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SIST EN 12321:2004+A1:2009

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EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

EN 12321:2003+A1

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English Version

Underground mining machinery - Specification for the safety requirements of armoured face conveyors

Machines d'exploitation souterraine - Spécification relative aux prescriptions de sécurité des transporteurs blindés à chaîne à raclettes

Bergbaumaschinen unter Tage - Sicherheitsanforderungen an Kettenkratzerförderer

This European Standard was approved by CEN on 11 March 2003 and includes Amendment 1 approved by CEN on 24 February 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.

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 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 12321:2003+A1:2009) has been prepared by Technical Committee CEN /TC 196 "Machines for underground mines - 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of an identical text or by endorsement, at the latest by October 2009, and conflicting national standards shall be withdrawn at the latest by December 2009.

This document includes Amendment 1, approved by CEN on 2009-02-24.

This document supersedes EN 12321:2003.

The start and finish of text introduced or altered by amendment is indicated in the text by tags $\boxed{A_1}$ $\boxed{A_1}$.

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).

$\boxed{A_1}$ For relationship with EU Directive(s), see informative Annexes ZA and ZB, which are integral parts of this document. $\boxed{A_1}$

Annex A is informative.

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.

EN 12321:2003+A1:2009 (E)**Introduction**

This European Standard is a type C standard as stated in EN 1070.

The extent to which hazards are covered is indicated in the scope of this standard. When compiling this standard it has been assumed that:

components are:

- designed in accordance with good engineering practice, taking account of expected shocks and vibrations and calculation codes, including all failure modes;
- of sound mechanical and electrical construction;
- made of materials with adequate strength and of suitable quality; and
- 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, purchaser and/or user (e.g. for fire resistant fluids, safety equipment and load restraining devices).

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1 Scope

1.1 This European Standard specifies the safety requirements for armoured face conveyors and covers, conveyor drive units, return units, line pans, chain assemblies, devices for tensioning and locking chains.

This European Standard does not apply to stage loader ancillaries, armoured face conveyors which form part of mineral bunker systems or operate as spillage conveyors, to haulage systems and guides utilised by extraction machines, to the technical requirements for cable-less remote controls, to compressed air powered machines, or to the interfaces between the elements of the conveyor and other machine installations.

Armoured face conveyors are designed for the transport of minerals and rock only.

NOTE Armoured face conveyors can be used as a base for guiding the extraction machine and as a link between the face roof support and the extraction machine if required.

This European Standard deals with all hazards, hazardous situations and events for the use in mines, when they are used as intended and for the conditions foreseen by the manufacturer. See clause 4 for the hazards dealt with.

1.2 This European Standard does not cover any hazards resulting from the electrical equipment associated with the machine. It does not contain any requirements relating to dust suppression or firedamp hazards. Hazards due to noise are also excluded from this European Standard, but a separate European Standard is in preparation where hazards due to noise will be addressed.

It is intended for manufacturers producing and marketing complete machines, and for manufacturers assembling new parts from different origins or assembling new machines even for their own use. These are called "manufacturers" in this European Standard.

1.3 This European Standard applies to armoured face conveyors which are manufactured after the date of issue of this European Standard.

2 Normative references

This European Standard incorporates by dated or undated references, 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, *Safety of machinery — Basic concepts, general principles for design — Part 2: Technical principles and specifications.*

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

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 894-1, *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 894-2, *Safety of machinery — Ergonomics requirements for the design of displays and control actuators — Part 2: Displays.*

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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 movable guards.*

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

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

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

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 61310-2, *Safety of machinery — Indication, marking and actuation — Part 2: Requirements for marking (IEC 61310-2:1995).*

EN ISO 8030, *Rubber and plastic hoses — Methods of test for flammability (ISO 8030:1987)*

ISO 3864, *Safety colours and safety signs.*

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

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3 Terms and definitions

For the purposes of this European Standard, the following terms and definitions, together, where appropriate, with those given in EN 1070:1998 apply:

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3.1

armoured face conveyor

conveying device used to transport mineral and rock in a steel plate line pan by means of the scrapers of a chain assembly

3.2

conveyor drive

assembly comprising drive frame, sprocket gearbox, coupling and motor

3.3

return unit

assembly comprising frame and sprocket

3.4

chain assembly

comprising of scrapers and link chain

3.5

sprocket

drive element which can transmit motor torque and the resulting movement to the chain assembly

3.6

scraper

element in the chain assembly which pushes conveyed rock and mineral

3.7

tensioning device

means of tensioning the chain assembly

3.8**chainlocking device**

means of preventing movement of the chain assembly at the coupling and de-coupling point

3.9**anchorage**

means of securing the armoured face conveyor or drive frame against uncontrolled movement

3.10**line pan**

intermediate components between the two ends of the conveyor designed to carry the chain assembly/mineral and rock

