BRITISH STANDARD

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13631-3:2004

Explosives for civil uses — High explosives —

Part 3: Determination of sensitiveness to friction of explosives

The European Standard EN 13631-3:2004 has the status of a British Standard

ICS 71.100.30

National foreword

This British Standard is the official English language version of EN 13631-3:2004.

The UK participation in its preparation was entrusted to Technical Committee CII/61, Explosives for civil uses, which has the responsibility to:

— aid enquirers to understand the text;

— present to the responsible international/European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;

— monitor related international and European developments and promulgate them in the UK.

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This British Standard, was published under the authority of the Standards Policy and Strategy Committee on 25 August 2004

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This document comprises a front cover, an inside front cover, the EN title page, pages 2 to 12, an inside back cover and a back cover.

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Explosives for civil uses - High explosives - Part 3: Determination of sensitiveness to friction of explosives

Explosifs à usage civil - Explosifs - Partie 3 : Détermination de la sensibilité au frottement des explosifs

Explosivstoffe für zivile Zwecke - Sprengstoffe - Teil 3: Bestimmung der Reibempfindlichkeit von Explosivstoffen

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

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Foreword

This document (EN 13631-3:2004) 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of an identical text or by endorsement, at the latest by February 2005, and conflicting national standards shall be withdrawn at the latest by February 2005.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 on *Explosives for civil uses - High explosives.* The other parts of this series are:

prEN 13631-1	Part 1:	Requirements
EN 13631-2	Part 2:	Determination of thermal stability of explosives
EN 13631-4	Part 4:	Determination of sensitiveness to impact of explosives
EN 13631-5	Part 5:	Determination of resistance to water
EN 13631-6	Part 6:	Determination of resistance to hydrostatic pressure
EN 13631-7	Part 7:	Determination of safety and reliability at extreme temperatures
EN 13631-10	Part 10:	Verification of the means of initiation
EN 13631-11	Part 11:	Determination of transmission of detonation
prEN 13631-12	Part 12:	Specification of boosters with different initiating capability
EN 13631-13	Part 13:	Determination of density
EN 13631-14	Part 14:	Determination of velocity of detonation
prEN 13631-15	Part 15:	Calculation of thermodynamic properties
EN 13631-16	Part 16:	Detection and measurement of toxic gases

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 a method for determining the sensitiveness to friction of explosives. This method is not applicable to liquid products.

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

EN 60672-3:1997, *Ceramic and glass insulating materials — Part 3: Specifications for individual materials (IEC 60672-3:1997)*

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
reaction
occurrence of report, crackling, sparking and/or flame

3.2
sensitiveness to friction
lowest load at which a reaction is obtained from at least one out of six trials

4 Principle

A small amount of the explosive is placed on a porcelain plate and a porcelain peg is pressed onto the sample under a specified load. The plate is moved to apply a friction stimulus to the sample. The load is reduced for subsequent trials until the lowest load at which a reaction is obtained from at least one out of six trials is reached.

5 Preparation of test samples

5.1 Solid substances which are easily broken up or in powdered form

Granular substances shall be passed through a sieve with a nominal aperture size of 0,5 mm.

Substances which have been compressed, cast or otherwise consolidated shall be broken into small pieces before sieving. The fraction which passes through the sieve shall be used for the test.

For substances which contain more than one constituent, the sieve fraction used for the test shall be representative of the original sample.

Take a sample of the prepared substance with a cylindrical measure of 10 mm^3 capacity (2,3 mm diameter by 2,4 mm length) and place it in the friction apparatus.

5.2 Plastic-bonded substances and other solids which are not easily broken up

These substances shall be tested in the form of discs or chips of 10 mm^3 and a minimum diameter of 4 mm.

