SLOVENSKI STANDARD
SIST EN 13631-2:2002

01-december-2002

Eksplozivi za civilno uporabo – Razstreliva – 2. del: Ugotavljanje toplotne stabilnosti razstreliv

Explosives for civil uses - High explosives - Part 2: Determination of thermal stability of explosives

Explosivstoffe für zivile Zwecke - Sprengstoffe - Teil 2: Bestimmung der thermischen Stabilität von Explosivstoffen

Explosifs a usage civil - Explosifs - Partie 2: Détermination de la stabilité thermique des explosifs

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Explosives for civil uses - High explosives - Part 2: Determination of thermal stability of explosives

Explosifs à usage civil - Explosifs - Partie 2: Détermination de la stabilité thermique des explosifs

Explosivstoffe für zivile Zwecke - Sprengstoffe - Teil 2: Bestimmung der thermischen Stabilität von Explosivstoffen

This European Standard was approved by CEN on 11 July 2002.

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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, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, 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 13631-2:2002) 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of an identical text or by endorsement, at the latest by March 2003, and conflicting national standards shall be withdrawn at the latest by March 2003.

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 European Standard 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.*

prEN 13631-3 *Part 3: Determination of sensitiveness to friction 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.*

prEN 13631-7 *Part 7: Determination of safety and reliability at extreme temperatures.*

prEN 13631-10 *Part 10: Method for the verification of the means of initiation.*

prEN 13631-11 *Part 11: Determination of transmission of detonation.*

prEN 13631-12 *Part 12: Determination of the initiating capability of boosters.*

prEN 13631-13 *Part 13: Method for the determination of density.*

prEN 13631-14 *Part 14: Method for the determination of velocity of detonation.*

prEN 13631-15 *Part 15: Calculation of thermodynamic properties.*

prEN 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, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

1 Scope

This European Standard specifies a method to assess the stability of explosives by subjecting them to elevated thermal conditions.

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).

prEN 13857-1:2001, *Explosives for civil uses - Part 1: Terminology*.

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 European Standard, the terms and definitions given in prEN 13857-1:2001 and the following definition apply.

3.1
self-heating
temperature rise at least 3 °C above the temperature of the reference substance

4 Apparatus

4.1 Heating chamber, capable of being controlled at (75 ± 2) °C.

NOTE The heating chamber should have dual thermostats or some other means of protection against thermal run-away if the control thermostat malfunctions. Preferably, the chamber should be isolated and capable of remote operation. It should also be equipped with a ventilation system. Electrical equipment should be safe for use with explosives.

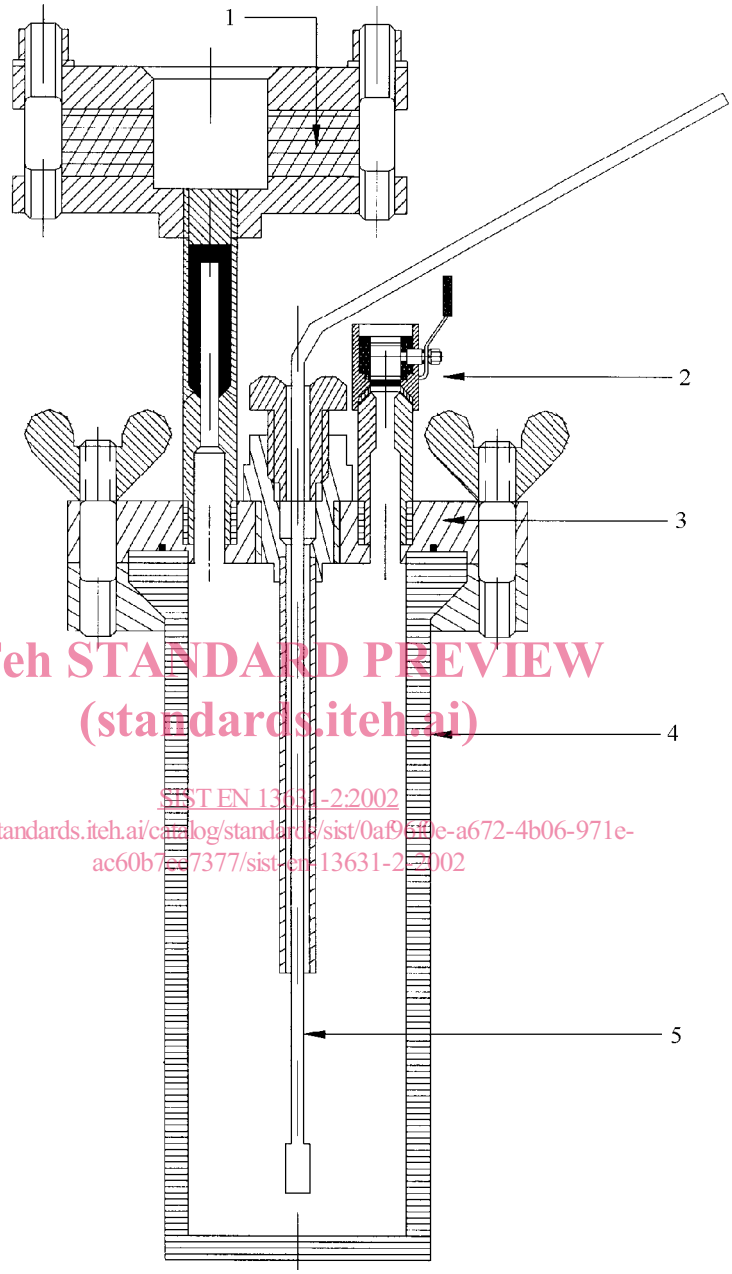
4.2 Balance, capable of weighing to ± 0,1 g.

