



SLOVENSKI STANDARD

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Nadomešča:

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Stroji za gradnjo predorov - Odkopne naprave - Varnostne zahteve

Tunnelling machines - Road headers and continuous miners - Safety requirements

Tunnelbaumaschinen - Teilschnittmaschinen und Continuous miners -
Sicherheitstechnische Anforderungen

Machines pour la construction de tunnels - Machines à attaque ponctuelle et mineurs
continus - Prescriptions de sécurité

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Tunnelling machines - Road headers and continuous miners -
Safety requirements

Machines pour la construction de tunnels - Machines à
attaque ponctuelle et mineurs continus - Prescriptions de
sécurité

Tunnelbaumaschinen - Teilschnittmaschinen und
Continuous miners - Sicherheitstechnische Anforderungen

This European Standard was approved by CEN on 20 March 2014.

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Foreword

This document (EN 12111:2014) 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of an identical text or by endorsement, at the latest by November 2014 and conflicting national standards shall be withdrawn at the latest by November 2014.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 12111:2002+A1:2009.

The main technical changes compared to EN 12111:2002+A1:2009 are the following:

- modification of the scope, "impact rippers" deleted;
- update of normative references;
- improvement of requirements on access systems;
- requirements on control systems improved;
- revision of requirements on audible and visual warning signs;
- improvement of noise test code.

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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, 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, 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

This document is a type C standard as stated in EN ISO 12100.

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

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.

Annex A is normative and contains the “Noise Test Code” and Annex B is informative and contains “Figures”.

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1 Scope

This European Standard deals with all significant hazards, hazardous situations and events relevant to road headers and continuous miners as defined in Clause 3 (hereinafter called machines) when they are used as intended and under conditions of misuse which are reasonably foreseeable by the manufacturer (see Clause 4).

NOTE 1 Within the intended use, overturning of the road header or continuous miner is not a significant hazard.

Excavators are out of the scope of this standard and are covered by EN 474-1:2006+A4:2013 and EN 474-5:2006+A3:2013.

The following items and applications are not covered by this European Standard:

- the supply of electricity up to the switch box;
- use of the machine in potentially explosive atmospheres;
- use of the machine under hyperbaric conditions;
- loading and transport equipment which is not an integral part of the machine.

This European Standard covers incorporation of monitoring devices for hazardous atmospheres.

This European Standard is not applicable to machines manufactured before the date of publication of this European Standard by CEN.

NOTE 2 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. For the application in potentially explosive atmospheres see EN 1710:2005+A1:2008.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 3-7:2004+A1:2007, *Portable fire extinguishers - Part 7: Characteristics, performance requirements and test methods*

EN 474-1:2006+A4:2013, *Earth-moving machinery - Safety - Part 1: General requirements*

EN 617:2001+A1:2010, *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 618:2002+A1:2010, *Continuous handling equipment and systems - Safety and EMC requirements for equipment for mechanical handling of bulk materials except fixed belt conveyors*

EN 620:2002+A1:2010, *Continuous handling equipment and systems - Safety and EMC requirements for fixed belt conveyors for bulk materials*

EN 894-1:1997+A1:2008, *Safety of machinery - Ergonomics requirements for the design of displays and control actuators - Part 1: General principles for human interactions with displays and control actuators*

EN 953:1997+A1:2009, *Safety of machinery - Guards - General requirements for the design and construction of fixed and movable guards*

EN 981:1996+A1:2008, *Safety of machinery - System of auditory and visual danger and information signals*

EN 1679-1:1998+A1:2011, *Reciprocating internal combustion engines - Safety - Part 1: Compression ignition engines*

EN 16228-1:2014, *Drilling and foundation equipment — Safety — Part 1: Common requirements*

EN 16228-2:2014, *Drilling and foundation equipment — Safety — Part 2: Mobile drill rigs for civil and geotechnical engineering, quarrying and mining*

