



SLOVENSKI STANDARD

SIST EN 1889-1:2004

01-junij-2004

**Stroji za podzemne rudnike – Mobilni stroji za podzemne rudnike – Varnost – 1.
del: Vozila z gumijastimi kolesi**

Machines for underground mines - Mobile machines working underground - Safety - Part
1: Rubber tired vehicles

Maschinen für den Bergbau unter Tage - Anforderungen an bewegliche Maschinen für
die Verwendung unter Tage - Sicherheit - Teil 1: Gummibereifte Gleislosfahrzeuge für
den Bergbau unter Tage

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Machines pour l'exploitation de mines souterraines - Machines mobiles souterraines -
Sécurité - Partie 1: Véhicules sur roues équipés de pneumatiques

Ta slovenski standard je istoveten z: EN 1889-1:2003

ICS:

73.100.40 Oprema za vleko in dviganje Haulage and hoisting
equipment

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en

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ICS 73.100.40

English version

Machines for underground mines - Mobile machines working underground - Safety - Part 1: Rubber tyred vehicles

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Machines mobiles souterraines - Sécurité - Partie 1:
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bewegliche Maschinen für die Verwendung unter Tage -
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den Bau unter Tage

This European Standard was approved by CEN on 7 February 2003.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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Foreword

This document (EN 1889-1:2003) has been prepared by Technical Committee CEN/TC 196, "Machines for underground mines - Safety", the secretariat of which is held by BSI.

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of an identical text or by endorsement, at the latest by December 2003, and conflicting national standards shall be withdrawn at the latest by December 2003.

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 EC Directive(s).

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

Annexes A and B are normative.

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, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Slovakia, Spain, Sweden, Switzerland and the United Kingdom.

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Introduction

This European Standard 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.

The standard takes into account the current state of the art and technical facilities to use in order to exclude or prevent, as far as possible, hazards when rubber tyred vehicles are used underground.

When compiling this standard it has been assumed that:

- components are:

- a) designed in accordance with the good engineering practice and calculation codes, taking account of shocks and vibration, including all failure modes;
- b) of sound mechanical and electrical construction;
- c) made of materials with adequate strength and of suitable quality; and
- d) free of defects.

- harmful materials, such as asbestos are not used.

- components are kept in good repair and working order, so that the required dimensions remain fulfilled despite wear.

- negotiations have taken place between the manufacturer, or authorised representative, and the purchaser and /or user (e.g. for fire resistant fluids, safety equipment, load restraining devices, use of surface machines not intended primarily for use in mines).

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1 Scope

1.1 This European Standard specifies the safety requirements and tests for self-propelled rubber tyred vehicles (defined in clause 3) intended primarily for use in underground mining (i.e. mine vehicles) and other underground workings (e.g. tunnelling vehicles). The electrical supply voltage is limited to 1100 A.C. and 1500 D.C.

1.2 This European Standard deals with the technical requirements to minimise the hazards listed in clause 4 which can arise during the commissioning, the travelling operation and the maintenance of rubber tyred vehicles when carried out in accordance with the specifications given by the manufacturer or his authorized representative.

1.3 This European Standard does not include rubber tyred drilling rigs, which are covered by EN 791, or earth moving machinery not intended primarily for use in underground mines, which are covered by EN 474 series. This European Standard does not take account of specific hazards associated with special-purpose vehicles, e.g. tankers, explosives vehicles.

This European Standard does not address operation in potentially explosive atmospheres, which is covered by another European Standard. Hazards due to noise are excluded from this standard, but a separate standard is in preparation where hazards due to noise will be addressed. This European Standard does not address remote control or deal with radiation and vibration. It does not deal with any equipment installed on the vehicle for purposes other than travelling.

1.4 This European Standard applies to vehicles which are manufactured after the date of issue of this standard.

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 292-1:1991, *Safety of machinery — Basic concepts , general principles for design — Part 1: Basic terminology, methodology.*

EN 292-2:1991 + EN 292-2/A1:1995, *Safety of machinery — Basic concepts , general principles for design — Part 2: Technical principles and specifications.*

EN 294, *Safety of machinery — Safety distance to prevent danger zones being reached by the upper limbs.*

EN 349, *Safety of machinery — Minimum gaps to avoid crushing of parts of the human body.*

EN 457, *Safety of machinery — Auditory danger signals — General requirements, design and testing (ISO 7731:1986, modified).*

EN 547-1, *Safety of machinery — Human body measurements — Part 1: Principles for determining the dimensions required for openings for whole body access into machinery.*

EN 547-2, *Safety of machinery — Human body measurements — Part 2: Principles for determining the dimensions required for access openings.*

EN 547-3, *Safety of machinery — Human body measurements — Part 3: Anthropometric data.*

