



SLOVENSKI STANDARD
oSIST prEN 13938-2:2021
01-april-2021

**Eksplzivni za civilno uporabo - Smodniki in raketna goriva - 2. del: Ugotavljanje
odpornosti proti elektrostatični energiji**

Explosives for civil uses - Propellants and rocket propellants - Part 2: Determination of
resistance to electrostatic energy

Explosivstoffe für zivile Zwecke - Treibladungspulver und Raketentreibstoffe - Teil 2:
Bestimmung der Widerstandsfähigkeit gegen elektrostatistische Energie

Explosifs à usage civil - Poudres propulsives et propergols pour fusées - Partie 2 :
Détermination de la résistance à l'énergie électrostatique

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71.100.30	Eksplzivni. Pirotehnika in ognjemeti	Explosives. Pyrotechnics and fireworks
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EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

DRAFT
prEN 13938-2

April 2021

ICS 71.100.30

Will supersede EN 13938-2:2004

English Version

Explosives for civil uses - Propellants and rocket propellants - Part 2: Determination of resistance to electrostatic discharge

Explosifs à usage civil - Poudres propulsives et propergols pour fusées - Partie 2 : Détermination de la résistance à l'énergie électrostatique

Explosivstoffe für zivile Zwecke - Treibladungspulver und Raketentreibstoffe - Teil 2: Bestimmung der Widerstandsfähigkeit gegen elektrostatische Energie

This draft European Standard is submitted to CEN members for enquiry. It has been drawn up by the Technical Committee CEN/TC 321.

If this draft becomes a European Standard, 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.

This draft European Standard was established by CEN 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 CEN-CENELEC Management Centre has the same status as the official versions.

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Recipients of this draft are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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Contents	Page
European foreword	3
1 Scope	4
2 Normative references	4
3 Terms and definitions	4
4 Principle	4
5 Apparatus	4
6 Preparation of test sample	7
7 Procedure	7
8 Test report	7
Annex A (normative) Sieving method	8
Annex B (informative) Calibrating procedure for electrostatic discharge generator	9
B.1 General	9
B.2 Device to be tested	9
B.3 Apparatus	9
B.3.1 High Voltage probe with a calibrated high input impedance	9
B.3.2 Current probe or shunt	9
B.3.3 Oscilloscope. Band width ≥ 100 MHz. For digital oscilloscope with a sampling at least of 20 MS/s.	9
B.4 Procedure	9
B.4.1 Voltage and capacitor calibration	9
B.4.2 Discharge circuit calibration	10
B.4.3 Additional calibration in case of an additional series resistance	11
B.5 Requirements for the generator	11
Annex C (informative) Screening method for electrostatic discharge generator	12
C.1 Material	12
C.2 Procedure	12
Annex ZA (informative) Relationship between this European Standard and the essential safety requirements of Directive 2014/28/EU relating to the making available on the market and supervision of explosives for civil uses aimed to be covered	13
Bibliography	14

European foreword

This document (prEN 13938-2:2021) has been prepared by Technical Committee CEN/TC 321 “Explosives for civil uses”, the secretariat of which is held by UNE.

This document is currently submitted to the CEN Enquiry.

This document will supersede EN 13938-2:2004.

In comparison with the previous edition, the following technical modifications have been made:

- a) the normative references have been updated;
- b) Clause 4, *Principle*, has been added;
- c) Annex A, *Range of applicability of the test method*, has been removed;
- d) Annex ZA has been updated.

This document has been prepared under a Standardization Request (M/562) annexed to the Commission Implementing Decision C(2019)6634 final as regards Explosives for civil uses given to CEN by the European Commission and the European Free Trade Association, and supports Essential Safety requirements of Directive 2014/28/EU.

For relationship with Directive 2014/28/EU, see informative Annex ZA, which is an integral part of this document.

EN 13938, *Explosives for civil uses — Propellants and rocket propellants*, is currently composed of the following parts:

- *Part 1: Requirements*
- *Part 2: Determination of resistance to electrostatic discharge*
- *Part 3: Determination of deflagration to detonation transition*
- *Part 4: Determination of burning rate under ambient conditions*
- *Part 5: Determination of voids and fissures*
- *Part 6: Solid rocket propellants — Guide for the determination of integrity of inhibitor coatings*
- *Part 7: Determination of safe and reliable ignition and complete deflagration of black powder*

prEN 13938-2:2021 (E)**1 Scope**

This document specifies a method for the determination of resistance to electrostatic energy for propellants containing a mass fraction of at least 5 % of particles which pass through a 1 mm sieve. This method does not apply to black powder.

NOTE If the mass fraction of particles smaller than 1 mm size is less than 5 % the propellant is considered to be insensitive to electrostatic energy and this test is not performed.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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.

prEN 13857-1:2021, *Explosives for civil uses — Part 1: Terminology*

ISO 565:1990, *Test sieves — Metal wire cloth, perforated metal plate and electroformed sheet — Nominal sizes of openings*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in prEN 13857-1:2021 and the following apply.

