

**Plahvatusohtlik keskkond. Plahvatuse vältimine ja  
kaitse. Osa 1: Põhimõisted ja metoodika**

Explosive atmospheres - Explosion prevention and  
protection - Part 1: Basic concepts and methodology

## EESTI STANDARDI EESSÕNA

## NATIONAL FOREWORD

Käesolev Eesti standard EVS-EN 1127-1:2011 sisaldab Euroopa standardi EN 1127-1:2011 ingliskeelset teksti.

Standard on kinnitatud Eesti Standardikeskuse 29.07.2011 käskkirjaga ja jõustub sellekohase teate avaldamisel EVS Teatajas.

Euroopa standardimisorganisatsioonide poolt rahvuslikele liikmetele Euroopa standardi teksti kättesaadavaks tegemise kuupäev on 20.07.2011.

Standard on kättesaadav Eesti standardiorganisatsioonist.

This Estonian standard EVS-EN 1127-1:2011 consists of the English text of the European standard EN 1127-1:2011.

This standard is ratified with the order of Estonian Centre for Standardisation dated 29.07.2011 and is endorsed with the notification published in the official bulletin of the Estonian national standardisation organisation.

Date of Availability of the European standard text 20.07.2011.

The standard is available from Estonian standardisation organisation.

ICS 13.230

### Standardite reprodutseerimis- ja levitamise õigus kuulub Eesti Standardikeskusele

Andmete paljundamine, taastekitamine, kopeerimine, salvestamine elektroonilisse süsteemi või edastamine ükskõik millises vormis või millisel teel on keelatud ilma Eesti Standardikeskuse poolt antud kirjaliku loata.

Kui Teil on küsimusi standardite autorikaitse kohta, palun võtke ühendust Eesti Standardikeskusega:  
Aru 10 Tallinn 10317 Eesti; [www.evs.ee](http://www.evs.ee); Telefon: 605 5050; E-post: [info@evs.ee](mailto:info@evs.ee)

### Right to reproduce and distribute belongs to the Estonian Centre for Standardisation

No part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying, without permission in writing from Estonian Centre for Standardisation.

If you have any questions about standards copyright, please contact Estonian Centre for Standardisation:  
Aru str 10 Tallinn 10317 Estonia; [www.evs.ee](http://www.evs.ee); Phone: 605 5050; E-mail: [info@evs.ee](mailto:info@evs.ee)

English Version

**Explosive atmospheres - Explosion prevention and protection -  
Part 1: Basic concepts and methodology**

Atmosphères explosives - Prévention de l'explosion et  
protection contre l'explosion - Partie 1: Notions  
fondamentales et méthodologie

Explosionsfähige Atmosphären - Explosionsschutz - Teil 1:  
Grundlagen und Methodik

This European Standard was approved by CEN on 18 June 2011.

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 CEN-CENELEC Management Centre 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 CEN-CENELEC Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.



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

**Management Centre: Avenue Marnix 17, B-1000 Brussels**

# Contents

Page

Foreword.....	4
Introduction .....	5
1 Scope .....	6
2 Normative references .....	7
3 Terms and definitions .....	8
4 Risk assessment.....	8
4.1 General.....	8
4.2 Identification of explosion hazards.....	9
4.2.1 General.....	9
4.2.2 Combustion properties .....	9
4.2.3 Explosion behaviour .....	10
4.2.4 Likelihood of occurrence of a hazardous explosive atmosphere .....	10
4.3 Identification of ignition hazards .....	11
4.3.1 General.....	11
4.3.2 Ignition properties .....	11
4.3.3 Likelihood of occurrence of effective ignition sources .....	12
4.4 Estimation of the possible effects of an explosion.....	12
5 Possible ignition sources .....	13
5.1 Hot surfaces .....	13
5.2 Flames and hot gases (including hot particles) .....	13
5.3 Mechanically generated sparks.....	14
5.4 Electrical apparatus.....	14
5.5 Stray electric currents, cathodic corrosion protection.....	14
5.6 Static electricity .....	15
5.7 Lightning.....	15
5.8 Radio frequency (RF) electromagnetic waves from $10^4$ Hz to $3 \times 10^{11}$ Hz .....	15
5.9 Electromagnetic waves from $3 \times 10^{11}$ Hz to $3 \times 10^{15}$ Hz.....	16
5.10 Ionizing radiation .....	16
5.11 Ultrasonics .....	16
5.12 Adiabatic compression and shock waves .....	16
5.13 Exothermic reactions, including self-ignition of dusts.....	17
6 Risk reduction .....	17
6.1 Fundamental principles .....	17
6.2 Avoidance or reduction of the amount of explosive atmosphere .....	18
6.2.1 Process parameters .....	18
6.2.2 Design and construction of equipment, protective systems and components .....	19
6.3 Hazardous areas .....	21
6.4 Requirements for the design and construction of equipment, protective systems and components by avoidance of effective ignition sources.....	21
6.4.1 General.....	21
6.4.2 Hot surfaces .....	23
6.4.3 Flames and hot gases .....	24
6.4.4 Mechanically generated sparks.....	24
6.4.5 Electrical apparatus.....	25
6.4.6 Stray electric currents and cathodic corrosion protection .....	25
6.4.7 Static electricity .....	26
6.4.8 Lightning.....	26
6.4.9 Radio frequency (RF) electromagnetic waves from $10^4$ Hz to $3 \times 10^{11}$ Hz .....	27
6.4.10 Electromagnetic waves from $3 \times 10^{11}$ Hz to $3 \times 10^{15}$ Hz .....	27

