SLOVENSKI STANDARD
SIST EN 619:2003+A1:2011

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Nadomešča:
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Naprave in sistemi za kontinuirni transport - Varnostne zahteve in zahteve za elektromagnetno združljivost naprav, sistemov in opreme za kontinuirni transport kosovnih tovorov (vključno z dopolnilom A1)

Continuous handling equipment and systems - Safety and EMC requirements for equipment for mechanical handling of unit loads

Stetigförderer und Systeme - Sicherheits- und EMV-Anforderungen an mechanische Fördereinrichtungen für Stückgut

Equipements et systèmes de manutention continue - Prescriptions de sécurité et de CEM pour les équipements de manutention mécanique des charges isolées

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EUROPEAN STANDARD

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Continuous handling equipment and systems - Safety and EMC requirements for equipment for mechanical handling of unit loads

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This European Standard was approved by CEN on 8 March 2001 and includes Amendment 1 approved by CEN on 28 September 2010.

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

Management Centre: Avenue Marnix 17, B-1000 Brussels

Contents

Foreword

This document (EN 619:2002+A1:2010) has been prepared by Technical Committee CEN/TC 148 "Continuous handling equipment and systems - Safety" the secretariat of which is held by AFNOR.

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of an identical text or by endorsement, at the latest by April 2011 and conflicting national standards shall be withdrawn at the latest by April 2011.

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 includes Amendment 1, approved by CEN on 2010-09-28.

This document supersedes EN 619:2002.

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

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(s), see informative Annexes ZA and ZB, which are integral parts of this document.

This draft standard forms part of a series of five draft standards the titles of which are given below:

— 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 618, *Continuous handling equipment and systems — Safety and EMC requirements for equipment for mechanical handling of bulk materials except fixed belt conveyors*;

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

— EN 620, *Continuous handling equipment and systems — Safety and EMC requirements for fixed belt conveyors for bulk material*;

— EN 741, *Continuous handling equipment and systems — Safety requirements for systems and their components for pneumatic handling of bulk materials*.

The Annexes A, B, C, D, E, F and H are normative, the Annexes G, ZA and ZB are 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, Croatia, 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 the United Kingdom.

Introduction

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

The machinery concerned and the extent to which hazards are covered are indicated in the scope of this standard.

While producing this standard it was assumed that:

— only competent persons operate the machine;

— components without specific requirements are:

  a) designed in accordance with the usual engineering practice and calculation codes, including all failure modes;

  b) of sound mechanical and electrical construction;

  c) made of materials with adequate strength and of suitable quality;

  d) made of materials free of defects;

— harmful materials, such as asbestos are not used as part of the machine;

— components are kept in good repair and working order, so that the required characteristics remain despite wear;

— by design of the load bearing elements, a safe operation of the machine is assured for loading ranging from zero to 100 % of the rated possibilities and during the tests;

— dialogue has taken place between the user and the supplier concerning the conditions for the use and places of use of the machinery;

— the working area is adequately lit;

— the places of installation allow a safe use of the machine.

1 Scope

1.1 This European standard deals with the technical requirements to minimise the hazards listed in Clause 4 and Annex B. These hazards can arise during the operation and maintenance of continuous handling equipment and systems when carried out in accordance with the specifications given by the manufacturer or his authorised representative. This standard deals with safety related technical verification during commissioning.

1.2 This standard applies to mechanical handling devices defined in Clause 3, singly or combined to form a conveyor system, and designed exclusively for moving unit loads continuously on a predefined route from the loading to the unloading points, possibly with varying speed or cyclically. In general, it also applies to conveyors which are built into machines or attached to machines.

1.3 Safety requirements and/or measures in this standard apply to equipment used in all environments. However, additional risk assessments and safety measures need to be considered for uses in severe conditions, e.g. freezer applications, high temperatures, corrosive environments, strong magnetic fields, potentially explosive atmospheres, radioactive conditions and loads the nature of which could lead to a dangerous situation (e.g. molten metal, acids/bases, specially brittle loads, explosives) operation on ships and earthquake effects and also contact with foodstuff. Hazards during decommissioning are not covered.

