

**Explosiv atmosfär – Förebyggande av och skydd
mot explosioner i gruvor under jord –
Skyddssystem –
Del 4: Automatiska släckningssystem för
fräsmaskiner**

**Explosion prevention and protection in
underground mines – Protective systems –
Part 4: Automatic extinguishing systems for road
headers**

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**Explosion prevention and protection in underground mines -
Protective systems - Part 4: Automatic extinguishing systems for
road headers**

Protection contre l'explosion dans les mines souterraines -
Systèmes de protection - Partie 4: Installation d'extinction
automatique d'explosion pour machines à attaque
ponctuelle

Explosionsschutz in untertägigen Bergwerken -
Schutzsysteme - Teil 4: Automatische
Explosionslöschanlagen für Teilschnittmaschinen

This European Standard was approved by CEN on 9 June 2007.

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Foreword

This document (EN 14591-4:2007) 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 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of an identical text or by endorsement, at the latest by January 2008, and conflicting national standards shall be withdrawn at the latest by January 2008.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 Annex ZA, which is an integral part of this document.

This European Standard consists of the following Parts:

EN 15491-1, *Explosion prevention and protection in underground mines — Protective systems — Part 1: 2-bar explosion proof ventilation structures*

EN 15491-2, *Explosion prevention and protection in underground mines — Protective systems — Part 2: Passive water trough barriers*

EN 14591-4, *Explosion prevention and protection in underground mines — Protective systems — Part 4: Automatic extinguishing systems for road headers*

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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1 Scope

This document lays down requirements for automatic explosion extinguishing systems for roadheader machines (selective cut heading machines) in roadheader drivages where these systems automatically detect the initial phase of a firedamp explosion which has been initiated by the cutter head of a roadheader machine and extinguish it at the roadhead in such a way that the roadway drivage team is not put at risk.

This document does not lay down any requirements for the fighting of fires at the roadhead.

The automatic explosion extinguishing system for roadheaders is an autonomous protective system designed in accordance with Directive 94/9/EC.

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 — Basic concepts and methodology for mining*

EN 10025 (all Parts), *Hot rolled products of structural steels*

EN 10204, *Metallic products — Types of inspection documents*

EN 13237:2003, *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 potentially explosive atmospheres — Part 1: Basic method and requirements*

EN 60068-2-6, *Environmental testing — Part 2: Tests — Tests Fc: Vibration (sinusoidal) (IEC 60068-2-6:1995 + Corrigendum 1995)*

EN 60079-0, *Electrical apparatus for explosive gas atmospheres — Part 0: General requirements (IEC 60079-0:2004, modified)*

EN 61000-6-2, *Electromagnetic compatibility (EMC) — Part 6-2 Generic standards — Emission standard for residential, commercial and light-industrial environments (IEC 61000-6-2:2005)*

EN 61000-6-4, *Electromagnetic compatibility (EMC) — Part 6-4: Generic standards — Emission standard for industrial environments (IEC 61000-6-4:1997, modified)*

EN 61508-1, *Functional safety of electrical/electronic/programmable electronic safety-related systems — Part 1: General requirements (IEC 61508-1:1998 + Corrigendum 1999)*

3 Terms and definitions

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

3.1 automatic explosion extinguishing system
assembly of equipment for the automatic detection of the beginning of an explosion and initiation of the discharge of the extinguishing agent in order, in this way, to limit the destructive effects of the explosion

3.2

HRD extinguishing agent container

device containing an explosion suppression agent that can be discharged by internal pressure

NOTE HRD is the abbreviation for High Rate Discharge

3.3

sensor

device that is triggered by changes in one or more parameters, e.g. temperature and/or radiation, caused by a developing explosion.

4 General requirements

4.1 General

Automatic explosion extinguishing systems for roadheaders essentially comprise the following co-ordinated components:

- sensors for explosion ignition detection;
- extinguishing agent containers for explosion fighting;
- control system for monitoring the individual components and their combined effect as well as the triggering of the extinguishing system (electronic control and operating unit);
- power supply and emergency power supply.

The number and configuration of the individual components are determined by the type of machine and by the roadway cross-section to be protected.

EN 13463-1 and EN 60079-0 shall be applied.

4.2 Functional requirements

4.2.1 General

All components are to be designed for high operating reliability in accordance with the “fail-safe” principle.

A high level of protection against incorrect triggering shall be ensured by means of a selective response action and minimum sensitivity to external interference factors.

Appropriate protection devices are to be used to protect the components from unauthorized external interventions.

If the roadheader has an automatic explosion extinguishing installation, the roadheader shall be equipped with a compulsory interlock.

All electrical equipment shall be of class M1.

The system is designed for an ambient temperature of – 20 °C to 40 °C.

A degree of protection of at least IP 54 is required.

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4.2.2 Sensors

Explosion-detection sensors shall operate on the basis of one of the physical quantities related to the event of an explosion (e.g. type of flame, radiation). In this respect, full use shall be made of the maximum response speed and sensitivity.

The monitoring range of the detection sensors shall be fixed in such a way that the system only detects those events that have to be controlled. The events to be detected are explosions that have been caused by the cutter head of the roadheader machine and which are initiated in the vicinity of the machine, but not fires occurring outside the cutting zone.

The functional reliability of the sensors shall not be impaired by local factors (dust, water/mist, construction materials, etc.).

The function of the sensors shall be proven by means of a function test with a methane flame.

4.2.3 Extinguishing agent containers

The discharge speed and total discharge time of the extinguishing agent containers have to be harmonized to the geometrical conditions of the roadhead. In this respect, the following parameters have to be taken into account in particular:

- distance from roadhead;
- radial dimensions of roadway cross-section;
- direction of discharge relative to the cutter-arm axis.

4.2.4 Electronic control and discharge unit

It shall be possible to connect at least 2 sensors to the electronic control and discharge unit.

The control and discharge unit controls and monitors all the electrical signals relating to the functions and safety of the systems, such as:

- the power supply;
- all the connected sensors;
- the storage of important system data in non-volatile memory modules;
- the display and operating elements;
- the ignition system;
- the automatic test routine.

It shall have a data transmission interface to the remote monitoring unit.

4.2.5 Power supply and emergency power supply

The power supply shall be designed as an emergency power supply for an operating period of at least 24 h with automatic changeover. In order to prevent spurious tripping, it shall be protected against interference from the supply network.