SLOVENSKI STANDARD

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Eksplozivi za civilno uporabo – Razstreliva – 16. del: Odkrivanje in merjenje strupenih plinov

Explosives for civil uses - High explosives - Part 16: Detection and measurement of toxic gases

Explosivstoffe für zivile Zwecke - Sprengstoffe - Teil 16: Nachweis und Messung von toxischen Schwadenbestandteilen

Explosifs a usage civil - Explosifs - Partie 16: Détection et mesurage des gaz toxiques

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Explosives for civil uses - High explosives - Part 16: Detection and measurement of toxic gases

Explosifs à usage civil - Explosifs - Partie 16: Détection et mesure des gaz toxiques az toxiques

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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.

CEN members are the national standards bodies of 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.

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COMITÉ EUROPÉEN DE NORMALISATION
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Foreword

This document (EN 13631-16:2004) 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of an identical text or by endorsement, at the latest by February 2005, and conflicting national standards shall be withdrawn at the latest by February 2005.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 13631-3	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 13631-7	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 determination of the quantity of nitrogen oxides and carbon oxides produced by the detonation of explosives for use in underground works.

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

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

EN ISO/IEC 17025, General requirements for the competence and testing of 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 apply.

4 Apparatus

4.1 Blast chamber

The chamber shall be designed to withstand the forces occurring during detonation of high explosives, with a minimum chamber volume of 15 m^3. The actual size of the chamber shall be known to within an accuracy of ± 2 %. The chamber shall be equipped with an effective mixing system, to ensure a homogeneous atmosphere in the chamber within a few minutes after the blast. The chamber shall be equipped with a means to measure the ambient temperature and pressure inside the chamber, and shall have ports for gas sampling.

When an open flow chamber is used, the volume and flow velocity shall be such as to prevent a significant loss of fumes.

4.2 Analysis apparatus

Suitable analysis equipment shall be used to continuously measure the quantity of CO, CO_2, NO and NO_2 over a period of 20 min. As an example, infrared technique can be used to measure CO and CO_2 and a chemiluminescent analyser for NO and NO_x.

4.3 Gas extraction equipment

An air pump and an air flow measuring device shall be used to extract the gas sample from the blast chamber. Condensation of water vapour in the gas sampling tube and subsequent dissolving of NO_x shall be prevented.

4.4 Tube

A thick walled steel tube (sufficiently strong to withstand a large number of blasts) with an inner diameter of 150 mm and an internal length of 1 400 mm.

4.5 Means of initiation

Shall be as specified by the manufacturer in accordance with EN 13631-10.

5 Test pieces

For cartridged explosives, cartridges with the minimum diameter placed on the market shall be used. Bulk explosives shall be filled into glass tubes or, if a strong confinement is needed, shall be filled into aluminium tubes. The inner diameter of the glass or aluminium tube shall be the minimum diameter recommended by the manufacturer for the use of the explosive. The minimum length of the explosive column shall be 700 mm or at least seven times the diameter of the charge. The minimum explosive mass-to-chamber volume ratio shall be 30 g/m^3 and shall not exceed 50 g/m^3. The amount of explosive used in each firing shall be recorded.

The cartridges shall be coaxially fixed in such a way that transmission of detonation is ensured. The length of the charge shall not exceed the length of the steel tube. No combustible material shall be used for coaxially and longitudinally centring of the charge.

6 Procedure

Place the charge centrally in the bore of the steel tube. Fire the charge. Allow the gases to mix for a maximum of 5 min. Start the gas sampling from the blasting chamber. Measure the gas concentration for a period of 20 min.

The concentration of CO and CO_2 will be constant after an initial mixing period, provided the blasting chamber is sufficiently gas tight. Since NO and NO_2 give subsequent secondary reactions, the measured concentration shall be extrapolated to obtain the initial concentration. The initial concentration of each nitrogen-containing component can be obtained by plotting the reciprocal concentration versus the time elapsed since the blast and extrapolating the resulting curve to zero time.

From the initial concentrations so determined, the volume of the chamber and the amount of explosive fired, the amount of each toxic gas shall be calculated in litres per kilogram of explosive (at standard temperature and pressure).

The test shall be performed three times.

7 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 document, i.e. EN 13631-16;

b) the volume and initial temperature of the blasting chamber, temperature and gas drying method within the gas sampling tube;

c) the diameter and length of the cartridges used and material and quality of the cartridge covering;

d) the means of initiation and confinement used;

e) the amount of each toxic gas (CO, CO_2, NO and NO_x) calculated for each firing, in l/kg;

f) the mean amount of each toxic gas, in l/kg.

Annex A
(informative)

Range of applicability of the test method

Range of applicability of the test method: – 30 °C to + 80 °C.