1.4 This European Standard deals with the technical requirements for electromagnetic compatibility (EMC).

1.5 This standard does not cover hazards during decommissioning and hazards generated by noise. It also does not cover operation in environments where the electromagnetic disturbances are outside the range of those specified in EN 61000-6-2.

This standard does not apply to conveying equipment and systems used underground or in public areas and to aircraft ground support equipment.

NOTE 1 Aircraft ground support equipment is covered by the standards of CEN/TC 247.

NOTE 2 Conveying equipment and systems used in public areas will be covered in an amendment.

NOTE 3 Hazards generated by noise will be dealt with in an amendment.

2 Normative references

[A1] The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies. [A1]

EN 81-3, *Safety rules for the construction and installation of lifts — Part 3: Electric and hydraulic service lifts*

[A1] *deleted text* [A1]

EN 294:1992, *Safety of machinery — Safety distances to prevent danger zones being reached by the upper limbs*

EN 341, *Personal protective equipment against falls from a height — Descender devices*

EN 349:1993, *Safety of machinery — Minimum gaps to avoid crushing of parts of the human body*

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

[A1] *deleted text* [A1]

EN 614-1, *Safety of machinery — Ergonomic design principles — Part 1: Terminology and general principles*

EN 626-1, *Safety of machinery — Reduction of risks to health from hazardous substances emitted by machinery: Part 1: Principles and Specifications for machinery manufacturers*

EN 795:1996, *Protection against falls from a height — Anchor devices — Requirements and testing*

EN 842, *Safety of machinery — Visual danger signals — General requirements, design and testing*

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

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

EN 982:1996, *Safety of machinery — Safety requirements for fluid power systems and their components — Hydraulics*

EN 983:1996, *Safety of machinery — Safety requirements for fluid power systems and their components — Pneumatics*

EN 1037, *Safety of machinery — Prevention of unexpected start-up*

EN 1050, *Safety of machinery — Principles for risk assessment*

EN 1070, *Safety of machinery — Terminology*

EN 1088:1995, *Safety of machinery — Interlocking devices associated with guards — Principles for design and selection*

EN 1760-1, *Safety of machinery — Pressure sensitive protective devices — Part 1: General principles for the design and testing of pressure sensitive mats and pressure sensitive floors*

〚A1〛 EN 13557:2003+A2:2008, *Cranes — Controls and control stations* 〈A1〉

〚A1〛 *deleted text* 〈A1〉

EN 50081-1, *Electromagnetic compatibility — Generic emission standard — Part 1: Residential, commercial and light industry*

EN 61000-6-2:1999, *Electromagnetic compatibility (EMC) — Part 6-2: Generic standards — Immunitiy for industrial environments*

EN 60204-1:1997, *Safety of machinery — Electrical equipment of machines — Part 1: General requirements (IEC 60204-1:1997 + prA1 1998)*

EN 60204-11:1998, *Safety of machinery — Electrical equipment of machines — Part 11: General requirements for voltages above 1000 V a.c. or 1500 V d.c. and not exceeding 36 kV*

EN 60529:1999, *Degrees of protection provided by enclosures (IEC 60529: 1989/A1:1999)*
A1:2000

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

prEN 61496-2:1997, *Safety of machinery — Electrosensitive protective equipment — Part 2: Particular requirements for equipment using active optoelectronic protective devices*

〚A1〛 EN ISO 7731, *Ergonomics — Danger signals for public and work areas — Auditory danger signals (ISO 7731:2003)*

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

EN ISO 12100-2:2003[1)], *Safety of machinery — Basic concepts, general principles for design — Part 2: Technical principles (ISO 12100-2:2003)*

EN ISO 13732-1, *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 14122-2:2001, *Safety of machinery — Permanent means of access to machines and industrial plants — Part 2: Working platforms and walkways (ISO 14122-2:2001)*

EN ISO 14122-3:2001, *Safety of machinery — Permanent means of access to machines and industrial plants — Part 3: Stairways, stepladders and guard-rails (ISO 14122-3:2001)*

ISO 3864-1, *Graphical symbols — Safety colours and safety signs — Part 1: Design principles for safety signs in workplaces and public areas* ⟨A1⟩

ISO 4309, *Cranes — Wire ropes — Code of practice for examination and discard*

NOTE Specific references may be added to this standard after the EN B-standards are completed.

