SLOVENSKI STANDARD

SIST EN 14886:2008

01-junij-2008

Stroji za predelavo gume in plastike - Traļ ni rezalni stroji za peno v bloku - Varnostne zahteve

Rubber and plastics machines - Bandknife cutting machines for block foams - Safety requirements

Kunststoff- und Gummimaschinen - Bandmessermaschinen für Blockschaum - Sicherheitsanforderungen

Machines pour les matieres plastiques et le caoutchouc - Machines de coupe a couteau ruban pour blocs de mousse - Prescriptions de sécurité

Ta slovenski standard je istoveten z: **EN 14886:2008**

ICS:

83.200

SIST EN 14886:2008 **en,fr,de**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 14886

February 2008

ICS 83.200

English Version

Plastics and rubber machines - Bandknife cutting machines for block foams - Safety requirements

Machines pour les matières plastiques et le caoutchouc - Machines de coupe à couteau ruban pour blocs de mousse - Prescriptions de sécurité

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COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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Ref. No. EN 14886:2008: E

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Foreword

This document (EN 14886:2008) has been prepared by Technical Committee CEN/TC 145 “Plastics and rubber machines”, the secretariat of which is held by UNI.

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of an identical text or by endorsement, at the latest by August 2008, and conflicting national standards shall be withdrawn at the latest by August 2008.

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Introduction

This European Standard is a type C standard as stated in EN ISO 12100-1.

The machinery concerned and the extent to which hazards, hazardous situations and events are covered is indicated in the scope of this document.

For the machines which are covered by the scope of this type C standard and which have been designed and built in accordance with the provisions of this standard, the provisions of this type C standard will take precedence over the provisions of any other type B standard.

1 Scope

This European standard applies to machines that are designed specifically to cut, split or peel block foams to commercially required shapes, using a single or double cut.

All hazards listed in clause 4 are covered by this document.

Cutting of block foams may be by:

— vertical cutting;

— horizontal cutting;

— inclined cutting;

— transverse cutting;

— contour cutting; or

— a combination of the above.

The material to be cut may be supported or transported by:

— a fixed table;

— a shuttle table;

— a conveyor;

— a turntable;

— rollers;

— mandrel; or

— a combination of the above.

Cutting can be either manual or automatic.

Cutting tools can be:

— smooth-edged or toothed bandknives;

— cutting wires.

Movement of the cutting tool can be either oscillating or continuous in one direction.

This European Standard does not apply to:

— laser and water jet cutting;

— hot wire cutting;

— wood, metal and food cutting machines.

The safety requirements for the additional hazards arising from the interaction between bandknife cutting machines and ancillary equipment, especially loading and unloading devices, are specified. The safety requirements for the ancillary equipment itself are not specified.

This European Standard covers machines used for cutting plastics and rubber having a cellular or compact structure. However, it may also be applied when these machines are used for cutting other materials, for example textiles, fibres and mineral wool, if cutting these materials does not create additional hazards.

This document is not applicable to bandknife cutting machines manufactured before the date of its publication as an EN.

2 Normative references

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.

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

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

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

EN 894-1, *Safety of machinery - Ergonomics requirements for the design of the 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*

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 954-1:1996, *Safety of machinery – Safety-related parts of control systems - Part 1: General principles for design*

EN 1760-2, *Safety of machinery - Pressure sensitive protective devices - Part 2: General principles for the design and testing of pressure sensitive edges and pressure sensitive bars*

EN 1760-3, *Safety of machinery - Pressure sensitive protective devices - Part 3: General principles for the design and testing of pressure sensitive bumpers, plates, wires and similar devices*

EN 12413, *Safety requirements for bonded abrasive products*

EN 13236, *Safety requirements for superabrasives*

EN 60204-1:2006, *Safety of machinery - Electrical equipment of machines - Part 1: General requirements (IEC 60204-1:2005, modified)*

EN 60529:1991, *Degrees of protection provided by enclosures (IP Code) (IEC 60529:1989)*

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

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

EN 61496-1:2004, *Safety of machinery – Electro-sensitive protective equipment – Part 1: General requirements and tests (IEC 61496-1:2004, modified)*

EN ISO 3744:1995, *Acoustics – Determination of sound power levels of noise sources using sound pressure – Engineering method in an essentially free field over a reflecting plane (ISO 3744:1994)*

EN ISO 3746:1995, *Acoustics – Determination of sound power levels of noise sources using sound pressure – Survey method using an enveloping measurement surface over a reflecting plane (ISO 3746:1995)*

EN ISO 4871:1996, *Acoustics – Declaration and verification of noise emission values of machinery and equipment (ISO 4871:1996)*

EN ISO 11201:1995, *Acoustics - Noise emitted by machinery and equipment – Measurement of emission sound pressure levels at the work station and at other specified positions – Engineering method in an essentially free field over a reflecting plane (ISO 11201:1995)*

