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Explosion prevention and protection in underground mines - Equipment and protective systems for firedamp drainage

Explosionsschutz in untertägigen Bergwerken - Geräte und Schutzsysteme zur Absaugung von Grubengas

Protection contre l'explosion dans les mines souterraines - Appareils et systemes de protection destinés au captage du grisou

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English Version

Explosion prevention and protection in underground mines - Equipment and protective systems for firedamp drainage

Protection contre l'explosion dans les mines souterraines -
Appareils et systèmes de protection destinés au captage
du grisou

Explosionsschutz in untertägigen Bergwerken - Geräte und
Schutzsysteme zur Absaugung von Grubengas

This European Standard was approved by CEN on 13 January 2007.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
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Foreword

This document (EN 14983:2007) 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 document shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by September 2007, and conflicting national standards shall be withdrawn at the latest by September 2007.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 Directive(s)**.

For relationship with **EU Directive(s)**, see informative Annex **ZA**, which is an integral part of this document.

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, 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.

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Introduction

Firedamp drainage is a technical process for selected gas removal, the purpose of which is to reduce the risks presented by inflammable gas and air mixtures. Firedamp drainage is therefore a measure for preventive explosion protection.

In the mining industry, firedamp is drained from the underground workings of gassy mines, from boreholes and abandoned mine workings to ensure that mine workers are not exposed to the risks associated with the occurrence of an explosive atmosphere at their place of work. In this case, the explosion risk results from unacceptable accumulations of firedamp occurring in the waste areas and cavities left in the rock strata after the coal has been extracted from the coal seam. In such cases, the need to drain these accumulations, and the complexity of the drainage system, depends on the amount of firedamp produced by the coal and the likelihood of it occurring in explosive quantities in the mine roadways and coal face. Examples of situations that might cause firedamp to move in dangerous concentrations from the waste area or cavities into the mine roadways: a breakdown of the mine ventilation system or a sudden reduction in the underground atmospheric pressure. National legislation in EU coal mining member countries requires workers to be withdrawn to a safe place if firedamp levels attain a specific nationally defined value in the general body of mine air. Firedamp drainage is therefore often used in gassy mines in an attempt to ensure that the concentration of firedamp in the general body of mine air is kept well below this critical level, even during abnormal situations such as those described above.

Once the accumulations of firedamp have been drained from the affected areas, it is usually discharged to the mine surface, but in some cases it is discharged into the mine return ventilation system. In systems where the firedamp is brought to the mine surface, it is discharged to the atmosphere through an earthed metallic discharge stack or pressurized and delivered to a utilisation system, such as a gas-fired boiler.

In abandoned mines, firedamp drainage is used

- to prevent gas pressure building up and gas issuing at the surface in an uncontrolled manner, and
- to protect workers at an adjacent nearby mine or
- to allow it to be utilized, for example by burning it in a gas-fired boiler to produce heat or to generate electricity.

1 Scope

This standard specifies the requirements for equipment and protective systems for firedamp drainage at mines. It also contains requirements for the construction and monitoring of this equipment and protective systems (see EN 1127-2).

This standard does not apply to firedamp utilization systems beyond the utilization shut-off device.

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 1127-2:2002, *Explosive atmospheres — Explosion prevention and protection — Part 2: Basic concepts and methodology for mining*

EN 1710:2005, *Equipment and components intended for use in potentially explosive atmospheres in underground mines*

EN 1333, *Flanges and their joints — Pipework components — Definition and selection of PN*

EN 12874, *Flame arresters — Performance requirements, test methods and limits for use*

EN 13237:2003, *Potentially explosive atmospheres — Terms and definitions for equipment and protective systems intended for use in potentially explosive atmospheres*

prEN 15089, *Explosion isolation systems* [SIST EN 14983:2007
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prEN 61024-1, *Protection of structures against fire, explosion and life hazards*

EN 61508 (all parts), *Functional safety of electrical/electronic/programmable electronic safety-related systems*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 1127-2:2002 and EN 13237:2003 and the following apply:

