SLOVENSKI STANDARD

SIST EN 13631-7:2004

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Eksplozivi za civilno uporabo – Razstreliva – 7. del: Ugotavljanje varnosti in zanesljivosti pri ekstremnih temperaturah

Explosives for civil uses - High explosives - Part 7: Determination of safety and reliability at extreme temperatures

Explosivstoffe für zivile Zwecke - Sprengstoffe - Teil 7: Bestimmung der Sicherheit und Zuverlässigkeit bei extremen Temperaturen

Explosifs a usage civil - Explosifs - Partie 7: Détermination de la sécurité et de la fiabilité aux températures extremes

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Explosives for civil uses - High explosives - Part 7: Determination of safety and reliability at extreme temperatures

Explosifs à usage civil - Explosifs - Partie 7: Détermination de la sécurité et de la fiabilité aux températures extrêmes

Explosivstoffe für zivile Zwecke - Sprengstoffe - Teil 7: Bestimmung der Sicherheit und Zuverlässigkeit bei extremen Temperaturen

This European Standard was approved by CEN on 1 September 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 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

Management Centre: rue de Stassart, 36 B-1050 Brussels

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Foreword

This document (EN 13631-7:2003) 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of an identical text or by endorsement, at the latest by May 2004, and conflicting national standards shall be withdrawn at the latest by May 2004.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 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.*

EN 13631-2 Part 2: *Determination of thermal stability of explosives.*

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.*

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 booster 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.*

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, Hungary, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Slovakia, Spain, Sweden, Switzerland and the United Kingdom.

1 Scope

This European Standard specifies the special conditions and procedures permitting the extension to wider ranges of applicability of the following test methods:

- determination of resistance to hydrostatic pressure;
- verification of the means of initiation;
- determination of transmission of detonation;

Standardised test methods at extreme temperatures for the following purposes are not given:

- determination of sensitiveness to friction;
- determination of sensitiveness to impact;
- determination of resistance to water;
- determination of the initiating capability of boosters;
- determination of velocity of detonation.

NOTE In these cases, the manufacturer of the explosive should provide a suitable test method and, in cases where the results should be checked by an independent institution or authority, the manufacturer and the institution or authority should agree upon a suitable test method.

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 13631-6, *Explosives for civil uses – High explosives – Part 6: Determination of resistance to hydrostatic pressure.*

EN 13631-10, *Explosives for civil uses – High explosives – Part 10: Verification of the means of initiation.*

EN 13631-11:2003, *Explosives for civil uses – High explosives – Part 11: Determination of transmission of detonation.*

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/IEC 17025:1999).*

3 Terms and definitions

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

3.1
extreme temperature
temperature below the minimum temperature or above the maximum temperature stated as the range of applicability of a given test method

4 Test methods

4.1 Method for the verification of the means of initiation

4.1.1 Apparatus

4.1.1.1 Conditioning chamber, consisting of a suitable oven or refrigerator, depending on the required test temperature, and thermostatically controlled with an accuracy of ± 2 ºC.

4.1.1.2 Thermocouple or equivalent, for monitoring test piece temperature.

4.1.1.3 Means of initiation, as specified by the explosives manufacturer and suitable for use at the test temperature.

4.1.1.4 Thermally insulated container

4.1.2 Preparation of test pieces

Prepare the test pieces according to EN 13631-10. In the case of bulk explosives close the tubes to prevent loss of substance.

4.1.3 Procedure

NOTE Before testing explosives at high temperatures, it should be checked that the explosive is not too dangerous for handling after being exposed to those high temperatures.

Place the thermocouple or equivalent inside the test piece.

Place the test piece in the conditioning chamber and adjust the thermostat to a test temperature (*T*) 5 °C lower than the minimum temperature or 5 °C higher than the maximum temperature for which the explosive is designed.

After the test piece has reached the required test temperature, it shall be maintained at the test temperature for at least 1 h.

Remove the test piece from the oven or refrigerator and place it immediately in a thermally insulated container.

Immediately before firing remove the test piece from the container.

Fire the test piece by using the initiation method recommended by the manufacturer.

At the time of firing the temperature of the test piece shall not differ by more than 5 °C from the conditioning temperature.

Perform the test three times.

Confirm that complete detonation has occurred as described in EN 13631-10.

4.2 Method for the determination of transmission of detonation

The test shall be carried out as described in EN 13631-11 with the following modifications:

a) Before firing, the whole test arrangement (see EN 13631-11:2003, Figure 1) shall be conditioned by means of a conditioning chamber as described in 4.1.1.1, depending on the temperature range claimed by the manufacturer.

b) The test piece shall be conditioned at 5 °C below the minimum temperature for which the explosive is designed. The temperature within the explosive shall be measured with a thermocouple or equivalent. After the test piece has reached the required test temperature, it shall be maintained at that temperature for at least 1 h.

c) Place the test arrangement into an insulating container and fire it within 5 min.

4.3 Method for the determination of resistance to hydrostatic pressure

4.3.1 Temperatures up to 100 °C

Prepare a watertight container permitting the circulation of water at a given temperature through it. It shall be big enough to hold the steel tube with all accessories as described in EN 13631-6. Additionally a thermocouple shall be mounted in the steel tube to measure the temperature of the water within the tube.

Place the steel tube into the container and close the container with an insulating cover.

Turn on the water circulation and adjust the temperature of the water so that the water in the steel tube will reach the desired temperature within 30 min. During the test, the temperature of the circulating water shall be controlled by a suitable thermostat within an accuracy of ±2 °C.

Proceed as described in EN 13631-6 by building up the desired pressure within the tube. When the temperature of the water within the tube has reached the desired value maintain at this temperature for 1 h.

Fire the explosive.

If the explosive detonates completely repeat the test twice more.

4.3.2 Temperatures above 100 °C

Fill the test piece into the steel tube. Fill the tube with water so that the test piece is fully immersed. For the desired temperature, obtain the resulting pressure from tables of vapour pressure. If the pressure claimed by the manufacturer is higher than this value, a connection for pressurised water is needed.

Mount a thermocouple to measure the temperature of the water inside and close the tube as described in EN 13631-6. No connection for pressurised water is needed.

Wind an electric heating ribbon round the tube in a way that the ribbon covers the surface of the tube regularly. The power consumption of the heating ribbon shall be at least 2 000 W per five litres steel tube volume.

For thermal insulation, cover the test arrangement for example with dry sand.

Start heating the steel tube until the temperature has reached the desired value. The heating rate should be such that the desired temperature is obtained within 30 min. Maintain this temperature for 1 h.

Fire the explosive.

In case of a test result “failure” wait until the temperature of the water has reached ambient value before opening the firing tube.

If the explosive detonates completely repeat the test twice more.

5 Test report

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

a) a reference to this standard, i.e. EN 13631-7;

b) in case of tests according to 4.1:

- length of the cartridge column;
- diameter of the cartridges or tubes;
- material of the wrapping of cartridges;
- type of detonation witness;
- density of explosive;
- means of initiation;
- time during which the temperature is sustained;
- method of temperature measurement;
- temperature.

c) in case of tests according to 4.2:

- length and diameter of the donor cartridge;
- length and diameter of the acceptor cartridge(s);
- material of the wrapping of cartridges;
- type of detonation witness;
- density of explosive;
- means of initiation;
- time during which the temperature is sustained;
- method of temperature measurement;
- temperature;
- maximum air gap for which transmission was observed.

d) in case of tests according to 4.3:

- time used to raise the temperature to the desired value;
- temperature and pressure.

In all cases the test results shall be given as described in the corresponding standards.