EN 60076-2:2011, *Power transformers — Part 2: Temperature rise for liquid-immersed transformers (IEC 60076-2:2011)*

EN 60204-1:2006, *Safety of machinery — Electrical equipment of machines — Part 1: General requirements (IEC 60204-1:2005, modified)*

EN 60204-11:2000, *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 60439-2:2000, *Low-voltage switchgear and controlgear assemblies — Part 2: Particular requirements for busbar trunking systems (busways) (IEC 60439-2:2000)*

EN 60439-4:2004, *Low-voltage switchgear and controlgear assemblies — Part 4: Particular requirements for assemblies for construction sites (ACS) (IEC 60439-4: 2004)*

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

EN 60947-1:2007, *Low-voltage switchgear and controlgear — Part 1: General rules (IEC 60947-1:2007)*

EN 61310-1:2008, *Safety of machinery — Indication, marking and actuation — Part 1: Requirements for visual, acoustic and tactile signals (IEC 61310-1:2007)*

EN 61439-1:2011, *Low-voltage switchgear and controlgear assemblies — Part 1: General rules (IEC 61439-1:2011)*

EN ISO 3411:2007, *Earth-moving machinery - Physical dimensions of operators and minimum operator space envelope (ISO 3411:2007)*

EN ISO 3449:2008, *Earth-moving machinery - Falling-object protective structures - Laboratory tests and performance requirements (ISO 3449:2005)*

EN ISO 3457:2008, *Earth-moving machinery - Guards - Definitions and requirements (ISO 3457:2003)*

EN ISO 3744:2010, *Acoustics - Determination of sound power levels and sound energy levels of noise sources using sound pressure - Engineering methods for an essentially free field over a reflecting plane (ISO 3744:2010)*

EN ISO 3746:2010, *Acoustics - Determination of sound power levels and sound energy levels of noise sources using sound pressure - Survey method using an enveloping measurement surface over a reflecting plane (ISO 3746:2010)*

EN ISO 3747:2010, *Acoustics - Determination of sound power levels and sound energy levels of noise sources using sound pressure - Engineering/survey methods for use in situ in a reverberant environment (ISO 3747:2010)*

EN ISO 4413:2010, *Hydraulic fluid power - General rules and safety requirements for systems and their components (ISO 4413:2010)*

EN ISO 4414:2010, *Pneumatic fluid power - General rules and safety requirements for systems and their components (ISO 4414:2010)*

EN ISO 4871:2009, *Acoustics - Declaration and verification of noise emission values of machinery and equipment (ISO 4871:1996)*

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EN ISO 7096:2008, *Earth-moving machinery - Laboratory evaluation of operator seat vibration (ISO 7096:2000)*

EN ISO 11201:2010, *Acoustics - Noise emitted by machinery and equipment - Determination of emission sound pressure levels at a work station and at other specified positions in an essentially free field over a reflecting plane with negligible environmental corrections (ISO 11201:2010)*

EN ISO 11202:2010, *Acoustics - Noise emitted by machinery and equipment - Determination of emission sound pressure levels at a work station and at other specified positions applying approximate environmental corrections (ISO 11202:2010)*

EN ISO 11204:2010, *Acoustics - Noise emitted by machinery and equipment - Determination of emission sound pressure levels at a work station and at other specified positions applying accurate environmental corrections (ISO 11204:2010)*

EN ISO 11688-1:2009, *Acoustics - Recommended practice for the design of low-noise machinery and equipment - Part 1: Planning (ISO/TR 11688-1:1995)*

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

EN ISO 12922:2012, *Lubricants, industrial oils and related products (class L) - Family H (Hydraulic systems) - Specifications for hydraulic fluids in categories HFAE, HFAS, HFB, HFC, HFDR and HFDU (ISO 12922:2012)*