3 Terms and definitions

For the purposes of this standard, the terms and definitions in EN 1070 and the following terms and definitions apply:

3.1
working area
area, as intended by the manufacturer, where persons work at or operate conveyors under normal conditions (inspection, maintenance and cleaning are excluded)

NOTE For manufacturers information relating to intended use, see Introduction “dialogue”.

3.2
traffic area
area, as intended by the manufacturer, which is accessible to or reachable by all persons without opening a guard, activating a trip device or using additional means

NOTE For manufacturers information relating to intended use, see Introduction “dialogue”.

3.3
transport area
area or space required by the moving element of a conveyor and its load

NOTE For manufacturers information relating to intended use see Introduction “dialogue”.

3.4
traction element
power driven parts of a conveyor which move the loads directly or indirectly e.g. belts, chains, straps, wire ropes

NOTE Traction elements can also be carrying elements, e.g. the chain of a drag chain conveyor.

⟨A1⟩ 1) EN ISO 12100-2:2003 is impacted by EN ISO 12100-2:2003/A1:2009, *Safety of machinery — Basic concepts, general principles for design — Part 2: Technical principles — Amendment 1 (ISO 12100-2:2003/Amd 1:2009)*. ⟨A1⟩

3.5
carrying element
parts of a conveyor which carry the loads

NOTE Carrying elements can also be traction elements, e.g. the chain of a drag chain conveyor.

3.6
belt conveyor
conveyor with an endless belt acting as a carrying and traction element. The belt is supported by rollers or slides on a surface (Figure A.1)

3.7
chain conveyor
conveyor with single or multiple strand, endless chains

3.7.1
drag chain conveyor
conveyor with chains as traction or carrying elements (Figure A.2), possibly with pushers attached to the chains

3.7.2
plate or link conveyor
conveyor with chains as traction elements and rods, battens, plates, or troughs as carrying elements for holding loads (Figure A.3)

3.8
single strand drag chain conveyor
conveyor with a single strand chain or wire rope in a duct beneath or above the ground as a traction element directly connected with transport cars (Figure A.4)

3.9
overhead conveyor
conveyor in which carrying elements are hanging on overhead tracks and are attached e.g. directly to either the traction chains or ropes or to separate trolleys powered by chain driven pusher dogs (Figure A.5)

3.10
swing tray, fixed tray and similar conveyors
conveyor in which the carrying element is attached with one or more chain strands that run in parallel as traction elements (Figure A.6)

3.11
roller conveyor, wheel conveyor and ball transfer table
conveyor in which some or all of the rollers, wheels or balls are driven (Figure A.8) or can rotate freely (Figure A.7)

3.12
self-propelled overhead conveyor
overhead conveyor with individually driven carrying elements (Figure A.9)

3.13
transfer car
mechanically guided car for transferring unit loads which is taken from a conveyor, pushed laterally and delivered to another conveyor or to another device (Figure A.10).

3.14
vertical transfer device
device with raising or lowering movements of more than 200 mm in the path of conveyors in which unit loads can be transferred from one defined level to one or more defined levels by a carrying element (Figure A.11)

NOTE These are not to be considered as goods lifts according to EN 81-3.

3.15
horizontal transfer device
permanently installed unit in the path of conveyors which diverts the unit loads at the same conveying level in a direction deviating from the original conveying direction e.g. turntable (Figure A.12)

3.16
competent person
designated person, suitably trained and qualified by knowledge and practical experience, and provided with the necessary instructions to enable the required task to be carried out safely

4 Hazards

The most important hazards are given in this clause. For a full list of hazards, see Annex B.

NOTE The hazards described below usually occur in conveyor installations in combination, e.g. crushing, shearing and drawing-in points in the case of conveyors with pusher dogs.

4.1 Mechanical hazards

Common examples of mechanical hazards are shown in Annex C.

4.1.1 Crushing and shearing hazards

Hazards may occur where parts can be moved against one another or against fixed parts or past one another or past other fixed parts so that persons or parts of their bodies can be crushed or sheared (e.g. Figures C.1 and C.2).

4.1.2 Entanglement hazards

Hazards may occur where projecting sharp edges, teeth, wedges, screws, lubricating nipples, shafts, shaft ends or the like move so that persons, parts of their bodies or their clothing can be caught and carried along.

