



SLOVENSKI STANDARD

SIST EN 12110:2014

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Nadomešča:

SIST EN 12110:2003+A1:2008

Stroji za gradnjo predorov - Zračne zapore - Varnostne zahteve

Tunnelling machines - Air locks - Safety requirements

Tunnelbaumaschinen - Druckluftschleusen - Sicherheitstechnische Anforderungen

Machines pour la construction de tunnels - Sas de transfert - Prescriptions de sécurité
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Ta slovenski standard je istoveten z: ~~ST EN 12110~~ EN 12110:2014

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ICS:

91.220	Gradbena oprema	Construction equipment
93.060	Gradnja predorov	Tunnel construction

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EUROPEAN STANDARD

EN 12110

NORME EUROPÉENNE

EUROPÄISCHE NORM

May 2014

ICS 91.220; 93.060

Supersedes EN 12110:2002+A1:2008

English Version

Tunnelling machines - Air locks - Safety requirements

Machines pour la construction de tunnels - Sas de transfert
- Prescriptions de sécurité

Tunnelbaumaschinen - Druckluftschleusen -
Sicherheitstechnische Anforderungen

This European Standard was approved by CEN on 6 March 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 12110:2014) 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of an identical text or by endorsement, at the latest by November 2014 and conflicting national standards shall be withdrawn at the latest by November 2014.

This document supersedes EN 12110:2002+A1:2008.

The following main technical changes have been made compared to EN 12110:2002+A1:2008.

- a) general revision of the structure of EN 12110;
- b) revision of fire protection requirements;
- c) revision of the access dimensions on air locks;
- d) new structure of requirements for electrical equipment and the emergency provisions for power supply and lighting;
- e) revision of requirements for oxygen supply.

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.

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.

EN 12110:2014 (E)**Introduction**

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

The machinery and equipment 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.

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1 Scope

This European Standard applies to the design, construction, equipping, marking and testing of air locks as defined in 3.3 including pressure bulkheads as defined in 3.4, which are to be used in tunnelling work. An oxygen breathing system used to provide the breathing supply necessary to conduct a safe decompression is also covered by this standard.

This European Standard is not applicable to machinery and equipment which is manufactured before the date of publication of this document by CEN.

NOTE Air locks can be connected to tunnelling machinery. This standard can help the design of air locks and bulkheads in other compressed air work in construction.

This European Standard deals with all significant hazards, hazardous situations and events relevant to such machinery when they are used as intended and under conditions of misuse which are reasonably foreseeable by the manufacturer (see Clause 4).

This European Standard does not cover the supply of services to the air lock.

Vibration, noise and EMC (Electromagnetic compatibility) hazards are not significant hazards for air locks.

This European Standard does not cover the hazards due to the mobility of the machinery.

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.

- iTech STANDARD PREVIEW
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- SIST EN 12110:2014
<https://standards.itech.ai/catalog/standards/sist/en-12110-2014/633dbb78cf65/sist-en-12110-2014>
- EN 250:2014, *Respiratory equipment — Open-circuit self-contained compressed air diving apparatus — Requirements, testing, marking*
- EN 12021:2014, *Respiratory equipment — Compressed gases for breathing apparatus*
- EN 12464-1:2011, *Light and lighting — Lighting of work places — Part 1: Indoor work places*
- EN 60204-1:2006, *Safety of machinery — Electrical equipment of machines — Part 1: General requirements (IEC 60204-1:2005, modified)*
- EN 60529:1991, *Degrees of protection provided by enclosures (IP code) (IEC 60529:1989)*
- EN 61000-6-1:2007, *Electromagnetic compatibility (EMC) — Part 6-1: Generic standards — Immunity for residential, commercial and light-industrial environments (IEC 61000-6-1:2005)*
- EN 61000-6-2:2005, *Electromagnetic compatibility (EMC) — Part 6-2: Generic standards — Immunity for industrial environments (IEC 61000-6-2:2005)*
- EN 61000-6-3:2007, *Electromagnetic compatibility (EMC) — Part 6-3: Generic standards — Emission standard for residential, commercial and light-industrial environments (IEC 61000-6-3:2006)*
- EN 61000-6-4:2007, *Electromagnetic compatibility (EMC) — Part 6-4: Generic standards — Emission standard for industrial environments (IEC 61000-6-4:2006)*
- EN 61310-1:2008, *Safety of machinery — Indication, marking and actuation — Part 1: Requirements for visual, acoustic and tactile signals (IEC 61310-1:2007)*

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

EN ISO 5171:2010, *Gas welding equipment — Pressure gauges used in welding, cutting and allied processes (ISO 5171:2009)*

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

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 14113:2013, *Gas welding equipment — Rubber and plastics hose and hose assemblies for use with industrial gases up to 450 bar (45 MPa) (ISO 14113:2013)*

IEC 60364-7-706:2005, *Low-voltage electrical installations — Part 7-706: Requirements for special installations or locations — Conducting locations with restricted movement*

IEC/TR 60877:1999, *Procedures for ensuring the cleanliness of industrial-process measurement and control equipment in oxygen service*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN ISO 12100:2010 and the following apply.

3.1**compressed air**

air with a pressure of more than 0,1 bar, above atmospheric

Note 1 to entry:

All pressures to be measured above atmospheric pressure.

3.2**working chamber**

space in which work in compressed air is carried out

3.3**air lock**

self-contained pressure vessel with one or more compartments that permits passage between areas of different pressure

Note 1 to entry:

The pressure vessel is equipped with access doors, which can be sealed and the vessel can be pressurized. It includes equipment for its safe operation.