4.3 Three thermocouples, of appropriate type, which are inert to the substances under test. If the sheath is not inert with respect to the substance under test, an inert envelope shall be used with a thermal resistance as low as possible.

4.4 Temperature recording system, capable of measuring temperature to ± 1 °C.

4.5 Two glass tubes, with a flat bottom, inner diameter (50,5 ± 0,5) mm, approximately 150 mm long and a thickness of approximately 3 mm. For its closure, the tube containing the substance under test shall be equipped with a gas-proof device with a weak part forming a rupture disk calibrated at a static gauge pressure of 60 kPa or a continuous pressure measurement device. An example of a closing device is shown in Figure 1. A means of venting the device should be provided.

4.6 Reference material, with the same physical state as that of the substance to be tested, stable at the test temperature (for example, sand or alumina for a granular solid, a polytetrafluoroethylene (PTFE) block for a solid rocket propellant and water for a liquid). A sample of 300 g is sufficient.



Key

1 Rupture disk
2 Outlet valve
3 Closing device
4 Glass tube
5 Thermocouple

Figure 1 – Example of glass tube equipped with a closing device with rupture disk

5 Preparation of test samples

5.1 Liquid substances, paste-like or granular solids

The test sample shall have a volume of (100 ± 4) ml. Particles bigger than 4 mm should be crushed before the test.

5.2 Compact solids

Compact solids shall be tested in cylindrical blocks with a diameter of $49^{+0,5}_{0}$ mm, and a length of (50 ± 1) mm. One of the sides of the block shall have a blind hole along the block axis, so as to house the thermocouple (see 4.3). The diameter of the hole shall exceed that of the thermocouple by a maximum of 0,3 mm. Its depth shall be such that the thermocouple junction lies within 2 mm of the centre of the block.

6 Procedure

WARNING If no information is available on thermal behaviour of the substance, a preliminary test should be performed with a small amount of substance (for example, 5 g) in order to determine whether the substance explodes at 75 °C.

Adjust the temperature of the oven to (75 ± 2) °C.

After having weighed an empty glass tube, place the test sample into it.

If the substance is a liquid, a paste or a granular solid, pour or place it into the tube. Granular solids are tested without compacting. The substance shall fill the lower part of the tube up to a height of (50 ± 1) mm, which gives a test sample volume of (100 ± 2) ml.

For a compact solid, the test sample comprises one of the cylindrical blocks described in 5.2. Place the block in the lower part of the tube.

Weigh the tube containing the substance to be tested in order to determine the mass of the test sample and derive the loading density of the substance, by means of the following equation:

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

where

ρ is the loading density, in grams per millilitre (g/ml);

M is the mass of the test sample, in grams (g);

V is the volume of the test sample, in millilitres (ml).