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

EN 811, *Safety of machinery - Safety distances to prevent danger zones being reached by the lower limbs.*

EN 894-1, *Safety of machinery — Ergonomic requirements for the design of displays and control actuators — Part 1: General principles for human interactions with displays and control actuators.*

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EN 894-2, *Safety of machinery — Ergonomic requirements for the design of displays and control actuators — Part 2: Displays.*

EN 894-3, *Safety of machinery — Ergonomics requirements for the design of displays and control actuators — Part 3: Control actuators.*

EN 953, *Safety of machinery — Guards — General requirements for the design and construction of fixed and moveable guards.*

EN 954-1, *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 1050:1996, *Safety of machinery – Principles for risk assessment.*

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

EN 1837, *Safety of machinery — Integral lighting of machines.*

EN 1679-1, *Reciprocating internal combustion engines — Safety — Part 1: Compression ignition engines.*

EN 13202:2000, *Ergonomics of the thermal environment — Temperatures of touchable hot surfaces - Guidance for establishing surface temperature limit values in production standards with the aid of EN 563.*

EN 13510, *Earth-moving machinery — Roll-over protective structures — Laboratory tests and performance requirements (ISO 3471:1994 , including Amendment 1:1997, modified).*

EN 13627, *Earth-moving machinery: Falling-object protective structures — Laboratory tests and performance requirements (ISO 3449:1992, modified).*

EN 50265-1, *Common test methods for cables under fire conditions — Test for resistance to vertical flame propagation for a single insulated conductor or cable — Part 1: Apparatus.*

EN 50265-2-1, *Common test methods for cables under fire conditions — Test for resistance to vertical flame propagation for a single insulated conductor or cable — Part 2-1: Procedures — 1 kW pre-mixed flame.*

EN 50265-2-2, *Common test methods for cables under fire conditions — Test for resistance to vertical flame propagation for a single insulated conductor or cable — Part 2-2: Procedures — Diffusion flame.*

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

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

EN ISO 3411:1999, *Earth-moving machinery — Human physical dimensions of operators and minimum operator space envelope (ISO 3411:1995).*

EN ISO 3450:1996, *Earth moving machinery – Braking systems of rubber-tyred machines – Systems and performance requirements and test procedures (ISO 3450:1996).*

EN ISO 6682, *Earth-moving machinery – Zones of comfort and reach for controls (ISO 6682:1986 including Amendment 1:1989).*

EN ISO 6683, *Earth-moving machinery — Seat belts and seat belt anchorages (ISO 6683:1981 + Amendment 1:1990).*

EN ISO 8030, *Rubber and plastic hoses — Method of test for flammability (ISO 8030:1995).*

ISO 1813, *Belt drives — V-ribbed belts, joined V-belts and V-belts including wide section belts and hexagonal belts — Electrical conductivity of antistatic belts: Characteristics and methods of test.*

ISO 3864 *Safety colours and safety signs.*

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

ISO 6405-2 *Earth-moving machinery — Symbols for operator controls and other displays - Part 2: Specific symbols for machines, equipment and accessories.*

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

ISO 7000, *Graphical symbols for use on equipment — Index and synopsis.*

ISO 10570, *Earth-moving machinery — Articulated frame lock — Performance requirements.*

3 Terms and definitions

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

3.1 vehicle

self-propelled rubber tyred machine running on the mine floor, designed for carrying persons, carrying or loading material or mineral, or with attached equipment designed to be used in mining operations. Examples of such vehicles are: load-haul-dump vehicles (LHD), dump trucks, supplies/materials vehicles, service vehicles, personnel carriers and the vehicle part of scaling rigs and shotcreting vehicles.

NOTE Vehicles covered by this standard are designed to operate in mines which have restricted widths and heights, therefore the machines are more compact so as to safely negotiate the mine roadways.

3.2 driver

designated person, suitably trained and qualified by knowledge and practical experience and provided with the necessary instructions to ensure safe travelling of the vehicle

3.3 braking systems

all the elements which combine together to brake and hold the vehicle. Such systems consist of a control, means of power transmission and the brake itself.

3.3.1 service braking system

primary system used for stopping and holding the vehicle

3.3.2 secondary braking system

braking system that can be applied manually or automatically to stop the vehicle

3.3.3 parking braking system

system used to hold a stopped vehicle in the stationary condition

3.4 maximum vehicle weight

operating weight of the fully laden vehicle up to that weight which includes the heaviest combination of cab, canopy, ROPS or FOPS with all their components and mountings, and equipment intended by the manufacturer of the vehicle, a driver of 80 kg and full fuel tank and full lubricating, hydraulic and cooling systems

3.5

mid-point switch disconnecter

device designed to disconnect the power of a traction battery at a place where the voltage between the positive take-off lead and the mid-point switch disconnecter is approximately equal to that between the mid-point switch disconnecter and the negative take-off lead

4 List of significant hazards

Table 1 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.