5.3 Paste-like and gel-type substances

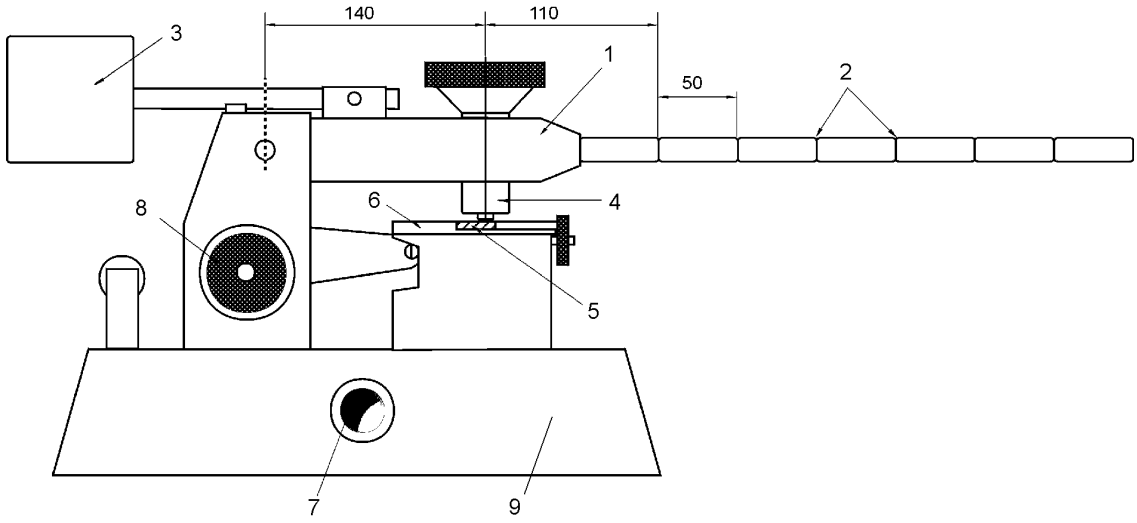
For these substances fill a rectangular 0,5 mm thick gauge with a 2 mm x 10 mm window with the substance, place it the apparatus and remove the gauge carefully.

6 Apparatus

6.1 General

The friction apparatus consists of a cast steel base on which the friction device is securely mounted, as shown in Figure 1.

Dimensions in millimetres



Key

1 Pivoted lever
2 Notches
3 Counterweight
4 Holder for porcelain peg
5 Porcelain plate
6 Movable carriage for porcelain plate
7 Operating switch
8 Wheel for manual adjustment
9 Cast steel base

Figure 1 — Friction apparatus

6.2 Loading device

The loading device consists of a pivoted lever with six notches on one side, a counterweight on the other side and a holder for a porcelain peg.

By adjusting the counterweight at one end of the lever the zero load condition is set. When the loading device is lowered onto the porcelain plate the longitudinal axis of the porcelain peg is perpendicular to the plate. The notches on the loading device are located at distances of (110 ± 2) mm, (160 ± 2) mm, (210 ± 2) mm, (260 ± 2) mm, (310 ± 2) mm, and (360 ± 2) mm from the axis of the porcelain peg and are numbered from 1 (110 mm) to 6 (360 mm). A weight is hung from a notch by means of a ring and hook. The same ring and hook are used for all weights. There are nine different weights of 0,28 kg, 0,56 kg, 1,12 kg, 1,68 kg, 2,24 kg, 3,36 kg, 4,48 kg, 6,72 kg, and 10,08 kg, numbered from 1 to 9. All specified masses include the weight of the ring and hook.

A range of applied loads, as listed in Table 1, is achieved by the use of different weights in different notches. Loads are given in Newtons [N].

NOTE The listed values are approximate because some basic values for the calculation are rounded to obtain integer numbers as results. The actual loads do not differ by more than 2 %.

The cylindrical porcelain pegs are made from technical white porcelain and their roughened ends are rounded. The dimensions are given in Figure 2.