EN ISO 13732-1:2008, *Ergonomics of the thermal environment - Methods for the assessment of human responses to contact with surfaces - Part 1: Hot surfaces (ISO 13732-1:2006)*

EN ISO 13849-1:2008, *Safety of machinery - Safety-related parts of control systems - Part 1: General principles for design (ISO 13849-1:2006)*

EN ISO 13850:2008, *Safety of machinery - Emergency stop - Principles for design (ISO 13850:2006)*

EN ISO 14122-1:2001, *Safety of machinery - Permanent means of access to machinery - Part 1: Choice of fixed means of access between two levels (ISO 14122-1:2001)*

EN ISO 14122-2:2001, *Safety of machinery - Permanent means of access to machinery - Part 2: Working platforms and walkways (ISO 14122-2:2001)*

EN ISO 14122-3:2001, *Safety of machinery - Permanent means of access to machinery - Part 3: Stairs, stepladders and guard-rails (ISO 14122-3:2001)*

EN ISO 14122-4:2004, *Safety of machinery - Permanent means of access to machinery - Part 4: Fixed ladders (ISO 14122-4:2004)*

ISO 3795:1989, *Road vehicles, and tractors and machinery for agriculture and forestry — Determination of burning behaviour of interior materials*

ISO 3864-1:2011, *Graphical symbols — Safety colours and safety signs — Part 1: Design principles for safety signs and safety markings*

ISO 3864-2:2004, *Graphical symbols — Safety colours and safety signs — Part 2: Design principles for product safety labels*

ISO 3864-3:2012, *Graphical symbols — Safety colours and safety signs — Part 3: Design principles for graphical symbols for use in safety signs*

ISO 5006:2006, *Earth-moving machinery — Operator's field of view — Test method and performance criteria*

ISO 6405-1:2004, *Earth-moving machinery — Symbols for operator controls and other displays — Part 1: Common symbols*

ISO 6805:1994, *Rubber hoses and hose assemblies for underground mining — Wire-reinforced hydraulic types for coal mining — Specification*

ISO 8178-1:2006, *Reciprocating internal combustion engines — Exhaust emission measurement — Part 1: Test-bed measurement of gaseous and particulate exhaust emissions*

ISO 8178-4:2007, *Reciprocating internal combustion engines — Exhaust emission measurement — Part 4: Steady-state test cycles for different engine applications*

ISO 10532:1995, *Earth-moving machinery — Machine-mounted retrieval device — Performance requirements*

ISO 11112:1995, *Earth-moving machinery — Operator's seat — Dimensions and requirements*

ISO 12508:1994, *Earth-moving machinery — Operator station and maintenance areas — Bluntness of edges*

ISO 15817:2012, *Earth-moving machinery — Safety requirements for remote operator control systems*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN ISO 12100 and the following apply.

3.1

road header

self-propelled tunnel driving machine, normally mounted on crawler tracks, which is designed and intended to cut and load stiff clay, soft to medium hard rock and similar materials in sections by means of a rotating cutter head mounted axially or transversely on a boom which can swivel both horizontally and vertically

Note 1 to entry: Equipment for the installation of ground support can be included on the machine. Spoil may be discharged at the rear of the machine. As an example see Figure B.1.

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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 one or more transversely mounted rotating drums which may be raised or lowered

Note 1 to entry: Equipment for the installation of ground support can be included on the machine. Spoil may be discharged at the rear of the machine. As an example see Figure B.2.

3.3

control station

location on a machine from where the functions of the machine can be controlled by an operator. Control may alternatively be from a remote station by cable or radio

3.4

servicing point

location on a machine where servicing and maintenance is carried out

3.5

tramming

travel of road header or continuous miner close to working face

3.6

conveying system

system for transporting excavated material

Note 1 to entry: It includes loading device, chain conveyor and slewing belt conveyor.

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3.7

trailing cable

cable attached to the machine which can be extended or retracted as the machine trams and which connects it to the tunnel or mine power supply

Note 1 to entry: The trailing cable is part of the machine if there is a cable reel integrated in the machine.

