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Explosiv atmosfär – Förhindrande av och skydd mot explosion – Del 2: Grundläggande begrepp och metodik för gruvdrift

Explosive atmospheres – Explosion prevention and protection – Part 2: Basic concepts and methodology for mining

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Europastandarden EN 1127-2:2014 gäller som svensk standard. Detta dokument innehåller den officiella engelska versionen av EN 1127-2:2014.

Denna standard ersätter SS-EN 1127-2+A1:2008, utgåva 1.

The European Standard EN 1127-2:2014 has the status of a Swedish Standard. This document contains the official version of EN 1127-2:2014.

This standard supersedes the Swedish Standard SS-EN 1127-2+A1:2008, edition 1.

Upplysningar om sakinnehållet i standarden lämnas av SIS, Swedish Standards Institute, telefon 08-555 520 00. Standarder kan beställas hos SIS Förlag AB som även lämnar allmänna upplysningar om svensk och utländsk standard.

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Denna standard är framtagen av kommittén för SEK/SIS ATEX, SIS/TK 001.

Har du synpunkter på innehållet i den här standarden, vill du delta i ett kommande revideringsarbete eller vara med och ta fram andra standarder inom området? Gå in på www.sis.se - där hittar du mer information.

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 1127-2

June 2014

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Supersedes EN 1127-2:2002+A1:2008

English Version

Explosive atmospheres - Explosion prevention and protection - Part 2: Basic concepts and methodology for mining

Atmosphères explosives - Prévention de l'explosion et protection contre l'explosion - Partie 2: Notions fondamentales et méthodologie dans l'exploitation des mines

Explosionsfähige Atmosphären - Explosionsschutz - Teil 2: Grundlagen und Methodik in Bergwerken

This European Standard was approved by CEN on 7 May 2014.

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.

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

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Foreword

This document (EN 1127-2:2014) 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 December 2014 and conflicting national standards shall be withdrawn at the latest by December 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 1127-2:2002+A1:2008.

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 Annexes ZA and ZB, which are an integral part of this document.

EN 1127, *Explosive atmospheres — Explosion prevention and protection* is composed of the following parts:

— *Part 1: Basic concepts and methodology*

— *Part 2: Basic concepts and methodology for mining* (the present document)

Annex C provides details of significant changes between this document and the previous edition.

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, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

Introduction

General

CEN and CENELEC are producing a series 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.

Special considerations for mining

Explosions can result from:

— materials processed or used by the equipment and components, e.g. minerals obtained as part of the winning process;

— materials released by the equipment and components;

— materials in the vicinity of the equipment, protective systems and components;

— materials of which the equipment, protective systems and components are constructed.

As the explosion protection of equipment, protective systems and components depends on:

— the design and construction of the equipment, protective systems and components;

— the intended use;

— the foreseeable misuse;

— the ambient conditions;

— the materials extracted and handled.

This standard also includes safety aspects related to these factors, i.e. it is imperative that the manufacturer consider how and for what the equipment, protective systems and components will be used and take this into account during their design and construction. Only in this way can hazards inherent in equipment, protective systems and components be reduced.

NOTE 1 This standard can 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.

Mines can be either gassy or non-gassy depending upon the mineral/material being extracted and whether or not firedamp can occur in the workings. It is usual practice to consider all coal mines as gassy mines. Non-coal mines can, however, also be susceptible to the occurrence of firedamp, e.g. if minerals/materials are being extracted in the vicinity of oil-bearing strata or unworked coal seams which are disturbed by the extraction process or mines susceptible to outbursts of flammable gas.

In mines where flammable minerals/materials are extracted, there can also be a risk of explosions because small particles of the extracted product can be blown into the air to form dust/air mixtures able to support rapid combustion. Combustible dust can either be an explosion risk on its own (when in the form of an explosive dust/air mixture), or it can settle in layers which may be blown from the floor and sides of the roadways by a

firedamp explosion. In the latter case, the explosive violence can increase many times as more and more fuel in the form of combustible dust is raised by a blast wave and added to the flame as it travels along the roadways.

The risk of an explosive atmosphere occurring and its consequences will therefore vary from mine to mine, depending on the type of mine, its layout, the mineral being extracted and the likelihood of firedamp and/or combustible dust occurring.

In **coal mining**, firedamp and coal dust naturally associated with the coal is released by the activity of the miners. Therefore, the potential explosion risk is greater as a result of explosive air/gas or air/dust mixtures forming that cannot be totally excluded by the preventive measures taken.