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Table 1 — List of significant hazards with associated requirements

EN 1050:1996,annex A	Hazards according to EN 1050:1996, annex A	Relevant clause/subclause of this standard
1	Mechanical hazards due to:	5.1, 5.2,5.3, 5.12
	- machine parts or workpieces, e.g.:	
	a) shape; b) relative location c) mass and stability d) inadequacy of mechanical strength	
1.1	Crushing hazard	
1.2	Shearing hazard	5.1.2, 5.1.5, 5.3, 5.12
1.3	Cutting or severing hazard	5.1.2, 5.1.5, 5.12
1.4	Entanglement hazard	5.1.2, 5.12
1.5	Drawing-in or trapping hazard	5.1.2, 5.12
1.6	Impact hazard	5.1.2, 5.1.5, 5.3, 5.12
1.7	Stabbing or puncture hazard	5.1.2, 5.1.5, 5.12
1.8	Friction or abrasion hazard	5.1.2, 5.12
1.9	High pressure fluid injection hazard	5.4.1, 5.4.2
2	Electrical hazard due to:	
2.1	Contact of person with live parts (direct contact)	5.5
2.2	Contact of person with parts which have become live under faulty conditions (indirect contact)	5.5
2.4	Electrostatic phenomena	5.5.1
3	Thermal hazards , resulting in:	
3.1	Burns and scalds by contact with objects or materials with an extreme high or low temperature, by flames or explosions and also by the radiation of heat sources	5.1.1, 5.4.1, 5.4.2, 5.13
3.2	Damage to health by hot or cold working environment	5.12

EN 1050:1996,annex A	Hazards according to EN 1050:1996, annex A	Relevant clause/subclause of this standard
7	Hazards generated by materials and substances (and their constituent elements) processed or used by the machinery	
7.1	Hazards from contact with or inhalation of harmful fluid, gases, mists, fumes and dusts	5.1.7, 5.4.1, 5.4.2, 5.6
7.2	Fire or explosion hazard	5.1.7, 5.4.1, 5.4.2, 5.5, 5.6, 5.7, 5.13
8	Hazards generated by neglecting ergonomic principles in machinery design, e.g. hazards from:	
8.1	Unhealthy postures or excessive effort	5.11, 5.12
8.2	Inadequate consideration of hand-arm or foot-leg anatomy	5.12
8.4	Inadequate area lighting	5.8
8.5	Mental overload and underload, stress	5.11
8.6	Human error	5.11
10	Unexpected start-up/over-run/over-speed (or any similar malfunction) from:	
10.1	Failure/disorder of the control system	5.4, 5.5, 5.10, 5.11
11	Impossibility of stopping the machine in the best possible conditions	5.10, 5.11
13	Failure of the power supply	5.4, 5.5, 5.6, 5.10, 5.11,
14	Failure of the control circuit	5.4, 5.5, 5.10, 5.11
15	Errors of fitting	7
17	Falling or ejected objects or fluids	5.4
18	Loss of stability/overturning of machinery	5.1.4, 5.2, 5.3, 5.12
20	Relating to the travelling function:	
20.1	Movement when starting the engine	5.10
20.2	Movement without a driver at the driving position	5.10.4
20.3	Movement without all parts in a safe	5.11.1.2

EN 1050:1996,annex A	Hazards according to EN 1050:1996, annex A	Relevant clause/subclause of this standard
	position	
20.5	Excessive oscillations when moving	5.1.4
20.6	Insufficient ability of machinery to be slowed down, stopped and immobilised	5.10, 5.11
21	Linked to the work position (inc. driving station) on machine:	
21.1	Fall of persons during access to (or at/from) the work position	5.12
21.2	Exhaust gases/lack of oxygen at the work position	5.6.1, 5.6.2, 5.6.3
21.3	Fire (flammability of the cab, lack of extinguishing means)	5.12, 5.13
21.4	Mechanical hazards at the work position: a) rollover; b) rollover; c) fall of objects, penetration by objects;	5.12 5.12
21.5	Insufficient visibility from the work positions	5.12
21.6	Inadequate lighting	5.8, 5.11.3
21.7	Inadequate seating	5.12.4
22	Due to the control system:	
22.1	Inadequate location of manual controls	5.11
22.2	Inadequate design of manual controls and their mode of operation	5.11
23	From handling the machine (lack of stability)	5.1.4
24	Due to the power source and to the transmission of power:	
24.1	Hazards from the engine and the batteries	5.5, 5.6
24.3	Hazards from couplings and towing	5.1, 5.3
25	From/to third persons:	
25.1	Unauthorised start-up/use	5.11
25.3	Lack or inadequacy of visual or acoustic	5.9