3.1

electrostatic leakage resistance

electrical resistance measured between an object and earth

3.2

active explosion isolation system

system which is designed to be activated by a detector and control and indicating equipment (CIE) which are inherent parts of the system and stop explosions from travelling through pipelines or limit destructive effects of the explosion

[prEN 15089:2004, 3.12.1]

3.3

starting by-pass

temporary and specific by-passing of a safety device when starting the exhauster of a firedamp drainage plant

3.4 design pressure

p_d

pressure at the top of each chamber of the pressure equipment chosen for the derivation of the calculation pressure of each component²

[EN 764-1:2004, 3.10]

3.5 pressure

pressure relative to atmospheric pressure, i.e. gauge pressure. As a consequence, vacuum is designated by a negative value

[EN 764-1:2004, 3.3]

3.6 flame arrester

device fitted to the opening of an enclosure or to the connecting pipework of a system of enclosures and whose intended function is to allow flow, but prevent the transmission of flame

NOTE This device should not be confused with a fire barrier, which is ineffective in case of explosion.

[EN 13237:2003, 3.41]

3.7 firedamp

any potentially explosive mixture of flammable gases naturally occurring, which may form a hazardous mixture when combined with air

NOTE As firedamp mainly consists of methane, in mining practice, the terms “firedamp” and “methane” are frequently used as synonyms.

[EN 1127-2:2003, 3.1]

3.8 firedamp collector pipe

gas pipes connected directly to one or more boreholes or gas drainage points

3.9 firedamp mains pipe

gas pipes connected to more than one gas collector pipe

3.10 extinguishing system

system that is used to discharge suppressant agent to extinguish flame and keep it from propagating into the vent pipe

3.11 technically leaktight

made in such a way that no changes in gas composition occur.

NOTE 1 Gas pipes, items of plant and equipment, including all detachable and non-detachable connections can be technically leaktight.

NOTE 2 The term “technically leaktight” means that diffusion through statically stressed seals can occur.

3.12

t_{90} -path

distance between the monitoring position and the shut-off device

NOTE This distance depends on the measured gas/air mixture, taking account of the velocity of flow, the response time (according to EN 61779-1) of the measurement device, the tripping time and the closing time of the rapid shut-off device; the response time is the time taken to achieve 90% of the final indication.

4 Equipment and protective systems for firedamp drainage

4.1 General

Electrical and mechanical equipment used in firedamp drainage shall not pose an explosion risk. For this reason:

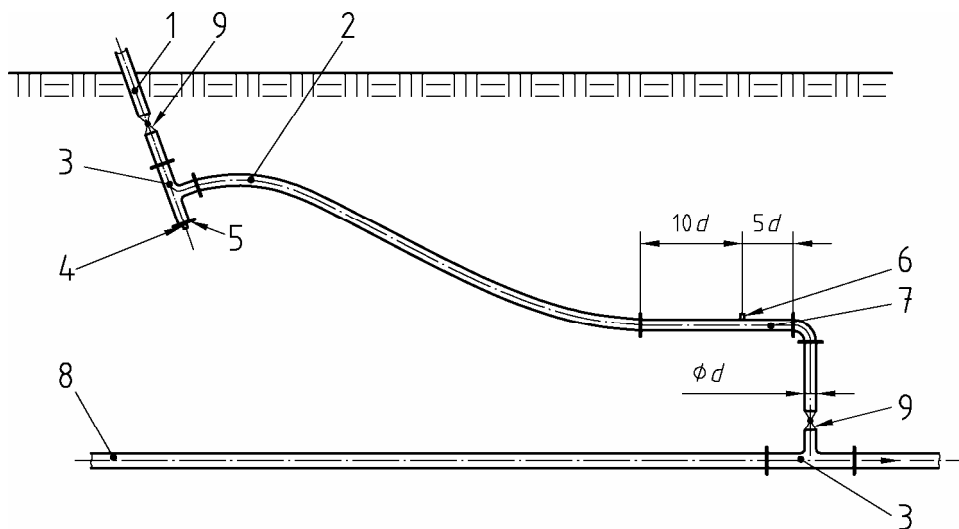
- equipment used in the firedamp drainage systems where flammable gas is likely to occur shall be explosion protected either Group I Category M1 or M2, or, if on the surface, Group II Category 1 or 2;
- where measuring equipment is in direct contact with firedamp/air concentration within the explosive range (e.g. the purity measuring instruments), it shall be category M1 ignition protected. In surface installations, Group II, Category 1 equipment may be used;
- the drainage system shall have a facility to allow it to be shut down, usually automatically, where the concentration of extracted firedamp in the pipework reaches a prescribed limit, taking into account the response time of the monitoring equipment and the t_{90} -path (see Annex E).