EN ISO 11202:1995, *Acoustics – Noise emitted by machinery and equipment – Measurement of emission sound pressure levels at the work station and at other specified positions – Survey method in situ (ISO 11202:1995)*

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, *Safety of machinery - Basic concepts, general principles for design – Part 2: Technical principles (ISO 12100-2:2003)*

EN ISO 13850, *Safety of machinery - Emergency stop - Principles for design (ISO 13850:2006)*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1
manual cutting machine
cutting machine on which the material to be cut, or the table on which it is placed, is moved by the force applied by the operator

3.2
automatic cutting machine
cutting machine where cutting is achieved without force being applied by the operator

3.3
tilting cutting machine
cutting machine where the bandknife can make either a vertical or an inclined cut

3.4
side guide
vertical or inclined surface, against which the material to be cut is supported

3.5
grinding unit
machine subassembly for sharpening the bandknife

3.6
freehand cutting
process in which the material to be cut is moved directly by hand

3.7
bandknife
tool that performs the cutting process

3.8
cutting zone
exposed part of the bandknife, where cutting can take place

3.9
profile cutting machine
machine used for profiling foam sheets; the sheets are fed towards the bandknife by means of two profile rollers

3.10
splitting machine
machine used for cutting blocks or slabs into sheets or foils; the material is usually fed towards the bandknife by two feed rollers or by a table or a conveyor

3.11
compression cutting machine
machine used for producing parts from material which is compressed by a conveyor belt and one or more pressure rollers into a template fixed on the machine table

3.12
peeling machine
machine for producing a foil from foam material rotating on a mandrel; the material may be fed towards the bandknife by one or more pressure rollers

3.13
cross-cutting machine
machine used for cutting long foam blocks into shorter ones; it can be a stationary machine (off-line cross-cutting machine) or a machine travelling synchronously with the block foam in the foaming line (in-line cross-cutting machine)

3.14
grinding area
area where the operator stands while grinding the bandknife

3.15
impeding device
any physical obstacle, attached to the floor or the machine structure, e.g. low barrier, rail, trip wire, which, without totally preventing access to the hazard zone, reduces the probability of access to this zone by offering an obstruction to free access

4 List of significant hazards

4.1 General hazards on bandknife cutting machines

4.1.1 General

The numbering system of the safety requirements and/or protective measures in clause 5 corresponds with the numbering system of the significant hazards in clause 4.

4.1.2 Mechanical hazards

4.1.2.1 Cutting by the moving bandknife

4.1.2.2 Cutting while replacing or changing the bandknife

4.1.2.3 Whiplash of the bandknife if it breaks

This hazard does not occur when oscillating bandknives are used.

4.1.2.4 Cutting and drawing-in at the danger zone inside the grinding unit

4.1.2.5 Ejection of fragments from a grindstone

4.1.2.6 Hazards due to loss of stability

4.1.3 Electrical hazards

4.1.4 Hazards due to failure of the control system

4.1.5 Hazards generated by noise

Hazards from high noise levels resulting in tiredness, interference with speech communications or with the perception of acoustic signals.

4.1.6 Fire hazard generated by flying sparks while grinding the bandknife

4.1.7 Hazard due to inhalation of harmful dusts created by cutting

Harmful dusts may be emitted when certain materials are being cut.

4.2 Additional hazards or general hazards which require particular protective measures on manual bandknife cutting machines

4.2.1 Vertical bandknife cutting machines (Figure 1)

4.2.1.1 Mechanical hazards

4.2.1.1.1 Cutting by the moving bandknife

4.2.1.1.2 Cutting due to unintentional contact with the bandknife at rest

4.2.1.1.3 Impact or crushing due to unintentional movement of the table during loading and unloading

4.2.1.2 Hazards generated by neglecting ergonomic principles of machinery design

4.2.1.3 Slip, trip and fall when the operator moves the table

4.2.2 Tilting bandknife cutting machines (Figure 2 and Figure 3)

4.2.2.1 Mechanical hazards

4.2.2.1.1 Cutting by the moving bandknife

4.2.2.1.2 Cutting due to unintentional contact with bandknife at rest

4.2.2.1.3 Impact or crushing due to unintentional movement of the table during loading and unloading

4.2.2.2 Hazards generated by neglecting ergonomic principles of machinery design

4.2.2.3 Slip, trip and fall when the operator moves the table

4.3 Additional hazards or general hazards which require particular protective measures on automatic bandknife cutting machines