3.1**reaction**

occurrence of report, crackling, sparkling and/or flame

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3.2**partial reaction**

change of colour, opening of the cell or heat traces at the surface of the cell

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4 Principle

Sudden and momentary electric current that flows in a sample at an electrical potential. During the handling operation, the particles could charge and an electrostatic discharge might occur, posing a risk of fire and explosion an also for people.

5 Apparatus

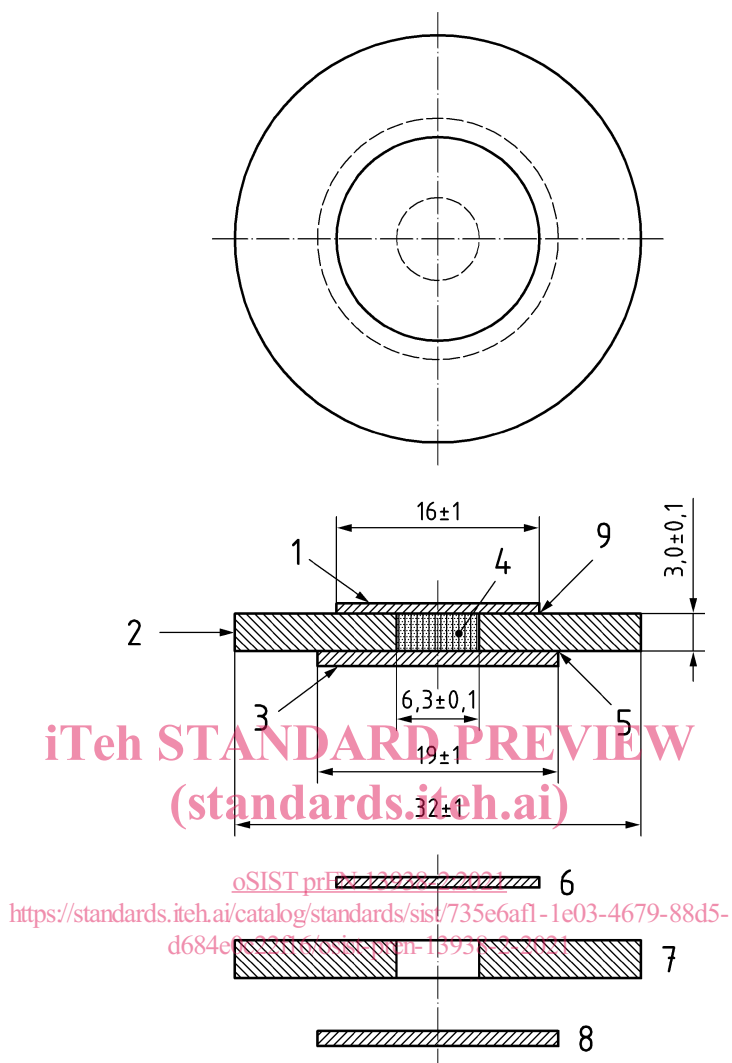
5.1 Cells and covers (see Figure 1). The cell consists of:

- a plastics disc, e.g. polyvinylchloride, thickness $(3,0 \pm 0,1)$ mm, diameter (32 ± 1) mm, with a centred drilled hole, diameter $(6,3 \pm 0,1)$ mm;
- a copper disc, thickness approximately 1 mm, diameter (19 ± 1) mm, which forms the cell base.

The plastics disc is fixed to the copper disc by means of a bead of adhesive around the outer edge.

The cover consists of a copper disc, thickness approximately 0,1 mm, diameter (16 ± 1) mm which is fixed to the upper part of the plastics disc by means of a double-sided adhesive tape.

Dimensions in millimetres

**Key**

- 1 upper copper disc
- 2 plastics disc
- 3 lower copper disc
- 4 substance under test
- 5 adhesive bead
- 6 upper copper disc (cover)
- 7 plastics disc
- 8 lower copper disc (base)
- 9 double-sided adhesive tape

Figure 1 — Cell and cover

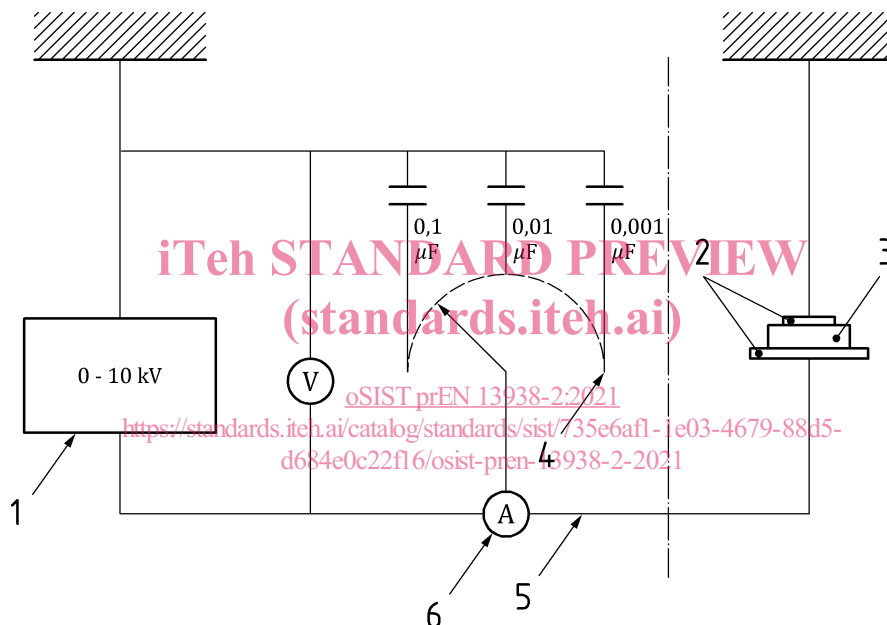
prEN 13938-2:2021 (E)