6.4.11	Ionizing radiation .....	28
6.4.12	Ultrasonics .....	29
6.4.13	Adiabatic compression and shock waves .....	29
6.4.14	Exothermic reactions, including self-ignition of dusts .....	30
6.5	Requirements for the design and construction of equipment, protective systems and components to reduce the explosion effects .....	30
6.6	Provisions for emergency measures .....	31
6.7	Principles of measuring and control systems for explosion prevention and protection .....	31
7	Information for use .....	31
7.1	General .....	31
7.2	Information for commissioning, maintenance and repair to prevent explosion .....	32
7.3	Qualifications and training .....	33
Annex A	(informative) Information for the use of tools in potentially explosive atmospheres .....	34
Annex B	(informative) Tightness of equipment .....	35
B.1	General .....	35
B.2	Equipment which is durably technically tight .....	35
B.3	Technically tight equipment .....	37
Annex C	(informative) Significant technical changes between this document and the previous edition of this European Standard .....	38
Annex ZA	(informative) Relationship between this European Standard and the Essential Requirements of EU Directive 94/9 EC .....	40
Annex ZB	(informative) Relationship between this European Standard and the Essential Requirements of EU Directive 2006/42/EC .....	41
Bibliography	.....	42

## Foreword

This document (EN 1127-1:2011) has been prepared by Technical Committee CEN/TC 305 “Potentially explosive atmospheres - Explosion prevention and protection”, the secretariat of which is held by DIN.

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 January 2012, and conflicting national standards shall be withdrawn at the latest by July 2014.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN 1127-1:2007.

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 Directives.

For relationship with EU Directives, see informative Annex ZA and ZB, which is an integral part of this document.

Annex C provides details of significant technical changes between this European Standard and the previous edition EN 1127-1:2007.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and the United Kingdom.

## Introduction

CEN and CENELEC are producing a set of standards to assist designers, manufacturers and other interested bodies to interpret the essential safety requirements in order to achieve conformity with European Legislation. Within this series of standards CEN has undertaken to draw up a standard to give guidance in the field of explosion prevention and protection, as hazards from explosions are to be considered in accordance with EN ISO 12100.

In accordance with EN ISO 12100, it is a type A standard.

This standard describes the basic concepts and methodology of explosion prevention and protection.

CEN/TC 305 has a mandate in this area to produce B-type, and C-type standards, which will allow verification of conformity with the essential safety requirements.

Explosions can occur from:

- a) materials processed or used by the equipment, protective systems and components;
- b) materials released by the equipment, protective systems and components;
- c) materials in the vicinity of the equipment, protective systems and components;
- d) materials of construction of the equipment, protective systems and components.

Since safety depends not only on equipment, protective systems and components but also on the material being handled and its use, this standard includes aspects related to the intended use and foreseeable misuse, i.e. the manufacturer should consider in which way and for which purpose the equipment, protective systems and components will be used and take this into account during its design and construction. This is the only way hazards inherent in equipment, protective systems and components can be reduced.

**NOTE** This standard may also serve as a guide for users of equipment, protective systems and components when assessing the risk of explosion in the workplace and selecting the appropriate equipment, protective systems and components.

## 1 Scope

This European Standard specifies methods for the identification and assessment of hazardous situations leading to explosion and the design and construction measures appropriate for the required safety. This is achieved by:

- risk assessment;
- risk reduction.

The safety of equipment, protective systems and components can be achieved by eliminating hazards and/or limiting the risk, i.e. by:

- a) appropriate design (without using safeguarding);
- b) safeguarding;
- c) information for use;
- d) any other preventive measures.

Measures in accordance with a) (prevention) and b) (protection) against explosions are dealt with in Clause 6, measures according to c) against explosions are dealt with in Clause 7. Measures in accordance with d) are not specified in this European Standard. They are dealt with in EN ISO 12100:2010, Clause 6.

The preventive and protective measures described in this European Standard will not provide the required level of safety unless the equipment, protective systems and components are operated within their intended use and are installed and maintained according to the relevant codes of practice or requirements.

This standard specifies general design and construction methods to help designers and manufacturers in achieving explosion safety in the design of equipment, protective systems and components.

This European Standard is applicable to any equipment, protective systems and components intended to be used in potentially explosive atmospheres, under atmospheric conditions. These atmospheres can arise from flammable materials processed, used or released by the equipment, protective systems and components or from materials in the vicinity of the equipment, protective systems and components and/or from the materials of construction of the equipment, protective systems and components.