Firedamp/air mixtures are usually diluted by the ventilation and evacuated to the surface via the mine workings so that the gas content in normal operation is kept far below the lower explosion limit. However, as a result of system malfunction (e.g. fan failure), sudden release of large gas quantities (gas outbursts) or intensified gas release caused by decreasing air pressure or by increased coal production, the permissible gas concentration thresholds may be exceeded. The explosive atmosphere caused in this way, even though limited in space and/or time, may cause a hazard not just at its point of origin but also in the escape roads, waste air paths and other connected mine structures in the mine layout.

Coal dust/air mixtures are usually neutralized at the dust source by water sprays, dust removal systems on heading machines and/or treating with inert dust in order to reduce the explosive potential. However, an explosion hazard can exist if explosive dust can become airborne, e.g. at transfer points, in bunkers and other conveying systems.

In contrast to surface industries, in gassy mines electrical and non-electrical equipment and mining personnel are in permanent contact with gas and/or dust/air mixtures which, under unfavourable conditions, may constitute explosive atmospheres. Accordingly, particularly stringent safety requirements are in force for explosion protection and escape possibilities in the event of a hazard. Due to the possibly devastating effects of underground gas/dust explosions, underground mining is permitted only well outside the explosion range.

In gassy mines, the decision as to whether or not mine workers can operate in a particular workplace depends upon the atmospheric conditions prevailing at the time. Traditionally, a factor of safety is also introduced so that it is common practice throughout the European member states for equipment to be de-energized or made safe and for miners to be withdrawn from their workplace if the atmospheric conditions attain a specific percentage of the lower explosion limit (LEL) of methane (firedamp) in air as defined by the relevant national legislation of the member states.

NOTE 2 The current limit values for disconnecting equipment and withdrawing personnel are different in each member state.

Two different ranges of explosive atmospheres originating from the intended installation and use of the equipment are taken into account when dealing with requirements for Equipment Groups M 2 and M 1:

— **potentially explosive atmosphere** — range between 0 % and below LEL or above UEL up to 100 % of firedamp in air;

— **explosive atmosphere** — range between LEL and UEL of firedamp in air.

In mine workings with explosive atmospheres, only M 1 equipment is acceptable as it has a very high level of protection. M 1 equipment, e.g. telephones or gas measuring equipment may continue to be operated in explosive atmospheres, because they are safe even in the event of rare equipment faults. This is ensured by the existence of two independent protective measures or double fail-safe systems.

In mine workings with potentially explosive atmospheres, both M 1 and M 2 equipment may be used. M 2 equipment may be used as it has a high level of protection and is suitable for the severe conditions in mining. In an explosive atmospheres, M 2 equipment needs to be capable of being disconnected or made safe.

NOTE 3 Under special conditions, it might be necessary to operate M 2 equipment in an explosive atmosphere for a short time, e.g. when personnel are escaping from mine workings with high firedamp readings with their M 2 caplights switched on, when personnel are being recovered by the mine rescue service or the firedamp extraction system has been started up.

M 1 and M 2 equipment can only be operated with the characteristics specified by the manufacturer as only then do they ensure the relevant level of protection. The manufacturer specifies the operating characteristics for the equipment.

In practice, national regulations require that gas measurements be taken at certain points and at specific intervals and suitable measures are taken to de-energize the equipment either manually or automatically if the firedamp concentration reaches a certain value. A subdivision into hazards caused by an explosive gas atmosphere and those caused by an explosive dust atmosphere is, in contrast to EN 1127-1:2011, not advisable in underground mining as the hazard to the mine workings can be caused simultaneously by firedamp and by clouds of combustible dust. Therefore, the explosion protection measures will always cover both, i.e. the hazard caused by firedamp and the one caused by combustible dust.

The definition of potentially explosive atmospheres in coal mines susceptible to firedamp based on Directive 94/9/EC extends the definition of potentially explosive atmosphere to include combustible dust as well as firedamp. Extensive research has shown that the minimum ignition energy (MIE) of coal dust/air mixtures is several hundred times that of firedamp/air mixtures and that the maximum experimental safe gap (MESG) of coal dust particles is more than double that for firedamp. It is therefore reasonable to assume that the equipment, protective systems and components which are designed and constructed for use in firedamp/air mixtures are also suitable for use in coal dust/air mixtures.

The comparison of methane and coal dust experimental data relates only to atmospheres (mixtures of gas and/or dust with air), not to dust layers. Additional precautions are required when considering coal dust deposits as, in this case, the maximum surface temperature of the equipment (limited to 150 °C for Group I equipment) on which the deposits can form can be limited to values below the minimum ignition temperature.

It is vital to bear in mind that in both coal mines and non-coal mines there can be areas where firedamp does not occur but where there is a risk of explosion because of combustible dust.