogeneous mass

4 Preparation of test samples

For granular black powder some test methods given in 5.1 and 5.2 imply a preparation of the sample, e.g. by sieving. Details are given in the corresponding documents, the reference of which is given in Clause 2.

5 Methods

5.1 Methods for black powder used as propellant, pyrotechnic or in safety fuses

5.1.1 Determination of thermal stability

Determine the thermal stability in accordance with the method described in EN 13631-2.

5.1.2 Determination of sensitiveness to friction

Determine the sensitiveness to friction in accordance with the method described in EN 13631-3.

5.1.3 Determination of sensitiveness to impact

Determine the sensitiveness to impact in accordance with the method described in EN 13631-4.

5.1.4 Determination of burning rate under ambient conditions

Determine the burning rate under ambient conditions in accordance with the method described in EN 13938-4.

5.1.5 Determination of bulk density

5.1.5.1 Principle

A measured volume of the sample poured into an empty cylinder is weighed.

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5.1.5.2 Apparatus

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5.1.5.2.1 Weighing machine, capable of weighing masses up to 500 g to an accuracy of 0,1 g.

5.1.5.2.2 Measuring cylinder with a capacity of 250 cm^3, capable of measuring to an accuracy of 1 cm^3, to be filled by a funnel.

5.1.5.3 Procedure

Place the empty measuring cylinder on the weighing machine and record the mass (M_1). Introduce the sample by means of a funnel to a volume of about 200 cm^3.

Drop the cylinder three times vertically onto a wooden surface from a distance of about 2 cm.

Record the volume of the product in the cylinder (V).

Then reweigh the cylinder and contents (M_2).

The density is determined three times with separate portions of the sample.

NOTE If the sensitiveness of the sample to impact and friction are not known, it should be determined before measuring the bulk density.

5.1.5.4 Calculation of Results

Calculate the bulk density of the sample ρ, expressed in grams per cm^3, from the following equation:

$$\rho = \frac{M_2 - M_1}{V}$$

where

M_1 is the mass of the empty measuring cylinder, in grams (g);

M_2 is the mass of the cylinder and contents, in grams (g);

V is the measured volume of the sample in the measuring cylinder, in cubic centimetres (cm^3).

5.1.6 Density of compressed pellets

The density of compressed pellets can be calculated from the dimensions (calculate the volume) and the mass.

$$\rho = \frac{M}{Vc}$$

where

M is the mass of the compressed pellets, in grams (g);

Vc is the calculated volume of the compressed pellets, in cubic centimetres (cm^3).

The density is calculated three times with separate samples of compressed pellets.

5.2 Methods for black powder for blasting

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5.2.1 Determination of thermal stability

Determine the thermal stability in accordance with the method described in EN 13631-2.

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5.2.2 Determination of sensitiveness to friction

Determine the sensitiveness to friction in accordance with the method described in EN 13631-3.

5.2.3 Determination of sensitiveness to impact

Determine the sensitiveness to impact in accordance with the method described in EN 13631-4.

5.2.4 Determination of burning rate under ambient conditions

Determine the burning rate under ambient conditions in accordance with the method described in EN 13938-4.

5.2.5 Determination of safe and reliable ignition and complete deflagration of black powder for blasting

5.2.5.1 Principle

The transmission of deflagration of black powder is determined by igniting one of two compressed cylinders or cartridges having the same diameter and separated by an air gap. For compressed black powder the transmission is measured horizontally unconfined. For granular black powder the transmission is measured horizontally under confinement.

5.2.5.2 Test samples

For compressed pellets of black powder, the pellets shall be tested as placed on the market but without any wrapping. For granular black powder, the black powder shall be tested in steel pipes.

5.2.5.3 Apparatus

Two cylindrical steel pipes with an inner diameter of 25 mm, a wall thickness of 2 mm and an effective length of 50 mm (see Figure 1). One of the tubes shall be closed at one end with a suitable metal plate or plug, perforated to allow the wires of an electric igniter to be passed through. Paper of approximately 30 g/m^2 is required to close the pipes.

5.2.5.4 Means of ignition

The donor is ignited by an igniter as specified by the manufacturer of the black powder.

5.2.5.5 Preparation of test samples

For granular black powder, cartridges are prepared as follows. For the donor, one end of a steel pipe is closed with a metal plate or plug fixed to the pipe in a suitable manner. The plate has a hole through which can be passed the wires of an electric igniter. The igniter is introduced in the open end of the tube, its wires passed through the hole in the plug and the igniter fixed 5 mm from the closure. One end of the acceptor pipe is closed with paper (approximately 30 g/m^2) fixed with adhesive tape.

The pipes are filled in an upright position with an excess of black powder and the surface levelled by drawing a blade across the top. Finally both pipes are closed with paper as described above (see Figure 1).

5.2.5.6 Procedure

The donor is ignited. Commence the test with a distance (gap) between donor and acceptor of 50 cm, if the acceptor is ignited, repeat the test with stepwise longer distances until no ignition of the acceptor will be observed. Otherwise, if no ignition of the acceptor is observed, repeat the test by stepwise reducing the gap.

The longest distance (go-gap) at which the acceptor will be ignited three times and the shortest distance (no-go-gap) at which the acceptor will be not ignited three times shall be recorded.

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5.2.6 Determination of bulk density

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Determine the bulk density in accordance with the method described in 5.1.5.

5.2.7 Determination of density of compressed pellets

Determine the density of compressed pellets in accordance with the method described in 5.1.6.

6 Test report

The test report shall conform to EN ISO/IEC 17025. In addition, the following information shall be given:

a) reference to this document, i.e. EN 13938-7;

b) complete identification of the sample, including grain size distribution;

c) mass of black powder under test in cylinders or cartridges;

d) loading density under test;

e) ambient conditions during test;

f) test result.