5.2 Electrostatic energy supply (see Figure 2). The electrostatic energy supply consists of:

- generator capable of applying a 10 kV continuous voltage;
- three capacitors: capacitance 0,001 μF , 0,01 μF and 0,1 μF , each with a relative tolerance of $\pm 10\%$;
- coaxial cable, length 1,85 m, characteristic impedance 50 Ω , capacitance 100 pF/m, attenuation 95×10^{-3} dB/m at 200 MHz;
- two brass electrodes;

and, if necessary:

- selector switch;
- change-over relay (in vacuum).

**Key**

- 1 generator
- 2 electrodes
- 3 cell and cover
- 4 selector switch
- 5 coaxial cable
- 6 discharge switch

Figure 2 — Electrostatic energy supply

5.3 Sieves. The sieves shall comply with Annex A.

5.4 Conditioning chamber for maintaining a temperature of (20 ± 5) °C and a relative humidity of not greater than (60 ± 10) %.

5.5 Balance capable of determining the sample weight to $\pm 0,1$ g.

6 Preparation of test sample

Take a 100 g sample and sieve it according to the sieving method given in Annex A. The fraction which passes through the 1,0 mm sieve shall be used for the test, when this fraction is greater than or equal to 5 g. If not, the test shall not be performed. The test sample shall be conditioned at $(20 \pm 5) ^\circ\text{C}$ and $(60 \pm 10) \%$ relative humidity for 24 h.

7 Procedure

Calibrate the generator according to the procedure given in Annex B. Alternatively, the screening procedure described in Annex C can be used.

Fill the cell, i.e. the hole in the plastics disc, with a portion of the test sample, ensuring that the cover will be in contact with the propellant and without tamping. Close the cell with the cover, using double-sided adhesive tape, and maintain it at $(20 \pm 5) ^\circ\text{C}$ and $(30 \pm 10) \%$ relative humidity.

Place the cell onto the lower electrode. Then bring the upper electrode in contact with the cover of the cell. Select a capacitor and charge it by applying the 10 kV voltage. Then discharge the capacitor through the electrodes.

During testing and when recovering the remainder of the test portion, observe whether reaction or partial reaction occurs, i.e. a positive event.

Carry out a series of test runs by using a new cell for each run. Start with a 5 J energy level (capacitance 0,1 μF). Test 20 test portions with the 5 J energy level. If a reaction or partial reaction occurs stop the test and proceed with a 0,5 J energy level (capacitance 0,01 μF) for the next 20 runs. If there is a reaction or partial reaction continue with a 0,05 J energy level (capacitance 0,001 μF) for another 20 runs unless a reaction or partial reaction occurs.

Report the test result as the limiting energy, i.e. the maximum energy level without reaction or partial reaction in a series of 20 runs. For example: if a reaction or partial reaction is obtained at the 0,05 J energy level, express the limiting energy as $\leq 0,05 \text{ J}$.

8 Test report

The test report should conform to EN ISO/IEC 17025:2017, 5.10.2 and 5.10.3. In addition, the following information shall be given:

- a) reference to this document;
- b) complete identification of the substance under test, including grain size distribution;
- c) individual test results, as: 'no reaction', 'partial reaction' or 'reaction';
- d) limiting energy.

Annex A (normative)

Sieving method

The method uses sieves according to ISO 565:1990 and a sieving machine. The aperture sizes of the sieves are given in Table A.1.

Table A.1 — Aperture size of the sieves

Number	n	1	2	3	4	5	6	7	8
Aperture size [mm]	X_n	0,10	0,16	0,25	0,40	0,63	1,0	1,6	2,5

The sieves, cover lid and lower collection bin shall be made of stainless steel.

Take 1 000 g (M) of the sample. Place the sieves on top of the collection bin in the order of the indicated numbers. Put the sample in the top sieve and close the column of sieves with the cover lid. Operate the sieving machine for 15 min. Weigh the different fractions, m_1 is the amount of sample passing through sieve number 1, m_2 is the amount of sample passing through sieve number 2 and retained on sieve number 1, etc.

The different percentages are calculated according to:

$$P1 = 100 \times m_1/M$$

$$P2 = 100 \times (m_1+m_2)/M$$

.....

$$P8 = 100 \times (m_1+m_2+\dots+m_8)/M$$

and the balance:

$$B = 100 \times (m_1+m_2+\dots+m_8+m_9)/M$$

The amplitude of the sieving machine shall be adjusted, if the machine has this option, to a medium level.

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