NOTE 1 Care is needed during start-up of the firedamp drainage system when the pipework will be full of air and will at some stage pass through the explosive range.

NOTE 2 Normally, the explosive range for firedamp/air mixtures is specified within a range of about 5 % by volume to 15 % by volume methane. Automatic shut down usually takes place when a methane concentration reaches a level of approx. 22 % by volume.

4.2 Borehole standpipes

Standpipes shall be made in such a way that devices (Y- or T-pieces) for the insertion of borehole probes can be attached to them. The standpipe shall have connection facilities to allow it to be connected, it shall be made in such a way and arranged so that no reduction in cross-section occurs, and should contain a suitable facility for measuring the volume flow and vacuum pressure where the boreholes are accessible for measuring and taking firedamp samples, e.g. a measuring section (see Figures 1 to 4).

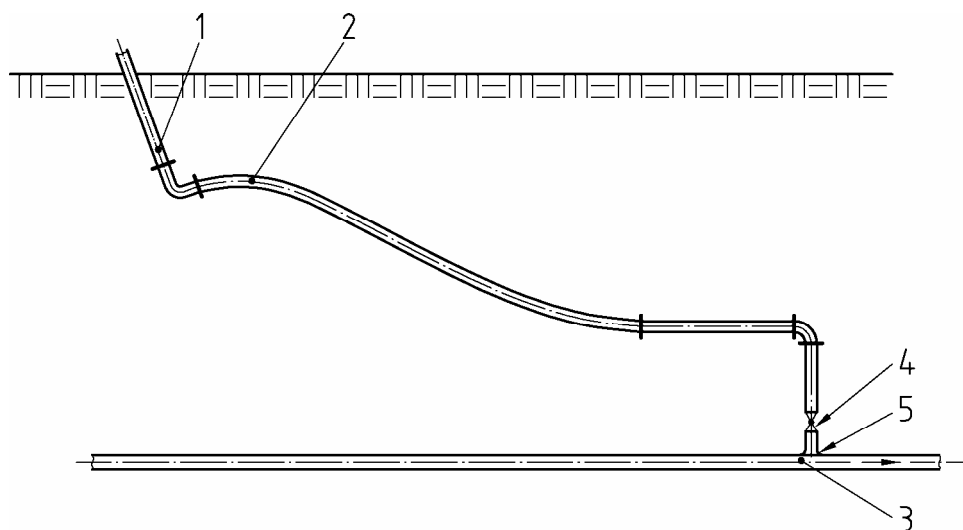


Key

- d Diameter
 1 Borehole standpipe
 2 Flexible hose suitable for the required flow and pressure
 3 T-piece
 4 Connection for water separator
 5 Facility for measurements
 6 Facility for measurements
 7 Measuring section
 8 Collector pipe
 9 Shut off device

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Figure 1 — Example of connection of roof borehole to collector pipe when measurement and control are accessible



Key

- 1 Borehole standpipe
- 2 Flexible hose suitable for the required flow and pressure
- 3 Collector pipe
- 4 Shut-off device
- 5 Suitable connection for collector pipe

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Figure 2 — Example of connection of roof borehole to collector pipe when measurement and control are not accessible

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