Dimensions in millimetres

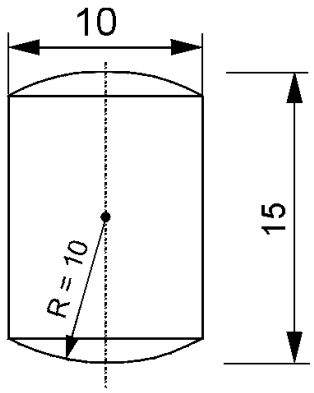


Figure 2 — Porcelain peg

Table 1 — Possible loads for the loading device (in Newtons)

Weight no.	Notch no.					
	1	2	3	4	5	6
1	5	6	7	8	9	10
2	10	12	14	16	18	20
3	20	24	28	32	36	40
4	30	36	42	48	54	60
5	40	48	56	64	72	80
6	60	72	84	96	108	120
7	80	96	112	128	144	160
8	120	144	168	192	216	240
9	180	216	252	288	324	360

6.3 Movable carriage

The movable carriage runs in two guides and supports a porcelain plate on which the substance under test is located.

6.4 Porcelain plates

The porcelain plates shall be made from technical white porcelain conforming to EN 60672-3:1997, subgroup C 111 and, before being fired in an oven, both rubbing surfaces are thoroughly roughened by being rubbed with a sponge. The dimensions are given in Figure 3.

Dimensions in millimetres

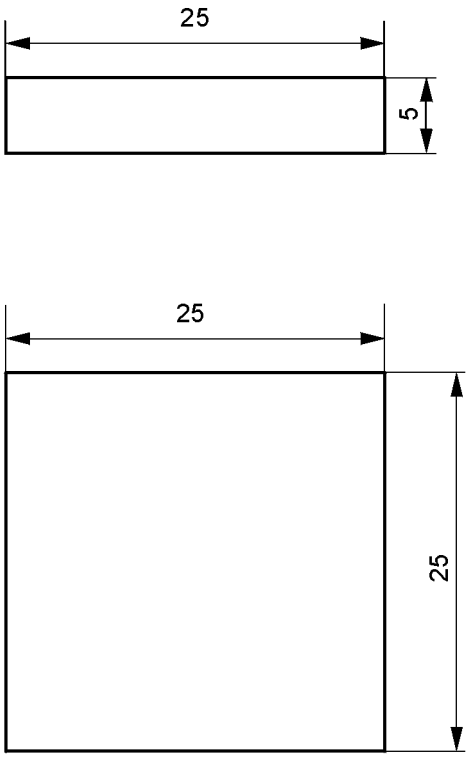


Figure 3 — Porcelain plate

The roughness measurement shall be performed with the following parameters: traverse length l_t = 15 mm, individual sampling length l_r = 2,5 mm, total sampling length l_n = *5* x l_r. The direction of measurements shall be perpendicular to the traces of the sponge. The roughness R_a is measured six times on 10 plates (each side three times). The mean of these measurements shall be in the range of R_a= 6 µm to 15 µm with no individual readings less than 5 µm or greater than 19 µm.

6.5 Motor and gearing

The motor is connected via an eccentric cam and a suitable gearing to the movable carriage. It is operated by a switch located on the front of the apparatus. The gearing allows the carriage to move forward and back for a distance of (10,0 ± 0,2) mm in each direction. A single trial consists of one movement in each direction. A single operation of the switch causes the carriage to move once in each direction. Motor and gearing shall be adjusted in such a way that the carriage moves (140 ± 3) times per minute forward and back when the switch is held in the operating position.

7 Procedure

NOTE Trials with high friction loads can result in sparking even when no substance is placed on the porcelain plate. Because of this effect such trials should be observed with great care.

The porcelain plate shall be fixed on the carriage so that the grooves of the sponge marks run transversely to the direction of movement. Attach the porcelain peg to the holder in the loading device. Place the substance to be tested on the plate and place the peg on the sample as shown in Figure 4. The peg shall rest on one end of the sample such that when the plate moves the sample travels underneath the peg. Attach the appropriate weights to the loading device.