3.3.1**material lock**

air lock for the passage of material or equipment only

3.3.2**personnel lock**

air lock for the passage of persons only

3.3.3**combined lock**

air lock for the passage of persons and material or equipment

3.4**pressure bulkhead**

structure which separates spaces with different pressure levels as part of an air lock

3.5**maximum working pressure**

highest pressure to which an airlock may be subjected in normal use

3.6**design pressure****DP**

maximum pressure for which the equipment is designed as specified by the manufacturer

Note 1 to entry: The design pressure is the maximum allowable pressure as derived from the EU Directive 97/23/EC concerning Pressure Equipment (PED).

3.7**test pressure****TP**

pressure to which the equipment is tested

3.8**oxygen breathing system**

plant, pipework and ancillary equipment used to provide oxygen supply necessary for a safe decompression procedure

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3.9**breathing unit**

part of the oxygen breathing system comprising a mask and regulator combination

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3.10**main chamber**

compartment of a personnel lock in which decompression is normally carried out

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3.11**entrance chamber**

compartment of a personnel lock which allows passage from atmospheric pressure to the main chamber

3.12**oxygen compatible**

can safely be used in contact with oxygen

4 List of significant hazards

This clause contains all the 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

Significant Hazards	Hazardous Situation	Safety Requirements and/or Measures	Reference
4.1 Mechanical hazards:	4.1.1 Impact hazard/Squeezing	No sharp edges, bumpers, warning signs, squeezing protection etc.	5.1 5.2.10 5.2.11 7.4
	4.1.2 Uncontrolled change of pressure	Design and construction of pressure vessels, piping and pressure housings. Marking and labelling. Control equipment and instrumentation Design and construction of bulkheads	5.2.1 5.2.2 5.2.3 5.2.5 5.3.5 5.3.6.2 5.3.6.3 5.3.9.2 5.4 5.6.1 7.4
	4.1.3 Hazards resulting from the suction by differential pressure between the pressurized environment and atmospheric pressure	Mesh grills for inlets of exhaust pipes	5.2.11
4.2 Electrical hazards:	4.2.1 Electrical contact, direct or indirect	EN 60204-1 and IEC 60364-7-706	5.2.5
	4.2.2 External influences on electrical equipment	EN 61000-6-1 to -4	5.2.6
4.3 Thermal hazards:	4.3.1 Burns and scalds, by a possible contact of persons, by flames or explosions and also by the radiation of heat sources	Flame retardant materials. Fire extinguishing system. Temperature limit for heating system	5.2.4 5.2.4 5.3.6.3
	4.3.2 Health-damaging effects by hot or cold work environment	Thermometer	5.3.6.2
4.4 Hazards generated by materials and substances processed, used or exhausted by machinery:	4.4.1 Hazards resulting from contact with or inhalation of harmful fluids, gases, mists, fumes and dusts	Fire emergency provisions at the control panel Gas sampling lines/ Oxygen monitoring Ventilation Sufficient breathing units	5.2.4 5.3.6.3, 5.3.9.5 5.3.7 5.3.9.4
	4.4.2 Fire or explosion hazards especially under increased pressure	Water spray system Emergency relief valve Oxygen compatible materials	5.2.4 5.3.9.2 5.3.9.2

Significant Hazards	Hazardous Situation	Safety Requirements and/or Measures	Reference
	4.4.3 Use of oxygen	Cleaning of oxygen system Gas sampling lines Distribution network Suitable breathing units	5.2.11 5.3.6.3 5.3.9.3 5.3.9.4
4.5 Hazards generated by neglecting ergonomic principles in machine design (mismatch of machinery with human characteristics and abilities):	4.5.1 Unhealthy postures or excessive efforts	Dimensions	5.3.2 5.3.3
	4.5.2 Inadequate consideration of human anatomy	Dimensions	5.3.2 5.3.4
	4.5.3 Inadequate local lighting	Interior Illumination acc. to EN 12464-1	5.3.6.4
	4.5.4 Unhealthy insufficient dimensions and upholstery of the seats	Dimensions and Insulation	5.3.3
4.6 Hazards caused by failure of energy supply, breaking down of machinery parts and other functional disorders:	4.6.1 Failure of energy supply (of energy and/or control circuits)	Emergency Power Supply Emergency lighting	5.2.7 5.2.7
	4.6.2 Errors of fitting	Leak test of pressure systems	5.2.11 5.3.9.2 5.3.9.3
	4.6.3 Uncontrolled decompression of working chamber or lock	Protection against inlet line breaks Doors Self-sealing/Interlock Pressure indicator	5.3.5, 5.3.8 5.2.10 5.3.6.3
	4.6.4 Loss of communication	Emergency Power Supply Second communication network Observation windows/CCTV	5.2.7 5.2.9 5.3.6.3
4.7 Hazards caused by (temporarily) missing and/or incorrectly positioned safety related measures/means:	4.7.1 All kinds of safety related (protection) devices	Description in instruction handbook	7.3
	4.7.2 Safety signs	Location and meaning acc. to instruction handbook.	7.2
	4.7.3 All kinds of information or warning devices	Control equipment and instrumentation Oxygen storage and network	5.3.6.2 5.3.9.3
		Description in instruction handbook	7.2
	4.7.4 Means of access for emergency personnel into the confined pressurized parts of the machine	Number of compartments (entrance chamber) Dimensions Doors	5.3.1 5.3.2 5.3.4, 5.3.5
4.7.5 Emergency devices,	Number of compartments	5.3.1	