SLOVENSKI STANDARD

SIST EN 619:2003

01-maj-2003

Naprave in sistemi za kontinuirni transport - Varnostne zahteve in zahteve za elektromagnetno združljivost naprav, sistemov in opreme za kontinuirni transport kosovnih tovorov

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

Ta slovenski standard je istoveten z: **EN 619:2002**

ICS:

33.100.01

53.040.10

SIST EN 619:2003 **en**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 619

October 2002

ICS 33.100.01; 53.040.10

English version

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

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

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

This European Standard was approved by CEN on 8 March 2001.

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 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 Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

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

Management Centre: rue de Stassart, 36 B-1050 Brussels

Ref. No. EN 619:2002 E

Contents

Foreword

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

This document has to be implemented at national level, either by publication of an identical text or by endorsement, by April 2003, and conflicting national standards have to be withdrawn by April 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 EU Directive(s).

For relationship with EU Directive(s), see informative annexes ZA and ZB, 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 document: Austria, Belgium, the Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

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.

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

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

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 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*.

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

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

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*.

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)*.

prEN 13557: 1999, Cranes - Controls and control stations

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*.

ISO/DIS 3864-1:1999, *Safety colours and safety signs – Part 1 Safety signs in workplaces and public areas – Design principles*.

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.

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. Figure C1 and C2).

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. Figure C4 and C5) ;

— 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 C3a);

— at contact points of pushers on slide ways ;

— at transfer points of conveyors as well as at chutes, roller and gravity tables (e.g. Figure C3b and C3c).

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 C6).

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 EN 292-1 and EN 292-2 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 :

— a safety distance of at least 0,05 m is maintained where there is a risk of fingers and hands being caught ;

— a safety distance of at least 0,12 m is maintained where there is a risk of arms or feet being caught ;

— a safety distance of 0,5 m is maintained where there is a risk of bodies being caught.

Drawing-in points shall be guarded e.g. by the use of :

— nip guards directly at the drawing-in point which shall have a gap of 5 mm at the most (see Figure D.7) ;

— plate guards directly below the tracks of pushers (see Figure D.8) ;

— other measures e.g. guards, such as covers, fences, barriers, tunnels or trip devices such as pressure sensitive mats, photo electric devices. Safety distances shall be in accordance with EN 294:1992, Table 1.

5.1.3.3 Diverting points of traction elements

In the working and traffic area drums, wheels and rollers on which the traction elements are diverted by more than 3° and sprockets shall be protected by nip guards or fixed distance guards (see Figures D.7 and D.9).

5.1.3.4 Danger zones between drag chain conveyors and conveyed unit loads

In the working area, danger zones (see Figure C.2b) between conveyed unit loads and fixed parts between the chains of drag chain conveyors shall be safeguarded e.g. by complete panelling of the area above cross beams close below the transport level.

5.1.3.5 Wheels or rollers of tow carts

In the working and traffic areas wheels or rollers of tow carts moved by conveyors shall be arranged or protected so that foot injuries are prevented. Tow carts shall be designed in such a way that the measures are in accordance with those given in Figure D.10. If the drawing-in hazard extends to the full width of the tow cart the protection shall cover this width.

5.1.3.6 Rollers of overhead conveyors

In working and traffic areas rollers moving in tracks at a height less than 2,5 m above the ground shall be protected e.g. by wheel guards or other guards (see Figure D.11).

5.1.3.7 Contact points on driven roller conveyors

In the working and traffic area contact points between the drive element and driven rollers or pressure rollers area on driven roller conveyors shall be safeguarded by fixed guards (see Figure D.12). For a free space between rollers of less than 8 mm safeguarding is not required on the topside.

5.1.3.8 Drawing-in points on driven roller conveyors

In the working and traffic area drawing-in points at belt, sprocket or chain drives of driven roller conveyors shall be safeguarded by fixed guards (see Figure D.13).

5.1.3.9 Danger zones between roller conveyors and conveyed unit loads

In the working area danger zones at roller conveyors between conveyed unit loads and rollers shall be safeguarded e.g. by panelling the space between the rollers by filling pieces or plate covers which are brought up to the roller so that a gap of 5 mm at the most remains (see Figure D.14).

5.1.3.10 Drawing in points at supporting rollers

Drawing in points between carrying and traction elements and supporting rollers of belt conveyors shall be safeguarded if the carrying and traction elements cannot be deflected by at least 0,05 m upwards.

Supporting rollers of belt conveyors at working areas, e.g. picking stations, shall be covered completely.

5.1.4 Measures for protection against striking/collision hazards

5.1.4.1 Cross over passageways

In working and traffic areas it shall be ensured that persons crossing conveyors are not endangered by the moving conveyed loads.

The hazards and risks at the crossing points shall be assessed taking account of the speed and frequency of the conveyed loads together with the frequency of use by persons and the position of the crossing point. One or more safety measures shall be provided as appropriate, e.g. :

— cross over with infill plates ;

— bridge ;

— trip devices e.g. opto-electronic devices (see prEN 61496-2:1997) or pressure sensing mats (EN 1760-1) ;

— interlocking guards ;

— stop/start devices.

In any event, it shall be ensured that machinery can only be restarted by the voluntary actuation of a control provided for this purpose.

5.1.4.2 Prevention of access to danger zones

Access to specific danger zones which may arise by conveying elements such as transfer cars or vertical transfer devices shall be prevented (see 5.1.1.1 and 5.1.4.6). Where it is foreseeable that conveyor load entry/exit points may be misused to gain access to danger zones, access shall be prevented or deterred in accordance with a risk assessment.

Appropriate safeguarding measures shall be provided (see annex F).

5.1.4.3 Crossings of fixed track conveyors and other means of transportation

If there is a risk of collision between power driven fixed track conveyors such as transfer cars or self propelled overhead conveyors and other devices of the system at crossings, measures which counteract the risk of collision shall be provided :