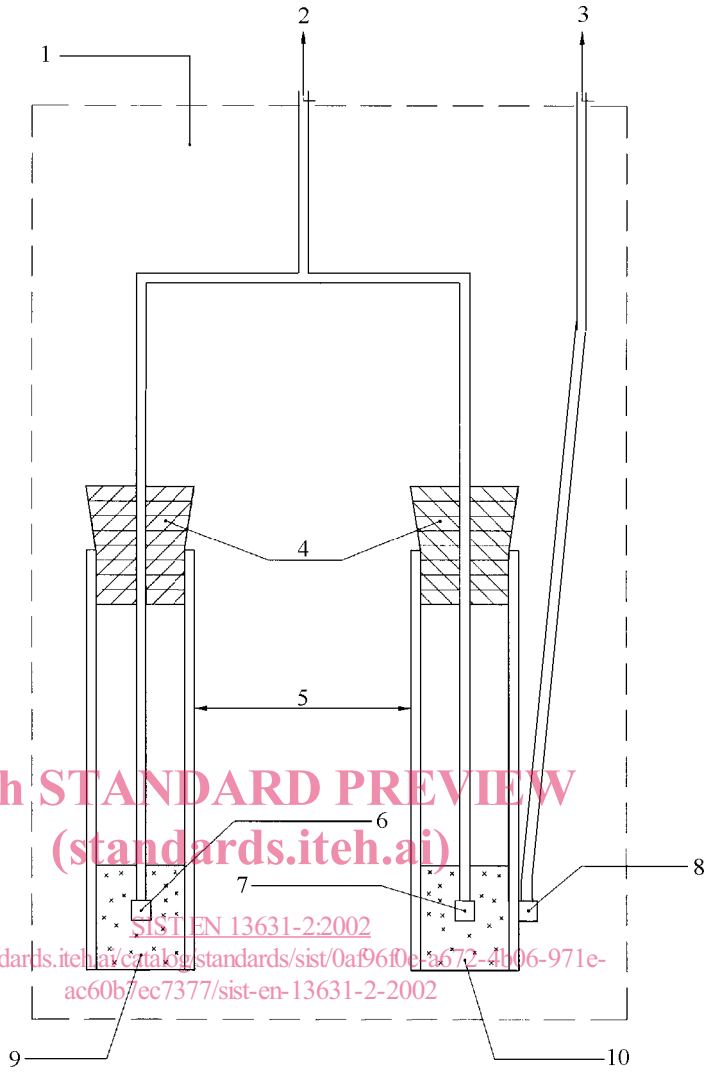
Pass the wires of thermocouple 1 through the closing device so that the junction of the thermocouple is within 2 mm of the centre of the test sample. In case of a compact solid it shall be placed in the blind hole of the test sample block. In other cases, push the thermocouple into the substance.

Place (100 ± 2) ml of the reference substance in the other glass tube, using the procedure described above, but without weighing. Insert thermocouple 2 and close the tube.

Finally, fix thermocouple 3 to the second tube, on the outside and at the same level as the other thermocouples, using wire, for example.

The schematic assembly of the apparatus is shown in Figure 2.

The two tubes are placed 10 cm or more apart from each other inside the chamber. The thermocouples are connected to the temperature-recording system, which is switched on. The temperatures of the substance under test and of the reference substance are recorded with thermocouples 1 and 2. The temperature of the chamber is recorded with thermocouple 3.



Key

1 Heating chamber
2 To (T1 –T2)
3 To (T3)
4 Closing device
5 Glass tubes
6 Thermocouple 1 (T1)
7 Thermocouple 2 (T2)
8 Thermocouple 3 (T3)
9 Substance under test (100 ml)
10 Reference substance (100 ml)

Figure 2 – Assembly of apparatus

After the sample and reference substance have reached a temperature of (75 ± 2) °C, release the pressure and continue the test for 48^{+1}_{0} h, unless one of the following phenomena occurs:

a) report or flame;

b) release of gas and breakage of the rupture disk or pressure rise above 60 kPa;

c) self-heating of the substance under test.

If one of above phenomena has occurred the test shall be terminated. Switch off the oven and, after it has cooled, examine its contents. If the test is concluded after 48^{+1}_{0} h, switch off the oven and, after it has cooled, recover the tube containing the substance under test and weigh it to determine whether any loss of mass has occured.

If none of the phenomena a), b) or c) has been observed, record the result as “no reaction”. Otherwise, record the result as “reaction”.