3.8

main switch gear

device at which all power to the machine can be cut off

Note 1 to entry: This is normally provided by the user.

4 List of significant hazards

4.1 General

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

Table 1 — List of significant hazards

No.	Hazards	Concerned subclauses
4.1	Mechanical hazards due to	
a)	Machine parts or work pieces, e.g.: - shape - mass and stability (potential energy of elements which may move under the effect of gravity); - mass and velocity (kinetic energy of elements in controlled or uncontrolled motion); - accumulation of energy inside the machinery, e.g.: liquids and gases under pressure.	5.2.1.1 5.5.8, 5.13 5.5.8 5.11, 5.16
b)	Crushing hazard	5.4, 5.5.8.2
c)	Shearing hazard	5.4
d)	Cutting or severing hazard	5.2.1.1, 5.4
e)	Entanglement hazard	5.4
f)	Drawing-in or trapping hazard	5.4
g)	Friction or abrasion hazard	5.2.1.1
h)	High pressure fluid injection or ejection hazard	5.11, 5.16
4.2	Electrical hazards due to	
a)	Contact of persons with live parts (direct contact)	5.8.1
b)	Contact of persons with parts which have become live under faulty conditions (indirect contact)	5.8.2, 5.8.3, 5.17
c)	Approach to live parts under high voltage	5.8.4.2, 5.17
d)	Electrostatic phenomena	5.8.7, 5.17
e)	Thermal radiation or other phenomena such as the	5.12.1

No.	Hazards	Concerned subclauses
	projection of molten particles and chemical effects from short-circuits, overloads, etc.	
4.3	Thermal hazards due to:	
a)	Burns, scalds and other injuries by a possible contact of persons with objects or materials with an extreme high or low temperature, by flames or explosions and also by the radiation of heat sources	5.2.1.2 5.12
b)	damage to health by hot or cold working environment	5.3.3.1
4.4	Hazards generated by noise	
a)	resulting in hearing loss (deafness), other physiological disorders (e.g. loss of balance, loss of awareness)	5.5.4, 5.7
b)	resulting in interference with speech communication, acoustic signals, etc.	5.5.4, 5.7
4.5	Hazards generated by vibration	5.3.1, 5.3.2.3, 7.3.2
4.6	Radiation	
	Low-frequency, radio-frequency radiation; microwaves	5.8.9
4.7	Hazards arising from materials and substances (and their constituent elements) processed or used by the machinery	
a)	Hazards from contact with or inhalation of harmful fluids, gases, mists, fumes, and dusts	5.6, 5.8.6, 5.11, 5.16
b)	Fire or explosion hazard	5.5.8.1, 5.6.3, 5.16, 5.8.4, 5.8.5.1, 5.11.1, 5.12, 5.8.8
4.8	Hazards arising from neglect of ergonomic principles in machinery design	
a)	unhealthy postures or excessive effort	5.3.1, 5.17
b)	inadequate consideration of hand-arm or foot-leg anatomy	5.3.1
c)	neglected use of personal protection equipment	5.3.1, 5.17
d)	inadequate local lighting	5.9
e)	human error, human behaviour	5.5.2, 5.15
f)	inadequate design, location or identification of manual Controls	5.5
g)	inadequate design or location of visual display units	5.5
4.9	Unexpected start-up, unexpected overrun/overspeed (or any similar malfunction)	
a)	failure/disorder of the control system	5.5.2, 5.17
b)	Restoration of energy supply after an interruption	5.5.2
c)	external influences on electrical equipment	5.8.9
d)	errors in the software	5.5.2
e)	errors made by the operator (due to mismatch of Machinery with human characteristics and abilities)	5.5.2
4.10	Impossibility of stopping the machine in the best possible conditions	5.5.3, 5.5.6, 5.5.7, 5.5.8