4.3.1 Bandknife cutting machines with turntable (carousel) (Figure 4)

4.3.1.1 Mechanical hazards

4.3.1.1.1 Cutting by the moving bandknife

4.3.1.1.2 Cutting due to unintentional contact with the bandknife at rest

4.3.1.1.3 Shearing and crushing during vertical movement of the cutting unit

4.3.1.1.4 Crushing and/or shearing and/or impact and/or drawing-in caused by movement of the turntable

4.3.1.1.5 Whiplash of the bandknife if it breaks

4.3.1.1.6 Slipping or tripping on the turntable, falling from the turntable

4.3.1.1.7 Cutting by the bandknife outside the grinding unit during manual intervention at the grinding unit

4.3.1.2 Hazards generated by neglecting ergonomic principles of machinery design

4.3.2 Vertical bandknife cutting machines with fixed table and movable cutting unit (Figure 5)

4.3.2.1 Cutting by the moving bandknife

4.3.2.2 Cutting due to unintentional contact with the bandknife at rest

4.3.2.3 Shearing and crushing and/or impact due to horizontal movement of the cutting unit

4.3.2.4 Crushing and/or shearing due to the feed or tilting movement of the power operated side guide

Such hazards may exist between the side guide and the guards at the front and rear side of the machine.

4.3.2.5 Whiplash of the bandknife if it breaks

4.3.3 Horizontal bandknife cutting machines

4.3.3.1 Horizontal bandknife cutting machines where the cutting is achieved by moving the material (Figure 6, Figure 7, Figure 8 and Figure 9)

4.3.3.1.1 Mechanical hazards

4.3.3.1.1.1 Cutting by the moving bandknife

On horizontal bandknife cutting machines with manual take off of single sheets, material may wrap around the pressure roller during splitting. The operator might try to prevent a wrap around of the sheet by reaching over the pressure roller and this may lead to the operator being drawn in towards the bandknife by the pressure roller (Figure 10).

4.3.3.1.1.2 Shearing and crushing during vertical movement of the cutting unit

4.3.3.1.1.3 Impact caused by table movement

4.3.3.1.1.4 Whiplash of the bandknife if it breaks

4.3.3.1.1.5 Cutting by the bandknife outside the grinding unit during manual intervention at the grinding unit

4.3.3.1.1.6 Drawing-in at the transfer points between the reversing table or conveyor and ancillary loading or unloading conveyors (Figure 8 and Figure 9)

4.3.3.1.1.7 Crushing at the transfer points between the reversing table and ancillary loading or unloading conveyors (Figure 9)

4.3.3.1.1.8 On horizontal bandknife cutting machines with manual take off of single sheets, drawing-in between the knife guide and the material during the return movement of the table or conveyor

4.3.3.1.2 Electrical hazards

For horizontal bandknife cutting machines with manual take off of single sheets, cutting certain types of material may generate electrostatic charges.

4.3.3.2 Horizontal bandknife cutting machines where the cutting is achieved by moving the cutting unit (Figure 11)

4.3.3.2.1 Same mechanical hazards as in 4.3.3.1.1.4, 4.3.3.1.1.5, 4.3.3.1.1.6, 4.3.3.1.1.7 and the following:

4.3.3.2.2 Cutting by the bandknife (moving or at rest)

4.3.2.2.3 Shearing, crushing and impact caused by vertical movement of the table(s) or conveyor(s)

4.3.4 Horizontal bandknife cutting machines for block trimming

4.3.4.1 Top trimming

Same hazards as in 4.3.3.1.

4.3.4.2 Bottom trimming (Figure 12)

Same hazards as in 4.3.3.1, plus cutting by the bandknife when the operator reaches upwards from underneath the bandknife to collect the trimmed skin.

4.3.5 Vertical bandknife cutting machines for block trimming (Figure 13, Figure 14 and Figure 15)

4.3.5.1 Cutting by the moving bandknife

4.3.5.2 Cutting due to unintentional contact with the bandknife at rest

4.3.5.3 Shearing, crushing and/or impact generated by the horizontal movement of the cutting unit

4.3.5.4 Whiplash of the bandknife if it breaks

4.3.5.5 Cutting by the bandknife outside the grinding unit during manual intervention at the grinding unit

4.3.6 Contour cutting machines

4.3.6.1 Horizontal contour cutting machines (Figure 16, Figure 17, Figure 18 and Figure 19)

4.3.6.1.1 Cutting by the moving bandknife

4.3.6.1.2 Shearing and crushing during vertical movement of the cutting unit

4.3.6.1.3 Impact caused by table movement

4.3.6.1.4 Whiplash of the bandknife if it breaks

4.3.6.1.5 Cutting by the bandknife outside the grinding unit during manual intervention of the grinding unit

4.3.6.1.6 Drawing-in at the transfer areas between the reversing table or conveyor and ancillary loading or unloading conveyors (Figures 16 and Figure 17)

4.3.6.1.7 Crushing at the transfer areas between the reversing table and ancillary loading or unloading conveyors (Figure 16 and Figure 17)