4.1.3 Drawing-in hazards

Hazards may occur where parts move so that a constriction is formed in which persons, parts of their bodies or their clothing can be drawn in.

Examples of drawing in points are as follows:

— between the traction or carrying elements or attached pushers and fixed parts of the conveyor or of the surroundings (e.g. Figures C.4 and C.5);

— at the traction or carrying elements in the area of direction changing points;

— between the traction or carrying elements and supporting rollers, if the traction or carrying element cannot deviate by at least 0,05 m upwards (e.g. Figure C.3a));

— at contact points of pushers on slide ways;

— at transfer points of conveyors as well as at chutes, roller and gravity tables (e.g. Figures C.3b) and C.3c)).

4.1.4 Impact hazards

Hazards may occur where parts move in relation to persons so that injury of persons or parts of their bodies is caused by impact (e.g. Figure C.6).

4.1.5 Falling objects

Hazards may occur as a result of falling of the machine or parts of the machine or unit loads.

4.1.6 Slip, trip and fall hazards

Hazards may occur e.g. depending on design of gangway and platforms.

4.2 Electrical hazards

Electrical hazards may arise e.g. from:

— direct or indirect contact with live parts as a result of damage to insulation;

— from electrostatic charging (due to the nature of the material);

— incorrect isolation switching of the supply to the system or individual sections and as a result of material or moisture ingress into electrical systems.

4.3 Hazards due to thermal influences

4.3.1 Thermal hazards may arise from touching heat sources.

4.3.2 Health-damaging effects may result from a hot or cold working environment.

4.4 Hazards due to neglecting ergonomic principles in machine design

Hazards may arise e.g. from:

— poor design of control devices and working places;

— overstress of personnel with regard to speed and effort.

4.5 Hazards caused by failure of energy supply, breaking down of machinery parts or other functional disorders

4.5.1 Hazards can occur in the case of failure of energy supply if conveyors or loads reverse or fall back unintentionally. If rollers break on a self propelled overhead conveyor, the trolley can derail.

4.5.2 Hazards due to component failure may occur e.g. breakage of roller on a self propelled overhead conveyor which can cause the trolley to fall.

4.5.3 Hazards may arise as a result of unexpected ejection of machine parts or fluids e.g. failure of hydraulic or pneumatic components.

4.5.4 On large installations, hazards, e.g. hydraulic, pneumatic, electrical, mechanical, may arise due to incorrect assembly on site as a result of inadequate erection or assembly instructions.

5 Safety requirements and/or measures

Machinery shall comply with the safety requirements and/or measures of this clause and in addition with ⟨A1⟩ EN ISO 12100-1 and EN ISO 12100-2 ⟨A1⟩ for hazards relevant but not significant which are not dealt with in this standard.

Where for safety reasons areas containing continuous handling equipment are completely enclosed, entrance into this area shall only be possible via interlock gates. This interlock shall give a stop command when actuated. Restarting of the equipment shall only be under control of those persons utilising a key dependence system.

When stopping occurs by e.g. tripping of safety devices, buffers, end stops, the stopping distance shall be as short as possible but compatible with the safety of the system.

5.1 Measures for protection against mechanical hazards

5.1.1 Measures for protection against crushing and shearing hazards

5.1.1.1 General

In the working and traffic area danger zones between powered and fixed components of horizontal or vertical transfer points, feed points, diverting points, horizontal and vertical transfer devices and gates shall be safeguarded. This shall be achieved e.g. by providing a continuous maximum gap of 5 mm between moving and fixed components (see Figure D.1).

Alternatively, the danger zones shall be safeguarded e.g. by fences (wire mesh in accordance with EN 294), interlocking doors or gates or trip devices (photo electric devices, pressure sensitive mats). If the load creates a danger zone, its most unfavourable position shall be taken into account.

See EN 1088, EN 1760-1 and prEN 61496-2:1997.

NOTE See also EN 953.

5.1.1.2 Enclosed units

Loading and unloading openings of enclosed units shall be designed in such a way that they prevent access to danger areas. If they are not, danger areas shall be safeguarded by inlet or outlet tunnel guards or interlocking guards as defined in 3.2 of EN 1088:1995. If the load creates a danger zone its most unfavourable position shall be taken into account. Tunnel guards shall be dimensioned using EN 294 for guidance. An example of protective devices at loading and unloading openings is shown in Figure D.2.