3.11**furnishings**

auxiliary equipment attached to the armoured face conveyor

4 List of significant hazards**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:	
	- machine parts or workpieces, e.g.:	
	a) shape;	5.9.2
	b) relative location;	5.6.1, 5.10, 5.2.1, 5.3.2
	c) mass and stability;	5.7, 5.9.2
	d) mass and velocity (kinetic energy of elements in controlled or uncontrolled motion);	5.7, 5.9.2
	e) inadequacy of mechanical strength;	5.11.1
1.1	Crushing hazard	5.2, 5.3, 5.8, 5.9.1, 5.10, 5.11.1, 5.11.2
1.2	Shearing hazard	5.2, 5.3, 5.8, 5.10, 5.11.1, 5.11.2
1.3	Cutting or severing hazard	5.2, 5.3, 5.8, 5.10, 5.11.1, 5.11.2
1.4	Entanglement hazard	5.2, 5.3, 5.8, 5.10, 5.11.1, 5.11.2
1.5	Drawing-in or trapping hazard	5.2, 5.3, 5.8, 5.10, 5.11.1, 5.11.2
1.6	Impact hazard	5.2, 5.3, 5.7, 5.9, 5.10, 5.11.1, 5.11.2
1.8	Friction or abrasion hazard	5.2, 5.3, 5.11.1
1.9	High pressure fluid injection hazard	5.5.3, 5.6.1
2	Electrical hazard due to:	
2.1	Contact of person with live parts (direct contact)	5.8
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	5.4, 5.5.3, 5.8, 5.10
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	5.5.2, 5.8, 5.10
7.2	Fire or explosion hazard	5.4
8	Hazards generated by neglecting ergonomic principles in machinery design, e.g. hazards from:	

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Table 1 (continued)

EN 1050:1996 annex A	Hazards according to EN 1050:1996 annex A	Relevant clause/subclause of this standard
8.1	Unhealthy postures or excessive effort	5.1.2, 5.6.2, 5.9.1, 5.9.2
8.6	Human error	5.1.2, 5.9.2
8.7	Inadequate design, location or identification of manual controls	5.1.2
8.8	Inadequate design or location of visual display units	5.1.2
10	Unexpected start-up/over-run/over-speed (or any similar malfunction) from:	
10.2	Restoration of energy supply after an interruption	5.2
11	Impossibility of stopping the machine in the best possible conditions	5.3.4
14	Failure of the control circuit	5.3
15	Errors of fitting	5.9.2
17	Falling or ejected objects or fluids	5.7, 5.9.2
18	Loss of stability/overturning of machinery	5.9.1
19	Slip, trip and fall of persons (related to machinery)	5.5.3
Additional hazards, hazardous situations and hazardous events due to mobility		
22	Due to the control system:	
22.1	Inadequate location of manual controls	5.3.2
23	From handling the machine (lack of stability)	
25	From/to third persons:	
25.1	Unauthorised start-up/use	5.2.4, 5.2.2, 5.3.3
25.2	Drift of a part away from its stopping position	5.3.4
25.3	Lack or inadequacy of visual or acoustic warning means	5.2
26	Insufficient instructions for the driver/operator	5.4
Additional hazards due to underground work		
30	Mechanical hazards/events due to:	
32	Fire and explosion	5.4, 5.6.1

5 Safety requirements/protective measures

5.1 General

5.1.1 Initial requirements

The extent to which hazards are covered is indicated in the scope of this standard. In addition machinery shall conform to EN 292-1 and EN 292-2 for hazards which are not covered by this standard.

For the application of EN 457, EN 953 and EN 982 the manufacturer shall carry out an adequate risk assessment for the requirements thereof where choice is necessary.

NOTE This specific risk assessment is part of the general risk assessment relating to the hazards not covered by this C standard.

5.1.2 Control systems

Control devices shall be designed, arranged and marked in accordance with EN 894 and have dimensions conforming to EN 547-3 so that they can be operated easily and safely. Minimum distances shall be as follows:

- a) 50 mm for operating handles that require a force of > 50 N;
- b) 25 mm for operating handles that require a force of < 50 N;
- c) 10 mm between rows of push buttons or switches;
- d) 15 mm between separate push buttons;

Control devices shall be designed such that intentional human action is needed. Control devices shall be so designed, arranged or protected that they cannot be operated accidentally, which could lead to a hazardous situation.

5.2 Starting

5.2.1 Pre-start warning

The armoured face conveyor shall be provided with audible pre-start warning systems conforming to EN 457. The intention is that the warning shall be provided throughout the intended length of the conveyor (see also clause 0, Introduction, on negotiation).

The pre-start warning shall last for a minimum of 5 seconds after which time the machine can start. The warning shall continue for a period of a minimum of 3 seconds after power is applied to the drive(s).

The requirements of this 5.2.1 need not apply to drive motor(s) dedicated to the chain tensioning devices specified in 5.11.1.

5.2.2 Local starting

The local operating control panel(s) shall be located at or near the conveyor (see clause 0, Introduction, on negotiation).

The local starting operation mode shall provide for the starting of a drive, or any combination of drives, of an armoured face conveyor by a manual operation. Starting shall be interlocked with the safety related devices provided for the drives.

The local starting shall override any remote control.

5.2.3 Mode selection

Where more than one mode of control is available, i.e. local, remote and combination of drives, the mode of control shall be selected at the local control panel. Selection of a particular mode shall ensure that starting is only available from the selected point. The mode selection switch shall be stable in each position.

5.3 Stopping

5.3.1 Normal stopping

Each control panel shall be equipped with a switch to switch off all drives and groups of drives of an armoured face conveyor controlled from that control panel.

The local stopping shall override any remote control.

5.3.2 Additional stopping

Means to stop the conveyor shall be provided at intervals throughout its length (see clause 0 on negotiation). The actuation of this stopping device shall induce a locked out position of the stop control. The locked out stop control shall prevent restarting until the control device is reset.

The local stopping shall override any remote control.