Operate the switch once and observe the behaviour of the substance under test. Classify the observation as one of the following:

a) reaction

b) no reaction

The test shall be commenced with a load of 360 N. If in this trial a reaction is observed continue the test with stepwise lower loads until no reaction is observed. Repeat the trial at this friction load a further five times provided no reaction occurs. Otherwise the test shall be repeated with stepwise reduction of friction loads until the load is achieved at which no reaction occurs in six trials.

If in the first trial at 360 N no reaction is observed, repeat the trial five times. If in all six trials no reaction occurs the substance shall be deemed to be insensitive to friction. If a reaction is obtained reduce the load as described above.

Each part of the surface of the plate and peg shall be used only once. The two ends of the peg can be used for one trial each and the two friction surfaces of the plate can be used for three trials each.

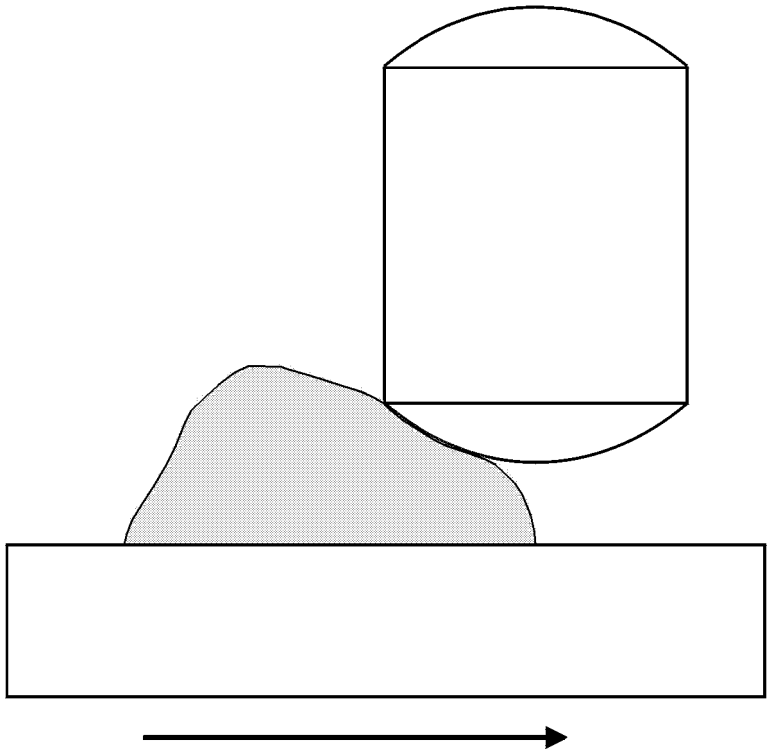


Figure 4 — Direction of porcelain peg before start of motor

8 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 13631-3;

b) grain size of the sample under test if relevant;

c) ambient conditions during testing;

d) results of all test series in the form of: friction load, number of trials, number of trials with a reaction as result;

e) sensitiveness to friction (N).

Annex A
(informative)

Range of applicability of the test method

Range of applicability of this test method: – 40 °C to + 80 °C.

NOTE Testing at temperatures outside ambient may require special arrangements to condition test samples and/or equipment.

Annex ZA
(informative)

Relationship between this European Standard and the Essential Requirements of EU Directive 93/15/EEC

This European Standard has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association to provide a means of conforming to Essential Requirements of the New Approach Directive 93/15/EEC.

Once this standard is cited in the Official Journal of the European Communities under that Directive and has been implemented as a national standard in at least one Member State, compliance with the normative Clauses of this standard confers, within the limits of the scope of this standard, a presumption of conformity with I.1 and II.1(c) of that Directive and associated EFTA regulations.

WARNING: Other requirements and other EU Directives may be applicable to the product(s) falling within the scope of this standard.

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