

**Tsiviilkäibes olevad lõhkeained.
Brisantlõhkeained. Osa 15:
Termodünaamiliste omaduste
arvutamine**

Explosives for civil uses - High explosives - Part 15:
Calculation of thermodynamic properties

EESTI STANDARDI EESSÕNA

NATIONAL FOREWORD

<p>Käesolev Eesti standard EVS-EN 13631-15:2005 sisaldab Euroopa standardi EN 13631-15:2005 ingliskeelset teksti.</p> <p>Käesolev dokument on jõustatud 22.06.2005 ja selle kohta on avaldatud teade Eesti standardiorganisatsiooni ametlikus väljaandes.</p> <p>Standard on kättesaadav Eesti standardiorganisatsioonist.</p>	<p>This Estonian standard EVS-EN 13631-15:2005 consists of the English text of the European standard EN 13631-15:2005.</p> <p>This document is endorsed on 22.06.2005 with the notification being published in the official publication of the Estonian national standardisation organisation.</p> <p>The standard is available from Estonian standardisation organisation.</p>
--	---

<p>Käsitlusala: This European Standard specifies a method to calculate the detonation characteristics at the constant-volume explosion state and some parameters derived thereof.</p>	<p>Scope: This European Standard specifies a method to calculate the detonation characteristics at the constant-volume explosion state and some parameters derived thereof.</p>
--	--

ICS 71.100.30

Võtmesõnad:

ICS 71.100.30

English version

**Explosives for civil uses - High explosives - Part 15: Calculation
of thermodynamic properties**

Explosifs à usage civil - Explosifs - Partie 15 : Calcul des
propriétés thermodynamiques

Explosivstoffe für zivile Zwecke - Sprengstoffe - Teil 15:
Berechnung der thermodynamischen Eigenschaften

This European Standard was approved by CEN on 21 March 2005.

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.



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

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

Contents

Foreword.....	3
Introduction	4
1 Scope	5
2 Normative references	5
3 Terms and definitions	5
4 Calculation procedure	5
5 Report	15
Annex A (informative) Sample calculations.....	16
Annex ZA (informative) Clauses of this European Standard addressing essential requirements or other provisions of EU Directives	20
Bibliography	21

Foreword

This document (EN 13631-15:2005) 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 November 2005, and conflicting national standards shall be withdrawn at the latest by November 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 European Standard is one of a series of standards on *Explosives for civil uses— High explosives*. The other parts of this series are:

Part 1: Requirements.

Part 2: Determination of thermal stability of explosives.

Part 3: Determination of sensitiveness to friction of explosives.

Part 4: Determination of sensitiveness to impact of explosives.

Part 5: Determination of resistance to water.

Part 6: Determination of resistance to hydrostatic pressure.

Part 7: Determination of safety and reliability at extreme temperatures.

Part 10: Method for the verification of the means of initiation.

Part 11: Determination of transmission of detonation.

Part 12: Specifications of boosters with different initiating capability.

Part 13: Determination of density.

Part 14: Determination of velocity of detonation.

Part 16: Detection and measurement of toxic gases.

This document includes a Bibliography.

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.

Introduction

Some properties of the explosives used to define their energetic performance on an *a priori* basis are obtained by means of a thermodynamic calculation. The outcome of such calculation, based on the composition and density of the explosive, is dependent on the detonation state considered, the thermodynamic data used and the calculation method itself.

The simplest thermodynamic calculation of explosives is the one for a constant-volume reaction, usually referred to as constant-volume explosion state. Other calculations such as the Chapman-Jouguet (CJ) detonation state are also commonly used, leading to important dynamic values such as detonation pressure and velocity. However, these calculated values are not meaningful in practice for non-ideal industrial explosives. For this reason, only the simple values of energy and amount of gases produced are considered in this European Standard.

1 Scope

This European Standard specifies a method to calculate the detonation characteristics at the constant-volume explosion state and some parameters derived thereof.

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*

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

constant-volume explosion state

detonation point of theoretical nature in which the specific volume of the detonation products is that of the unreacted explosive

3.2

heat of explosion

energy released in the chemical reaction of the explosive when the composition of the reaction products is that of the constant-volume explosion state. It is usually given per mass of explosive

3.3

gas volume

volume occupied by the detonation product gases, as calculated from the chemical equilibrium composition in the constant-volume explosion state, at a specified condition of temperature and pressure. It is usually given per mass of explosive

3.4

specific force

result of the calculation: nRT , n being the number of moles of detonation product gases per mass, R the universal gas constant and T the temperature of explosion. It would be equal to the pressure exerted by the detonation gases if the specific volume were unity and the gases behaved as ideal. It is also called in some places specific energy

4 Calculation procedure

4.1 Thermodynamic Data and Functions

4.1.1 General

The thermodynamic properties needed relate to both explosive components and detonation products.

4.1.2 Explosive components

For each component the following data are required:

- Molecular or empirical formula.