This European Standard is applicable to equipment, protective systems and components at all stages of its use.

This European Standard is only applicable to equipment group II which is intended for use in other places than underground parts of mines and those parts of surface installations of such mines endangered by firedamp and/or flammable dust.

This European Standard is not applicable to:

- 1) medical devices intended for use in a medical environment;
- 2) equipment, protective systems and components where the explosion hazard results exclusively from the presence of explosive substances or unstable chemical substances;
- 3) equipment, protective systems and components where the explosion can occur by reaction of substances with other oxidizers than atmospheric oxygen or by other hazardous reactions or by other than atmospheric conditions;



- 4) equipment intended for use in domestic and non-commercial environments where potentially explosive atmospheres may only rarely be created, solely as a result of the accidental leakage of fuel gas;
- 5) personal protective equipment covered by Directive 89/686/EEC;
- 6) seagoing vessels and mobile offshore units together with equipment on board such vessels or units;
- 7) means of transport, i.e. vehicles and their trailers intended solely for transporting passengers by air or by road, rail or water networks, as well as means of transport insofar as such means are designed for transporting goods by air, by public road or rail networks or by water; vehicles intended for use in a potentially explosive atmosphere shall not be excluded;
- 8) the design and construction of systems containing desired, controlled combustion processes, unless they can act as ignition sources in potentially explosive atmospheres.

## 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 1839, *Determination of explosion limits of gases and vapours*

EN 13237, *Potentially explosive atmospheres — Terms and definitions for equipment and protective systems intended for use in potentially explosive atmospheres*

EN 13463-1, *Non-electrical equipment for use in potentially explosive atmospheres — Part 1: Basic method and requirements*

EN 13463-6, *Non-electrical equipment for use in potentially explosive atmospheres — Part 6: Protection by control of ignition source 'b'*

EN 13821, *Potentially explosive atmospheres — Explosion prevention and protection — Determination of minimum ignition energy of dust/air mixtures*

EN 14034-1, *Determination of explosion characteristics of dust clouds — Part 1: Determination of the maximum explosion pressure  $p_{max}$  of dust clouds*

EN 14034-2, *Determination of explosion characteristics of dust clouds — Part 2: Determination of the maximum rate of explosion pressure rise  $(dp/dt)_{max}$  of dust clouds*

EN 14034-3, *Determination of explosion characteristics of dust clouds — Part 3: Determination of the lower explosion limit LEL of dust clouds*

EN 14034-4, *Determination of explosion characteristics of dust clouds — Part 4: Determination of the limiting oxygen concentration LOC of dust clouds*

EN 14373, *Explosion suppression systems*

EN 14460, *Explosion resistant equipment*

EN 14491, *Dust explosion venting protective systems*

EN 14522, *Determination of the auto ignition temperature of gases and vapours*

EN 14756, *Determination of the limiting oxygen concentration (LOC) for flammable gases and vapours*

EN 14797, *Explosion venting devices*

EN 15089, *Explosion isolation systems*

EN 15198, *Methodology for the risk assessment of non-electrical equipment and components for intended use in potentially explosive atmospheres*

CEN/TR 15281, *Guidance on Inerting for the Prevention of Explosions*

EN 15794, *Determination of explosion points of flammable liquids*

EN 15967, *Determination of maximum explosion pressure and the maximum rate of pressure rise of gases and vapours*

EN 50281-2-1, *Electrical apparatus for use in the presence of combustible dust — Part 2-1: Test methods — Methods for determining the minimum ignition temperatures of dust*

CLC/TR 50404, *Electrostatics — Code of practice for the avoidance of hazards due to static electricity*

EN 50495, *Safety devices required for the safe functioning of equipment with respect to explosion risks*

EN 60079-1, *Explosive atmospheres — Part 1: Equipment protection by flameproof enclosures "d" (IEC 60079-1:2007)*

EN 60079-10-1, *Explosive atmospheres — Part 10-1: Classification of areas — Explosive gas atmospheres (IEC 60079-10-1:2008)*

EN 60079-10-2, *Explosive atmospheres — Part 10-2: Classification of areas — Combustible dust atmospheres (IEC 60079-10-2:2009)*

EN 61241-14, *Electrical apparatus for use in the presence of combustible dust — Part 14: Selection and installation (IEC 61241-14:2004)*

EN ISO 12100:2010, *Safety of machinery — General principles for design — Risk assessment and risk reduction (ISO 12100:2010)*

EN ISO 13849-1, *Safety of machinery — Safety-related parts of control systems — Part 1: General principles for design (ISO 13849-1:2006)*

EN ISO 16852, *Flame arresters — Performance requirements, test methods and limits for use (ISO 16852:2008, including Cor 1:2008 and Cor 2:2009)*

### **3 Terms and definitions**

For the purposes of this document, the terms and definitions given in EN 13237 apply.

### **4 Risk assessment**

#### **4.1 General**

This risk assessment shall be carried out for each individual situation in accordance with EN ISO 12100 and/or EN 15198, unless other standards can be identified as being more appropriate to the situation: