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**Stroji za gradnjo predorov - Odkopne naprave - Varnostne zahteve**

Tunnelling machines - Road headers, continuous miners and impact rippers - Safety requirements

Tunnelbaumaschinen - Teilschnittmaschinen, Continuous Miners und Schlagkopfmachines - Sicherheitstechnische Anforderungen

Machines pour la construction de tunnels - Machines à attaque ponctuelle, mineurs continus, brise-roches - Règles de sécurité

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**Tunnelling machines - Road headers, continuous miners and  
impact rippers - Safety requirements**

Machines pour la construction de tunnels - Machines à  
attaque ponctuelle, mineurs continus, brise-roches - Règles  
de sécurité

Tunnelbaumaschinen - Teilschnittmaschinen, Continuous  
Miners und Schlagkopfmachines - Sicherheitstechnische  
Anforderungen

This European Standard was approved by CEN on 9 October 2002 and includes Corrigendum 1 issued by CEN on 15 September 2004 and Amendment 1 approved by CEN on 28 May 2009.

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 Management Centre or to any CEN member.

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**EN 12111:2002+A1:2009 (E)****Foreword**

This document (EN 12111:2002+A1:2009) has been prepared by Technical Committee CEN /TC 151, "Construction equipment and building material machines - Safety" 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of an identical text or by endorsement, at the latest by January 2010, and conflicting national standards shall be withdrawn at the latest by January 2010.

This European Standard was approved by CEN on 9 October 2002 and includes Corrigendum 1 issued by CEN on 15 September 2004 and Amendment 1 approved by CEN on 28 May 2009.

This document supersedes EN 12111:2002.

The start and finish of text introduced or altered by amendment is indicated in the text by tags **A1** **A1**.

The modifications of the related CEN Corrigendum have been implemented at the appropriate places in the text and are indicated by the tags **AC** **AC**.

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).

**A1** For relationship with EU Directive(s), see informative Annexes ZA and ZB, which are integral parts of this document. **A1**

Annex A is normative and contains "Protective measures for electrical accessories and lighting", Annex B is normative and contains "Verification of safety requirements and/or protective measures" and Annex C is informative and contains "Figures".

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, 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 United Kingdom.

## Introduction

This document is a type C-standard as stated in EN 1070.

The machinery concerned and the extent to which hazards, hazardous situations and events are covered are indicated in the scope of this document.

Due to the wide range of geological and environmental conditions in which these types of machines are likely to be employed, it is not possible always to give precise technical requirements in this standard.

The particular conditions of use and places of use of the machinery (e.g. ground and local safety conditions, hazardous gas concentration (see 5.5.3)) are the subjects of negotiation between the manufacturers and the user/purchaser.

NOTE “Manufacturer” should be understood within the European Union as intended in the Machinery Directive.

When provisions of this type C standard are different from those which are stated in type A or B standards, the provisions of this type C standard take precedence over the provisions of the other standards, for machines that have been designed and built according to the provisions of this type C standard.

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## EN 12111:2002+A1:2009 (E)

## 1 Scope

### 1.1 Description of the machine

This European Standard specifies all significant hazards, hazardous situations and events relevant to road headers, continuous miners and impact rippers, when they are used as intended and under the conditions foreseen by the manufacturer (see clause 4). This standard specifies the appropriate technical measures to eliminate or reduce risks arising from the significant hazards. This European Standard is applicable to road headers, continuous miners and impact rippers used in tunnelling and underground mining.

Certain associated matters are not included in the scope of this standard:

- the supply of electricity up to the machine;
- the provision of a cab or similar accommodation for an operator;
- ancillary tools and equipment used for, at or on the machine;
- equipment for use in potentially explosive atmospheres;
- any method for monitoring gases in the atmosphere of the tunnel or other workplace;
- the method of calculation of the design of any part described or the verification of this;
- loading and transport equipment which is not an integral part of the machine;
- electromagnetic compatibility;
- pressure vessels.

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NOTE 1 Directive 94/9/EC concerning equipment and protective systems intended for use in potentially explosive atmospheres can be applicable to the type of machine or equipment covered by this European Standard. The present standard is not intended to provide means of complying with the essential health and safety requirements of Directive 94/9/EC.

NOTE 2 prEN 1710 “Equipment and components intended for use in potentially explosive atmospheres in mines” is currently under preparation in CEN/TC 305.

**1.2** This standard deals with all significant hazards, hazardous situations and events relevant to road headers, continuous miners and impact rippers, when they are used as intended and under the conditions foreseen by the manufacturer (see clause 4). This standard specifies the appropriate technical measures to eliminate or reduce risks arising from the significant hazards.

**1.3** This document is not applicable to machines which are manufactured before the date of publication of this document by CEN.

## 2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text, and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

EN 3-1, *Portable fire extinguishers — Part 1: Description, duration of operation, class A and B fire test.*

Ⓐ<sub>1</sub> EN ISO 12100-1:2003 *Safety of machinery — Basic concepts, general principles for design — Part 1: Basic terminology, methodology (ISO 12100-1:2003)* Ⓐ<sub>1</sub>



EN ISO 12100-2:2003 *Safety of machinery — Basic concepts, general principles for design — Part 2: Technical principles (ISO 12100-2:2003)* <sup>(A1)</sup>

EN 418:1992, *Safety of machinery — Emergency stop equipment, functional aspects — Principles for design.*

EN 474-1, *Earth-moving machinery — Safety - Part 1: General requirements.*

EN 563, *Safety of machinery — Temperatures of touchable surfaces — Ergonomics data to establish temperature limit values for hot surfaces.*

EN 617, *Continuous handling equipment and systems — Safety and EMC requirements for the equipment for the storage of bulk materials in silos, bunkers, bins and hoppers.*

EN 619, *Continuous handling equipment and systems — Safety and EMC requirements for equipment for mechanical handling of units loads.*

EN 954-1:1996, *Safety of machinery — Safety related parts of control systems — Part 1: General principles for design.*

EN 982, *Safety of machinery — Safety requirements for fluid power systems and their components — Hydraulics.*

EN 983, *Safety of machinery — Safety requirements for fluid power systems and their components — Pneumatics.*

EN 1070:1998, *Safety of machinery — Terminology.*

EN 60204-1:1997, *Safety of machinery — Electrical equipment of machines — Part 1: General requirements (IEC 60204-1:1997).*

EN 60204-11, *Safety of machinery - Electrical equipment of machines - Part 11: Requirements for HV equipment for voltages above 1000 V a.c. or 1500 V d.c. and not exceeding 36 kV (IEC 60204-11:2000).*

EN 60439-1:1999, *Low-voltage switchgear and controlgear assemblies — Part 1: Type-tested and partially type-tested assemblies (IEC 60439-1:1999).*

EN 60439-2, *Low-voltage switchgear and controlgear assemblies — Part 2: Particular requirements for bushbar trunking systems (bushways) (IEC 60439-2:2000).*

EN 60439-3, *Low-voltage switchgear and controlgear assemblies — Part 3: Particular requirements for low-voltage switchgear and controlgear intended to be installed in places where unskilled persons have access for their use — Distribution boards (IEC 60439-3:1991).*

EN 60439-4, *Low-voltage switchgear and controlgear assemblies — Part 4: Particular requirements for assemblies for construction sites (ACS) (IEC 60439-4:1990).*

EN 60529:1991, *Degrees of protection provided by enclosures (IP Code) (IEC 60529:1989).*

EN 60947-1, *Low-voltage switchgear and controlgear — Part 1: General rules (IEC 60947-1:1999, modified).*

EN 61310-1, *Safety of machinery - Indication, marking and actuation — Part 1: Requirements for visual, auditory and tactile signals (IEC 61310-1:1995).*

EN ISO 2867:1998, *Earth-moving machinery — Access systems (ISO 2867:1994).*

EN ISO 3411, *Earth-moving machinery — Human physical dimensions of operators and minimum operator space envelope (ISO 3411:1995).*

prEN ISO 3457:2000, *Earth-moving machinery — Guards and shields — Definitions and specifications (ISO/DIS 3457:2000).*

EN ISO 7096, *Earth-moving machinery — Laboratory evaluation of operator seat vibration (ISO 7096:2000).*

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EN ISO 11202, *Acoustics — Noise emitted by machinery and equipment — Measurement of emission sound pressure levels at a workstation and at other specified positions — Survey method in situ (ISO 11202:1995).*

EN ISO 11688-1, *Acoustics — Recommended practice for the design of low-noise machinery and equipment — Part 1: Planning (ISO/TR 11688-1:1995).*

ISO 3795, *Road vehicles, and tractors and machinery for agriculture and forestry — Determination of burning behaviour of interior materials.*

ISO 3864, *Safety colours and safety signs.*

ISO 4413, *Hydraulic fluid power — General rules relating to systems.*

ISO 4414, *Pneumatic fluid power — General rules relating to systems.*

ISO 6405-1, *Earth-moving machinery — Symbols for operator controls and other displays — Part 1: Common symbols.*

ISO 8643, *Earth-moving machinery — Hydraulic excavator and backhoe loader boom-lowering control device — Requirements and tests.*

ISO 10567, *Earth-moving machinery — Hydraulic excavators — Lift capacity.*

ISO 12508, *Earth-moving machinery — Operator station and maintenance areas — Bluntness of edges.*

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### 3 Terms and definitions – Symbols and abbreviated terms

For the purposes of this European Standard, the terms and definitions given in EN 1070:1998 and the following apply.

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#### 3.1

##### **road header**

self-propelled tunnel driving machine, normally mounted on crawler tracks, which is designed and intended to cut and load soft to medium hard rock in sections by means of a rotating cutting tool mounted axially or transversely on a boom. Spoil may be discharged at the rear of the machine. As an example see Figure C.1

#### 3.2

##### **continuous miner**

self-propelled machine, normally mounted on crawler tracks, which is designed and intended to cut coal or soft minerals by means of a transversely mounted rotating drum. Spoil may be discharged at the rear of the machine. As an example see Figure C.2

#### 3.3

##### **impact ripper**

self-propelled tunnel driving machine which is designed and intended to excavate the rock in sections by means of a tool such as a percussive hammer. Such tools are excluded from this standard. The machine may be fitted with loading and transport equipment. As an example see Figure C.3

#### 3.4

##### **control station**

location on a machine from where the functions of the machine can be controlled by an operator. In the basic design, the control station will not be covered by a canopy. Control may alternatively be from a remote station by cable or radio

#### 3.5

##### **servicing point**

any location on a machine where servicing and maintenance is carried out

## 4 List of significant hazards

### 4.1 General

This clause contains all the significant hazards, hazardous situations and events, as far as they are dealt with in this standard, identified by risk assessment as significant for this type of machinery and which require action to eliminate or reduce the risk.

### 4.2 Mechanical hazards

- a) crushing or shearing, see: 5.3, 5.4.4.2;
- b) cutting, see: 5.1.3.1;
- c) drawing-in or trapping, see: 5.3;
- d) high-pressure fluid injection, see: 5.1.4;
- e) loss of stability, see: 5.1.5;
- f) slip, trip and fall, see: 5.1.6, 5.8.1;
- g) shape, see: 5.1.3.1;

### 4.3 Electrical hazards

- a) direct or indirect electrical contact, see: 5.7;
- b) approach of persons to live parts, especially in the range of high voltage, see: 5.7.1;  
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- c) external influences on electrical equipment, see: 5.4.1, 5.7, 5.8.1;

### 4.4 Thermal hazards

See: 5.1.3.2;

### 4.5 Noise hazards

See: 5.6;

Hazards that can occur are:

- a) hearing damage (deafness);
- b) accidents due to interference with speech communication and acoustical signals.

### 4.6 Vibration hazards

See clause: 5.2.1;

### 4.7 Hazards generated by materials and substances

- a) inhalation of harmful gases including exhaust gases from diesel engines; the composition of gases is not dealt with, see: 5.5.2, 5.5.3, 5.7.3, 5.7.4;
- b) inhalation of dusts, see: 5.4.3, 5.5.1, 5.7.4;
- c) fire and explosion, see: 5.5.3.1, 5.7.3, 5.10;

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d) rock fall, see: 5.2.2;

**4.8 Hazards generated by neglecting ergonomic principles**

a) unhealthy postures or excessive efforts, see: 5.2.1;

b) inadequate local lighting, see: 5.8;

**4.9 Hazards caused by failure of energy supply**

a) failure of energy supply, see: 5.4.3, 5.4.6;

b) failure of control system, see: 5.4.3;

**4.10 Hazards caused by missing and/or incorrectly positioned safety related measures**

a) all kinds of guards, see: 5.3;

b) all kinds of safety-related devices, see: 5.3, 5.4;

c) starting and stopping devices, see: 5.4.2, 5.4.4, 5.4.6;

d) warning signs and tags, see clause: 5.11, 7.2, 7.3;

e) all kinds of information and warning devices, see: 5.4.4.2, 5.11, 7.2.1, 7.2.2;

f) energy supply disconnecting devices, see: 5.4.3, 5.4.4;

g) emergency devices, see clause: 5.4.5;

h) handling of machinery or parts thereof, see: 7.2.3;

i) essential measures for safe maintenance and repair, see: 5.3, 5.4.3, 5.7.2, 7.2.3;

**5 Safety requirements and/or protective measures****5.1 General safety requirements****5.1.1 General**

Machinery shall comply with the safety requirements and/or protective measures of this clause.

In addition, the machines shall be designed according to the principles of **EN ISO 12100** for hazards relevant but not significant which are not dealt with by this document (e.g. sharp edges).

Design calculations shall be carried out in accordance with usual engineering practice and calculation codes shall include the effect of elastic deformation. All failure modes of the materials shall be considered including fatigue and wear.

**5.1.2 Materials**

Materials shall be chosen so that they do not cause any danger to the health or safety of exposed persons. The materials shall be suitable for the foreseen ambient temperatures.