5.1.1.3 Lateral safety distances for conveyors

In the working and traffic area danger zones (as identified by risk assessment) between conveyed loads and fixed adjacent objects shall be avoided by minimum gaps in accordance with Table 1 of EN 349:1993 or shall be safeguarded e.g. by trip devices.

5.1.1.4 Lateral safety distances for all overhead conveyors

In the working and traffic areas, a lateral minimum gap of 0,5 m up to a height of 2,5 m above the standing surface of persons shall be maintained between the conveyors, their loads and fixed objects in the surroundings (see Figure D.3).

5.1.1.5 Specific lateral safety distances for self-propelled overhead conveyors

Outside the working and traffic area, a continuous safety space in which persons can find protection from approaching vehicles shall be present at least on one side next to each transport area of rail-mounted overhead conveyors. The safety space shall be at least 2,5 m high and 0,5 m wide (see Figure D.3).

Fixed obstructions in the safety space of a self-propelled overhead conveyor with a maximum speed of 1,0 m/s are permitted if safety spaces of at least 1 m long by 2,5 m high by 0,5 m depth are located at maximum intervals of 10 m (see Figure D.4).

5.1.1.6 Safety distances under self-propelled overhead conveyors

The following safety distances shall be maintained under self-propelled overhead conveyors, including the suspended conveyed materials, in the working and traffic area down to the floor or up to fixed objects:

— at least 0,12 m between the ground and mobile units in the working and traffic area (see Figure D.5);

— at least 0,5 m, above parts of structures or machines and above other traffic and transport means which move under self-propelled overhead conveyors where persons can be injured by crushing hazards (see Figure D.6);

— at least 2,5 m above permanent work places and traffic routes for persons (see Figure D.6) provided no other safety measures are taken, e.g. underguarding with a minimum height of 2,1 m.

5.1.1.7 Safety distances between mobile units of self-propelled overhead conveyors

In working and traffic areas the carrying elements of self-propelled overhead conveyors shall be stopped so as to leave a clearance in the direction of travel between two mobile units and/or their loads of at least 0,5 m up to a height of 2,5 m above the floor of the working level of the personnel (see Figure D.5). Swinging of the mobile units shall be taken into account.

Where these safety conditions are not achieved e.g. incline/decline areas of overhead conveyors then guarding, e.g. handrail, fences, etc shall be provided according to Table 4 of EN 294:1992.

5.1.1.8 Prevention of access beneath vertical transfer devices

Vertical transfer devices capable of being lowered to a height of less than 2,5 m shall be provided with means of preventing access of persons to the area beneath the carrying elements and/or their loads. This may be achieved e.g. by the provision of an interlocked door or guard.

5.1.1.9 Safety clearances in vertical transfer devices

For maintenance purposes above the lifting element of a vertical transfer device, a clear volume of 0,5 m x 0,6 m x 0,8 m high shall be provided by construction or ensured by a built-in blocking device. For maintenance purposes below, these dimensions shall be 0,5 m x 0,6 m x 1,0 m high. If the accessible volume is less than the dimensions above all maintainable components shall be reachable from the outside.

5.1.2 Measures for protection against entanglement hazards

Fixed guards as defined in 3.2 of EN 953:1997 shall be provided to prevent reaching entanglement danger zones.

5.1.3 Measures for protection against drawing-in hazards

5.1.3.1 Danger zones at transmission parts

In working and traffic areas, safeguards for hazards arising at rotating shafts and couplings, chains and chain wheels, gears and power transmissions, belts, pulleys and rough moving surfaces shall be made by means of fixed guards or interlocking guards and in accordance with the requirements of EN 294:1992, Table 4, EN 1088:1995, 3.2 and as defined in EN 953.

5.1.3.2 Drawing-in points at traction and carrying elements or pushing elements

In the working and traffic area drawing-in points, crushing and shearing points which arise because of the return of the traction and carrying elements or because of the movement of the pushing elements shall be avoided by design or safeguarded up to a height of at least 2,5 m.

Hazards are considered to be avoided by design if: