BRITISH STANDARD

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14886:2008

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

ICS 83.200

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British Standards

National foreword

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A list of organizations represented on this committee can be obtained on request to its secretary.

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Kunststoff- und Gummimaschinen - Bandmesserschneidmaschinen für Blockschaum - Sicherheitsanforderungen

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of an identical text or by endorsement, at the latest by August 2008, and conflicting national standards shall be withdrawn at the latest by August 2008.

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For relationship with EU Directives, see informative Annex ZA and ZB, which are an integral part of this document.

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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)

4.3.6.2 Vertical contour cutting machines (Figure 20)

4.3.6.2.1 Cutting by the moving bandknife

4.3.6.2.2 Cutting due to unintentional contact with the bandknife at rest

4.3.6.2.3 Crushing or drawing-in at the transfer areas of ancillary loading or unloading conveyors

4.3.6.2.4 Whiplash of the bandknife if it breaks

4.3.7 Profile cutting and splitting machines (Figure 21 and Figure 22)

4.3.7.1 Mechanical hazards

4.3.7.1.1 Drawing in by the two rollers and subsequent cutting by the bandknife; drawing-in between a roller and fixed parts of the machine, at the front, rear and the sides of the machine

4.3.7.1.2 Shearing, crushing and drawing-in between the lower roller and fixed parts of the machine underneath the table

4.3.7.1.3 Drawing-in and crushing by the upper roller when reaching from the rear of the machine (Figure 21)

4.3.7.1.4 Drawing-in and crushing between the pressure and supporting rollers when reaching from the rear of the machine (Figure 22)

4.3.7.2 Electrical hazards

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

4.3.7.3 Hazards generated by neglecting ergonomic principles of machinery design

Physiological effects such as musculoskeletal disorders resulting, e.g. from unhealthy postures, excessive or repetitive efforts due to mismatch of machinery with human characteristics and abilities.

4.3.8 Compression cutting machines (Figure 23)

4.3.8.1 Cutting by the moving bandknife

4.3.8.2 Shearing and crushing during vertical movement of the cutting unit

4.3.8.3 Drawing in between the belt or rollers that compress the material and the material itself or the table

4.3.8.4 Impact, crushing and shearing caused by movement of the table

4.3.8.5 Whiplash of the bandknife if it breaks

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

4.3.9 Peeling machines (Figure 24)

4.3.9.1 Mechanical hazards

4.3.9.1.1 Cutting by the moving bandknife and drawing-in between the pressure roller and the material

4.3.9.1.2 Cutting due to unintentional contact with the bandknife at rest

4.3.9.1.3 Whiplash of the bandknife if it breaks

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

4.3.9.2 Electrical hazards

For peeling machines, cutting of certain types of materials may generate electrostatic charges.

4.3.10 Cross-cutting machines (Figure 25, Figure 26, Figure 27 and Figure 28)

4.3.10.1 Cutting by the moving bandknife

4.3.10.2 Shearing, crushing and impact due to movement of the cutting unit

4.3.10.3 Whiplash of the bandknife if it breaks

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

5 Safety requirements and/or protective measures

5.1 General requirements and/or measures for bandknife cutting machines

5.1.1 General

Bandknife cutting machines shall comply with the safety requirements and/or protective measures of this clause.

In addition, they shall be designed in accordance with the principles of EN ISO 12100 (both parts) for relevant, but not significant hazards which are not dealt with by this document (e.g. sharp edges).

Unless otherwise specified, safety distances shall be in accordance with EN 294:1992, Table 1 and/or Table 4, EN 349 and EN 811.

Guards shall be designed in accordance with EN 953.

The fixing systems of fixed guards shall remain attached to the guards or to the machinery when these guards are removed.

NOTE This requirement only applies when Directive 2006/42/EC is in force.

Electro-sensitive protective equipment (ESPE) shall be in accordance with type 2 of EN 61496-1:2004.

Pressure sensitive edges and bars shall be in accordance with EN 1760-2. Pressure sensitive wires shall be in accordance with EN 1760-3.

Where the distance between a guard or impeding device and the table or conveyor is greater than 100 mm, stepping behind the guard or impeding device shall be prevented, e.g. by fixed plates with an inclined surface (45 ± 5)°, see distance A in Figures 1, 2, 3, 5, 6, 7, 8, 9, 11, 12, 13, 14, 15, 16, 17, 20, 23, 25, 26, 27 and 28. This requirement does not apply to bandknife cutting machines with turntables, profile cutting and splitting machines, nor to peeling machines.

5.1.2 Mechanical hazards

5.1.2.1 Cutting by the moving bandknife

Contact with the moving bandknife outside the maximum cutting zone shall be prevented by fixed or interlocking guards. Unless otherwise specified, fixed guards shall be in accordance with EN 294:1992 Table 2 and/or Table 4 and interlocking guards shall be in accordance with EN 294:1992 Table 1 and/or Table 4.

A clearly visible yellow (amber) light, or set of lights, shall provide warning when the bandknife is moving. See 7.1.2.1.

The run-down time of the bandknife following a stop signal generated by a protective device or an emergency stop shall be as short as possible. The deceleration shall not create further hazards, e.g. the bandknife breaking or coming off a wheel. Whenever practicable, the rundown time shall not exceed 5 s. However, where for reasons of process technology, e.g. certain materials that require a cutting speed of more than 20 m/s, this requirement cannot be met, additional protective measures shall be taken such as guard locking on interlocking guards.

5.1.2.2 Cutting while replacing or changing the bandknife

The machine shall be provided with devices that reduce the risk of being cut while mounting the bandknife, for example support devices, clamps and guides. See 7.1.2.2.

5.1.2.3 Whiplash of the bandknife if it breaks

If the bandknife breaks, the bandknife drive shall stop automatically.

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

Hazards in the danger zone inside the grinding unit shall be prevented by:

— installation of guards preventing access to the danger zone; and

— designing the machine so that grinding the bandknife and adjusting the grindstones can be performed without opening these guards. These guards shall allow a good view of the grinding process. An observation opening covered by a flap is permitted to allow the operator to see the result of adjusting the grindstones, but see 7.1.2.3.

5.1.2.5 Ejection of fragments from a grindstone

The guards for the grinding unit shall be constructed to reduce the risk of fragments of grindstones being ejected. Only abrasive products in accordance with EN 12413 or EN 13236 shall be used. See also 7.1.2.3.

5.1.2.6 Hazards due to loss of stability

Suitable anchorage points shall be provided on the machine. See also 7.1.2.4.

5.1.3 Electrical hazards

5.1.3.1 General

Electrical equipment shall be in accordance with EN 60204-1:2006, specifically the requirements given in 5.1.3.2, 5.1.3.3, 5.1.3.4, 5.1.3.5 and 5.1.3.6 below.

5.1.3.2 Protection against direct contact

Protection against direct contact shall be in accordance with 6.2 of EN 60204-1:2006, with minimum degrees of protection in accordance with EN 60529:1991.

5.1.3.3 Protection against indirect contact

Protection against indirect contact shall be in accordance with 6.3 of EN 60204-1:2006.

5.1.3.4 Hazards arising from faults in electrical equipment

Electrical equipment located on, or in the vicinity of, the machine shall have enclosures affording protection in accordance with 11.3 of EN 60204-1:2006. Enclosures shall also meet at least IP54 of EN 60529:1991.

5.1.3.5 Emergency stop equipment

Bandknife cutting machines shall be provided with emergency stop equipment that shall be in accordance with the following requirements:

— EN ISO 13850 and 9.2.5.4 of EN 60204-1:2006;

— EN ISO 13850, category 0 or 1; however, in the case of in-line cross-cutting machines (Figure 27 and Figure 28) the emergency stop shall function in accordance with stop category 1, which means that when the emergency stop actuator is actuated, movement of the bandknife shall continue until the knife guide is outside the material and then all machine movements shall stop;

— at least one emergency stop actuator shall be easily reachable from the control panel.

5.1.3.6 Control actuators

Control actuators shall be:

— located outside the danger zones;

— easy for the operator to actuate;

— in accordance with EN 894-1, EN 894-2, EN 894-3, EN 60204-1:2006, EN 61310-1 and EN 61310-2.

5.1.4 Hazards due to failure of the control system

Safety related parts of the control systems shall be in accordance with category 1 of EN 954-1:1996 for hardwired control systems and with category 2 or 3 for electronic control systems.

The braking systems operated by the control system shall be tested regularly. See also 7.1.2.5.

5.1.5 Hazards generated by noise

5.1.5.1 Noise reduction at source by design

The main sources of noise on bandknife cutting machines are:

— the vacuum system used to maintain the foam blocks on the table or conveyor;

— the air cushion system used to move the foam blocks on the table or conveyor;

— grinding the bandknife;

— the bandknife drive system;

— conveying systems.

Bandknife cutting machines shall be designed and constructed so that risks resulting from the emission of airborne noise are reduced to the lowest level, taking into account technical progress and the availability of means of reducing noise, in particular at source. When designing a machine:

— the available information and technical measures for reducing noise at source shall be taken into account;

— it is recommended that the methodology described in EN ISO 11688-1 is considered.

NOTE EN ISO 11688-2 gives useful information on noise generation mechanisms in machinery.

5.1.5.2 Noise reduction by protective devices

Additional noise reduction may be achieved by:

— sound insulating and/or absorbing materials;

— low noise material for/on the bandknife drive wheels if practicable;

— sound reducing enclosures around the motors;

— silencers on the exhaust of the vacuum system;

— low noise materials for the conveying systems.

5.1.5.3 Information connected with noise hazards

The instruction handbook shall give additional information, see 7.1.2.6.

See also 7.1.2.7 and Annex A.

5.1.6 Fire hazard generated by flying sparks while grinding the bandknife

The grinding unit shall be designed so that dust emission into the environment and flying sparks are reduced as far as possible, e.g. by local exhaust ventilation connected to the grinding unit. The grinding unit and guards shall be designed to reduce accumulation of dust inside the guards. See also 7.1.2.8.

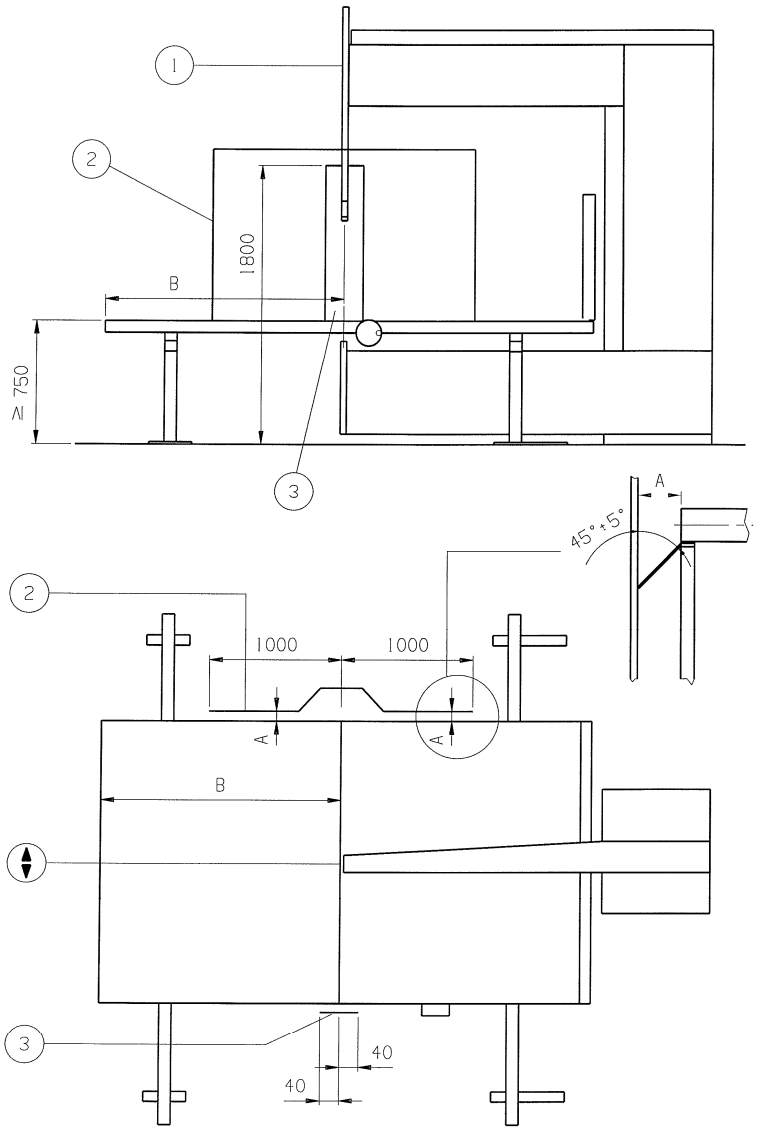
5.1.7 Hazard due to inhalation of harmful dusts created by cutting

When specified by contract that local exhaust ventilation is required, the machine shall be provided with an exhaust failure detection system. The system shall prevent the machine from starting or bring it to a controlled stop in the event of a failure of the exhaust ventilation. See also 7.1.2.9.

5.2 Additional requirements and/or measures for manual bandknife cutting machines

5.2.1 Vertical bandknife cutting machines (Figure 1)

Dimensions in millimetres



Key

1 Height-adjustable guard
2 Fixed back guard
3 Front guard

Cutting edge of the bandknife

Figure 1 — Manual vertical bandknife cutting machine

5.2.1.1 Mechanical hazards

5.2.1.1.1 Cutting by the moving bandknife

Access to the moving bandknife shall be prevented or restricted as follows.

— The table shall have a minimum height of 750 mm.

— The horizontal distance B in Figure 1 shall not be less than 1 000 mm.

— The bandknife shall be enclosed by fixed guards except for the part necessarily exposed for cutting. To cover the part of the bandknife that runs above the material to be cut the machine shall be fitted with a U-section height-adjustable guard that extends behind the edges of the bandknife (see item 1 in Figure 1). The height-adjustable guard shall be capable of being adjusted to within 50 mm of the table surface in order to provide protection also when cutting thin material. See 7.1.3.1. With usable cutting heights of more than 500 mm the height adjustable guard shall be power operated.

— Access to the usable part of the bandknife from the back of the machine shall be prevented by a fixed guard mounted on the table having a height in accordance with EN 294:1992 Table 2. The guard shall extend horizontally for at least 1 000 mm on each side of the bandknife (see item 2 in Figure 1).

— A front guard (see item 3 in Figure 1) shall be fixed to the operator's side of the table to prevent unintentional contact of the operator's head with the bandknife. This guard shall have a minimum height of 1 800 mm from the floor and shall extend horizontally for at least 40 mm on each side of the bandknife. When the machine is designed so that the highest possible point of the exposed part of the bandknife is less than 1 800 mm above the floor, the height of the guard may be reduced accordingly.

— If the front guard can be moved out of its position for normal operation, as described above, to allow freehand cutting, it shall be interlocked in such a way that the bandknife cannot move unless:

  — for freehand cutting, the table is locked in a position in which its front edge is at a horizontal distance ≥ 500 mm from the cutting edge of the bandknife; or

  — for normal operation, the front guard is in the position described in the fifth indent of this subclause.

  See also 7.1.3.2.

5.2.1.1.2 Cutting due to unintentional contact with the bandknife at rest

The front guard mentioned in 5.2.1.1.1 also reduces the risk of unintentional contact with the bandknife during loading and unloading.

A warning not to climb on the table shall be affixed to the machine. See 7.1.3.3 and Annex B.

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

The table shall be fitted with a locking device to prevent movement of the table during loading and unloading. See also 7.1.3.4.

5.2.1.2 Hazards generated by neglecting ergonomic principles of machinery design

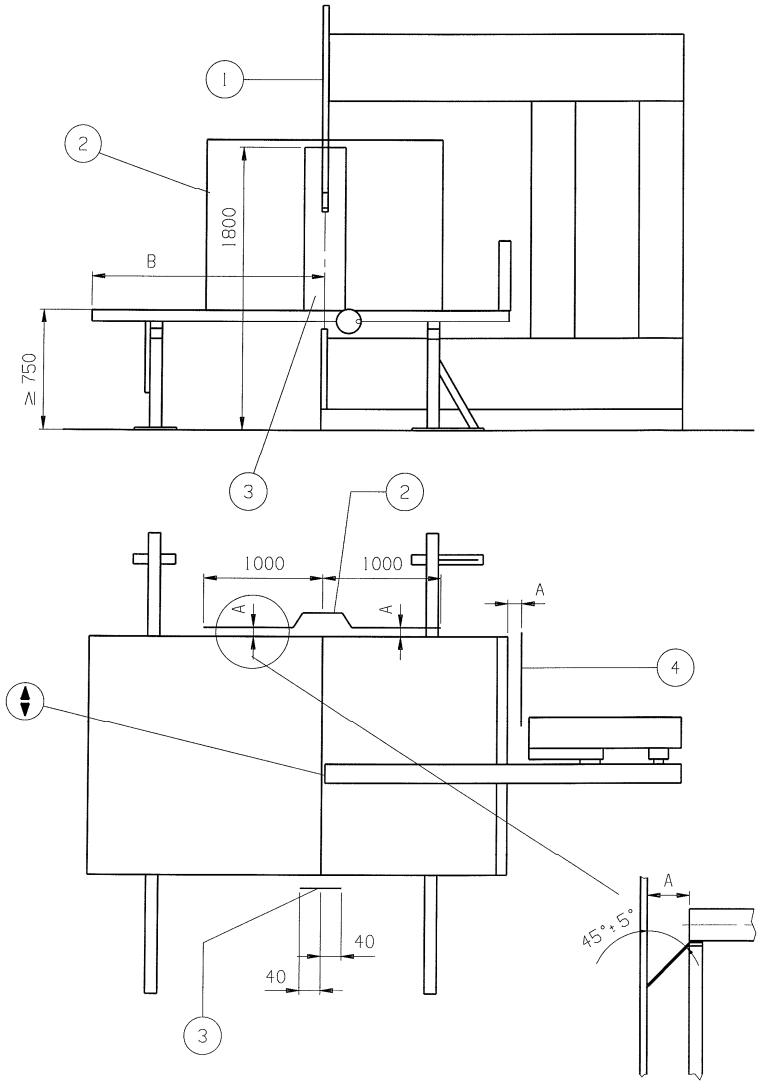
The surface of the table shall have a minimum height of 750 mm from the floor.

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

See 7.1.3.5.

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

Dimensions in millimetres



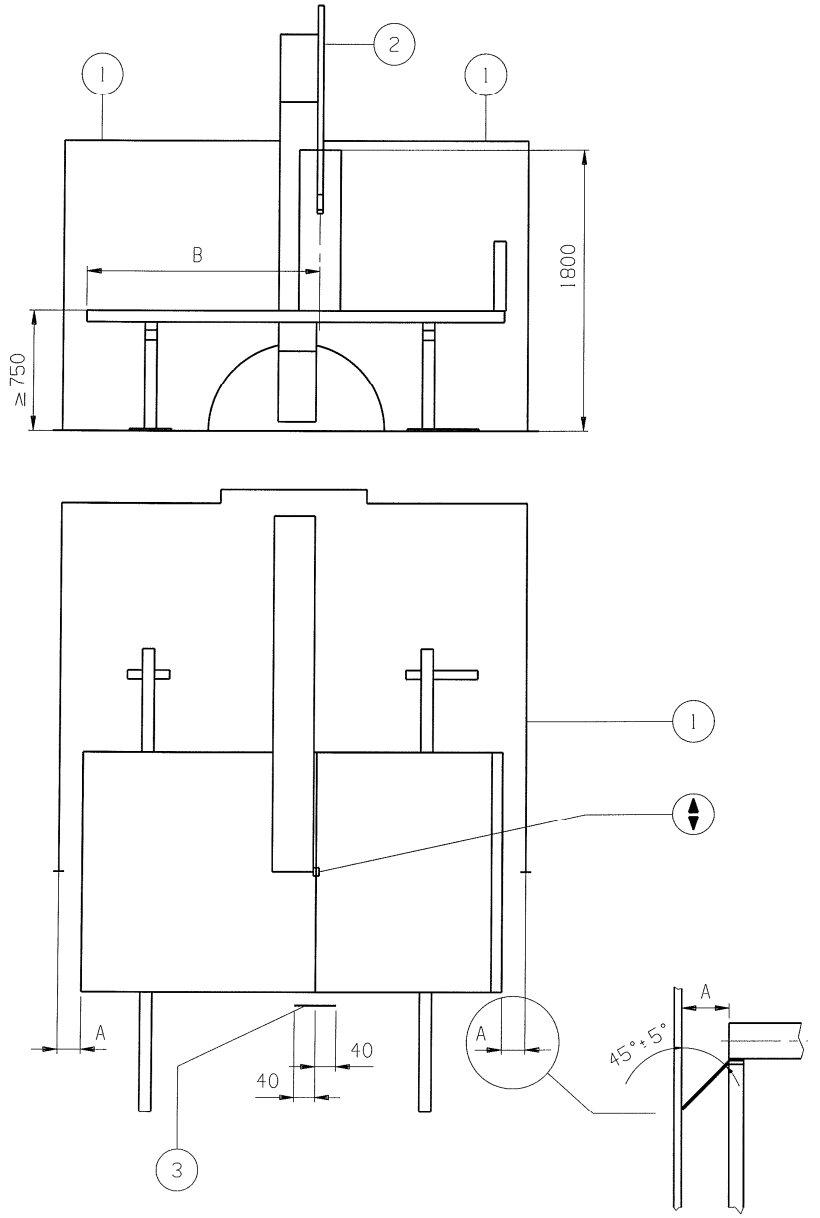
Key

1 Height-adjustable guard
2 Fixed back guard
3 Front guard
4 Fixed guard

Cutting edge of the bandknife

Figure 2 — Manual tilting bandknife cutting machine, type 1

Dimensions in millimetres



Key

1 Fixed guard
2 Height-adjustable guard
3 Front guard

Cutting edge of the bandknife

Figure 3 — Manual tilting bandknife cutting machine, type 2

5.2.2.1 Mechanical hazards

5.2.2.1.1 Cutting by the moving bandknife

Access to the moving bandknife shall be prevented or restricted as follows.

— The table shall have a minimum height of 750 mm.

— The horizontal distance B as shown in Figure 2 and Figure 3 shall not be less than 1 000 mm.

— The bandknife shall be enclosed by fixed guards except for the part necessarily exposed for cutting. To cover the part of the bandknife that runs above the material to be cut the machine shall be fitted with a U-section height-adjustable guard that extends behind the edges of the bandknife (see item 1 in Figure 2 and item 2 in Figure 3). The height-adjustable guard shall be capable of being adjusted to within 50 mm of the table surface in order to provide protection also when cutting thin material. See 7.1.3.1. With usable cutting heights of more than 500 mm the height adjustable guard shall be power operated.

— Access to the usable part of the bandknife from the back and from the side of the machine shall be prevented as shown in Figure 2 or Figure 3.

  In Figure 2 fixed guard 2 shall be mounted on the table and have a height in accordance with EN 294:1992 Table 2. The guard shall extend horizontally for at least 1 000 mm on each side of the bandknife. Access to the moving bandknife from the side of the machine behind the cutting unit shall be prevented by a fixed guard mounted on the floor (see item 4 in Figure 2).

  In Figure 3 fixed guard 1 shall be mounted on the floor and extend sufficiently far forward to prevent access to the area behind the table even when the table is in its most forward position.

— A front guard (see item 3 in Figure 2 and Figure 3) shall be fixed to the operator's side of the table to prevent unintentional contact of the operator's head with the bandknife. This guard shall have a minimum height of 1 800 mm from the floor and shall extend horizontally for at least 40 mm on each side of the bandknife. When the machine is designed so that the highest possible point of the exposed part of the bandknife is less than 1 800 mm above the floor, the height of the guard may be reduced accordingly.

— If the front guard can be moved out of its position for normal operation, as described above, to allow freehand cutting, it shall be interlocked in such a way that the bandknife cannot move unless:

  — for freehand cutting, the table is locked, in a position in which its front edge is at a horizontal distance ≥ 500 mm from the cutting edge of the bandknife; or

  — for normal operation, the front guard is in the position described in the fifth dash of this subclause.

  See also 7.1.3.2.

5.2.2.1.2 Cutting due to unintentional contact with the bandknife at rest

The front guard mentioned in 5.2.2.1.1 also reduces the risk of unintentional contact with the bandknife during loading and unloading.

A warning not to climb on the table shall be affixed to the machine. See 7.1.3.3 and Annex B.

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

The table shall be fitted with a locking device to prevent movement of the table during loading and unloading. See also 7.1.3.4.

5.2.2.2 Hazards generated by neglecting ergonomic principles of machine design

The surface of the table shall have a minimum height of 750 mm from the floor.

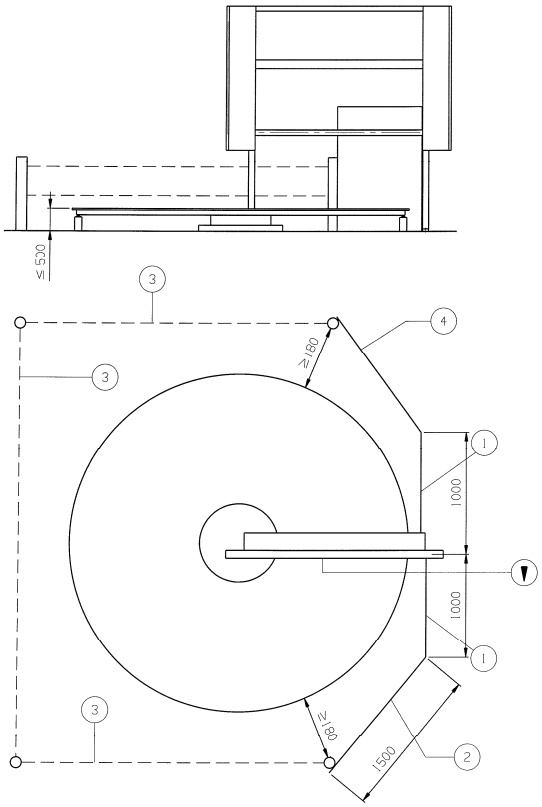
5.2.2.3 Slip, trip and fall when the operator moves the table

See 7.1.3.5.

5.3 Additional requirements and/or measures for automatic bandknife cutting machines

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

Dimensions in millimetres



Key

1 Fixed guard
2 Impeding device
3 Electro-sensitive protective equipment
4 Fixed guard

Cutting edge of the bandknife

Figure 4 — Bandknife cutting machines with turntable (carousel)

5.3.1.1 Mechanical hazards

5.3.1.1.1 Cutting by the moving bandknife

Access to the moving bandknife shall be prevented or restricted as follows.

— Fixed guards shall be provided in the immediate vicinity of the cutting unit as shown in Figure 4 (item 1). The height of these guards shall be in accordance with EN 294:1992, Table 2. These guards shall extend horizontally at least 1 000 mm on each side of the bandknife.

— Quick access to the cutting edge of the bandknife from beyond the guard specified in the previous indent shall be prevented by an impeding device in the form of a fence at the infeed side. This device shall have a minimum height of 1 000 mm and a minimum length of 1 500 mm and shall be mounted on the floor (item 2 in Figure 4).

— That part of the perimeter of the turntable not enclosed by the guard and fence mentioned in the first two indents shall be enclosed by a combination of fixed guards with either interlocking guards or electro-sensitive protective equipment (ESPE) (items 3 and 4 in Figure 4). The guards shall have a minimum height of 1 000 mm. If ESPE is used, it shall have at least two horizontal beams arranged at heights of 400 mm and 900 mm. Opening an interlocking guard or interrupting an ESPE shall automatically stop:

  — the turntable before it has rotated through an angle of 35 °;

  — the bandknife; and

  — the vertical movement of the cutting unit.

5.3.1.1.2 Cutting due to unintentional contact with the bandknife at rest

For manual loading and unloading operations, powered rotation of the turntable shall be possible only by means of a hold-to-run control device that allows a maximum circumferential turntable speed of 10 m/min. In this mode of operation, it shall only be possible to rotate the turntable if contact with the cutting edge of the bandknife is prevented, i.e. if an interlocked knife cover such as a flap or roller is in the protective position.

Reactivating the automatic mode of operation shall require actuation of an acknowledgement switch followed by an additional start command from the control panel. The acknowledgement switch shall be installed outside the guarded area and in such a position that it is not possible to actuate it from inside the guarded area. The acknowledgement switch shall be located in a position from where the danger zone of the bandknife is clearly visible.

5.3.1.1.3 Shearing and crushing during vertical movement of the cutting unit

The danger areas are safeguarded by the provisions of 5.3.1.1.1.

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

The turntable shall have a smooth vertical periphery and the distance between the table and the fence at the points of entry shall be ≥ 180 mm shown in Figure 4.

5.3.1.1.5 Whiplash of the bandknife if it breaks

In addition to 5.1.2.3 breakage of the bandknife shall automatically stop the turntable.

5.3.1.1.6 Slipping and tripping on the turntable, falling from the turntable

The turntable shall have a slip resistant surface.

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

The machine shall preferably be designed so that manual intervention at the grinding unit can be performed outside the area protected by the fixed guard specified in 5.3.1.1.1.

Otherwise, a fixed guard with an interlocking door shall be provided to surround the grinding area. Unintentional contact with the bandknife from inside the guarded area shall be prevented by an additional guard. This guard shall be designed so that from the position in which the operator stands during manual intervention at the grinding unit direct access to, or falling into, the bandknife is prevented.

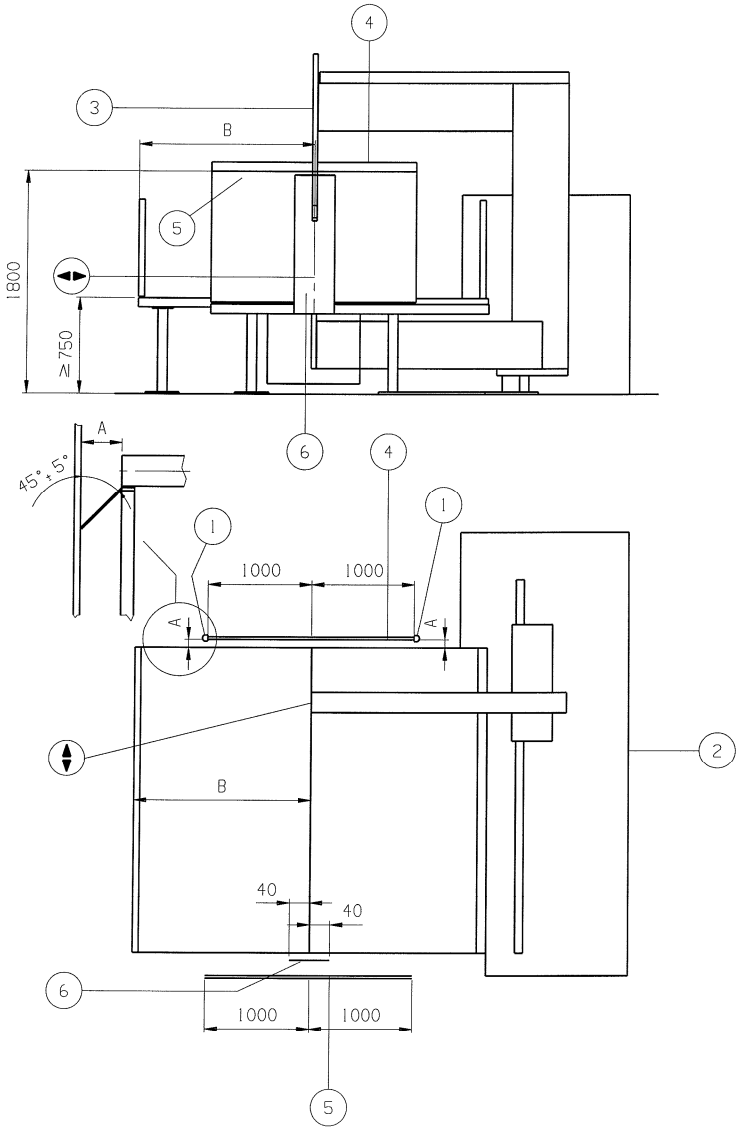
A mode selector switch shall be installed. If the mode selector switch is in the "operating" position, opening the interlocking door shall result in an emergency stop. If the mode selector switch is in the "grinding" position any movement of the turntable and the cutting unit shall be prevented.

5.3.1.2 Hazards generated by neglecting ergonomic principles of machinery design.

For manual loading or unloading the height of the turntable shall not exceed 500 mm.

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

Dimensions in millimetres



Key

1 Vertical pressure sensitive edge
2 Fixed or interlocking guard
3 Height-adjustable guard
4 Fixed back guard
5 Interlocking guard (operator's side), shown in its position for normal operation
6 Additional guard

Cutting edge of the bandknife

Figure 5 — Automatic vertical bandknife cutting machines with fixed table and movable cutting unit

5.3.2.1 Cutting by the moving bandknife

Access to the moving bandknife shall be prevented or restricted as follows.

— The table shall have a minimum height of 750 mm.

— The horizontal distance B as shown in Figure 5 shall not be less than 1 000 mm.

— The bandknife shall be enclosed by fixed guards except for the part necessarily exposed for cutting. To cover the part of the bandknife that runs above the material to be cut the machine shall be fitted with a U-section height-adjustable guard that extends behind the edges of the bandknife (item 3 in Figure 5). The height-adjustable guard shall be capable of being adjusted to within 50 mm of the table surface in order to provide protection also when cutting thin material. See 7.1.3.1. With usable cutting heights of more than 500 mm the height adjustable guard shall be power operated.

— Access to the usable part of the bandknife from the back of the machine shall be prevented by a fixed guard (item 4 in Figure 5). The guard shall extend horizontally at least 1 000 mm on each side of the bandknife.

— Access to the usable part of the bandknife from the operator's side of the machine shall be prevented by an interlocking guard (item 5 in Figure 5). The guard shall extend horizontally at least 1 000 mm on each side of the bandknife. When this guard is opened or moved out of the central position the interlock shall automatically stop:

  — horizontal movement of the cutting unit;

  — the bandknife;

  — feed movement of the power operated side guide.

— If the machine is designed for freehand cutting, freehand cutting shall only be possible by means of a mode selector switch. When freehand cutting is selected, movement of the cutting unit with interlocking guard 5 opened, or out of the central position, shall only be possible by means of a hold-to-run control device. This shall allow a maximum speed of the cutting unit of 6 m/min but only with the guard specified in 5.3.2.2 (item 6 in Figure 5) in place. If guard 6 is removed, movement of the cutting unit shall be automatically prevented and movement of the bandknife shall only be possible with the cutting edge at a distance ≥ 500 mm from the front edge of the table (see also 7.1.3.2).

5.3.2.2 Cutting due to unintentional contact with the bandknife at rest

To prevent unintentional contact with the bandknife at rest when, during loading or unloading, the interlocking guard (item 5 in Figure 5) is moved out of its position for normal operation, an additional guard (item 6 in Figure 5) shall be provided. This guard shall have a minimum height of 1 800 mm from the floor and shall extend a horizontal distance of at least 40 mm on each side of the bandknife. When the highest possible exposed part of the bandknife is, by design, less than 1 800 mm from the floor, the height of this guard may be reduced accordingly. For freehand cutting guard 6 may be removed (see 5.3.2.1).

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

Access to the danger zones shall be prevented by fixed or interlocking guards (item 2 in Figure 5). Opening an interlocking guard shall automatically stop movement of the cutting unit.

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

These hazards shall be prevented by either:

— a vertical pressure sensitive edge (item 1 in Figure 5) at the edge(s) of the guards facing the power operated side guide (item 4 in Figure 5), which, when actuated, stops the feed or tilting movement; or

— freely movable interlocking guards (item 5 in Figure 5) which, when moved out of the central position, trigger an emergency stop.

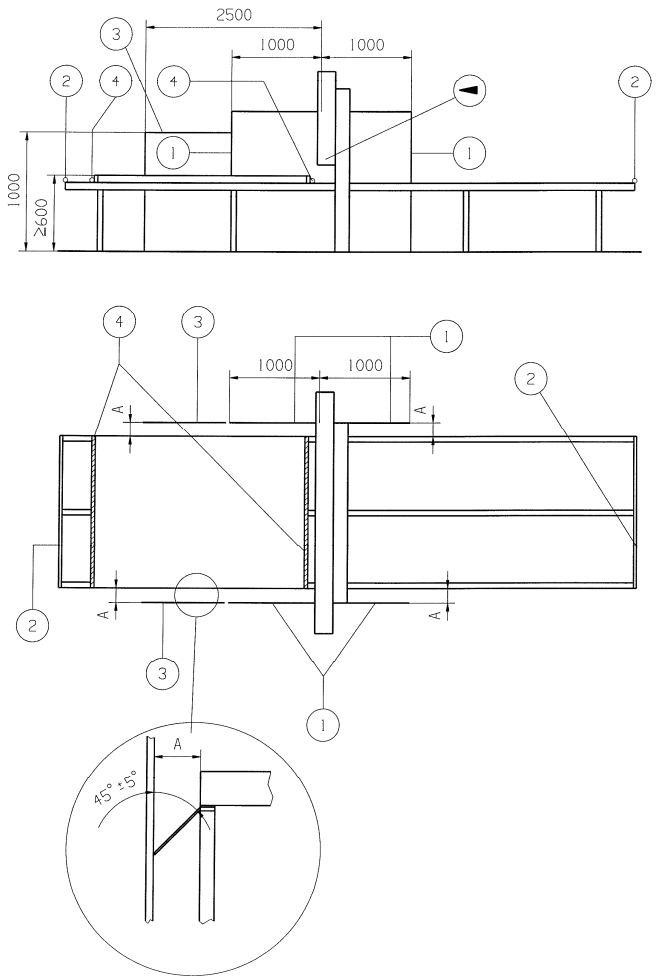
5.3.2.5 Whiplash of the bandknife if it breaks

In addition to 5.1.2.3 breakage of the bandknife shall automatically stop the cutting unit and the power operated side guide.

5.3.3 Horizontal bandknife cutting machines

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

Dimensions in millimetres



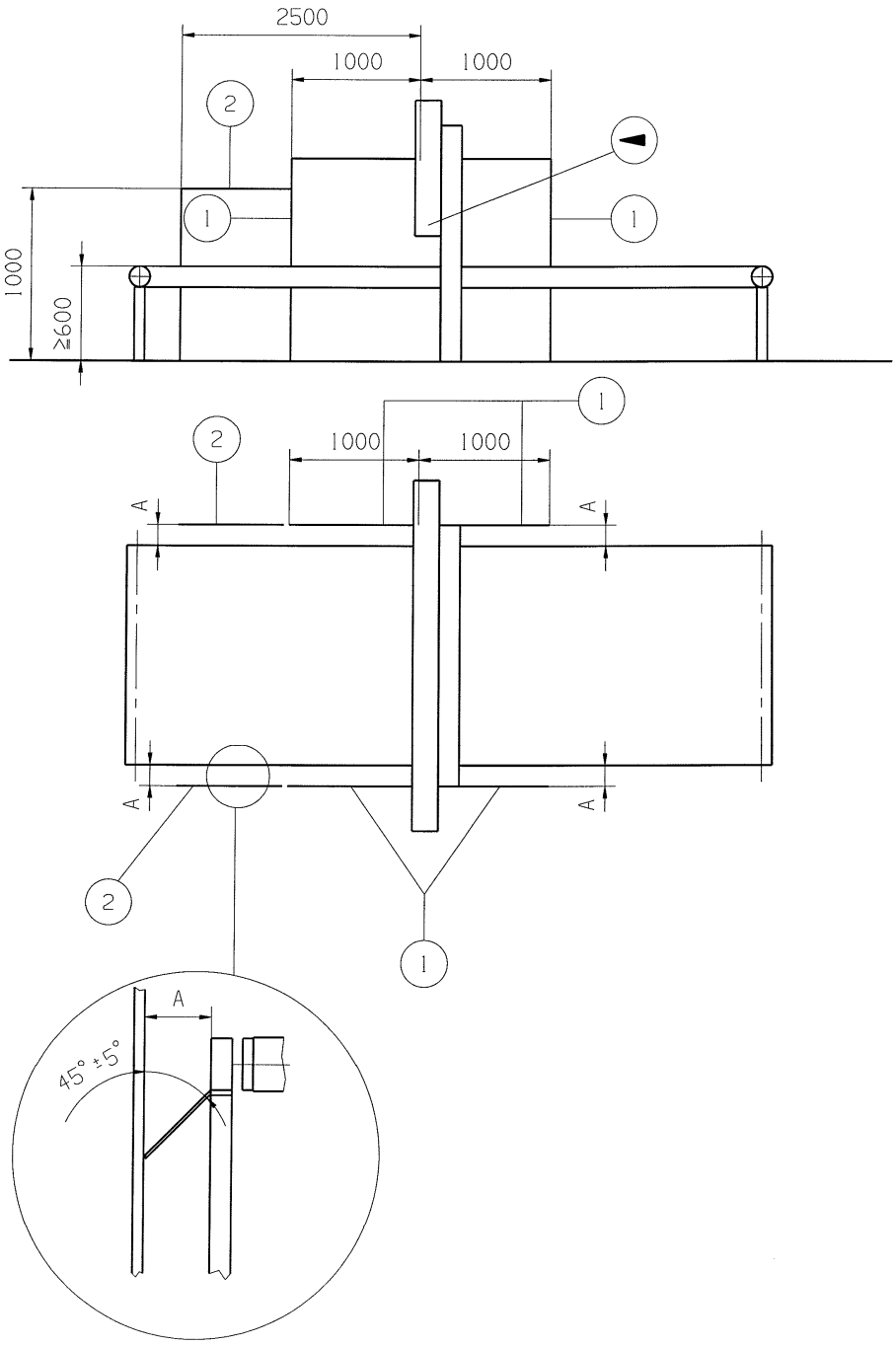
Key

1 Guard
2 Impeding device at the end of the table support
3 Impeding device at the side of the table
4 Pressure sensitive edge

Cutting edge of the bandknife

Figure 6 — Horizontal bandknife cutting machine with shuttle table (without conveyor belts)

Dimensions in millimetres

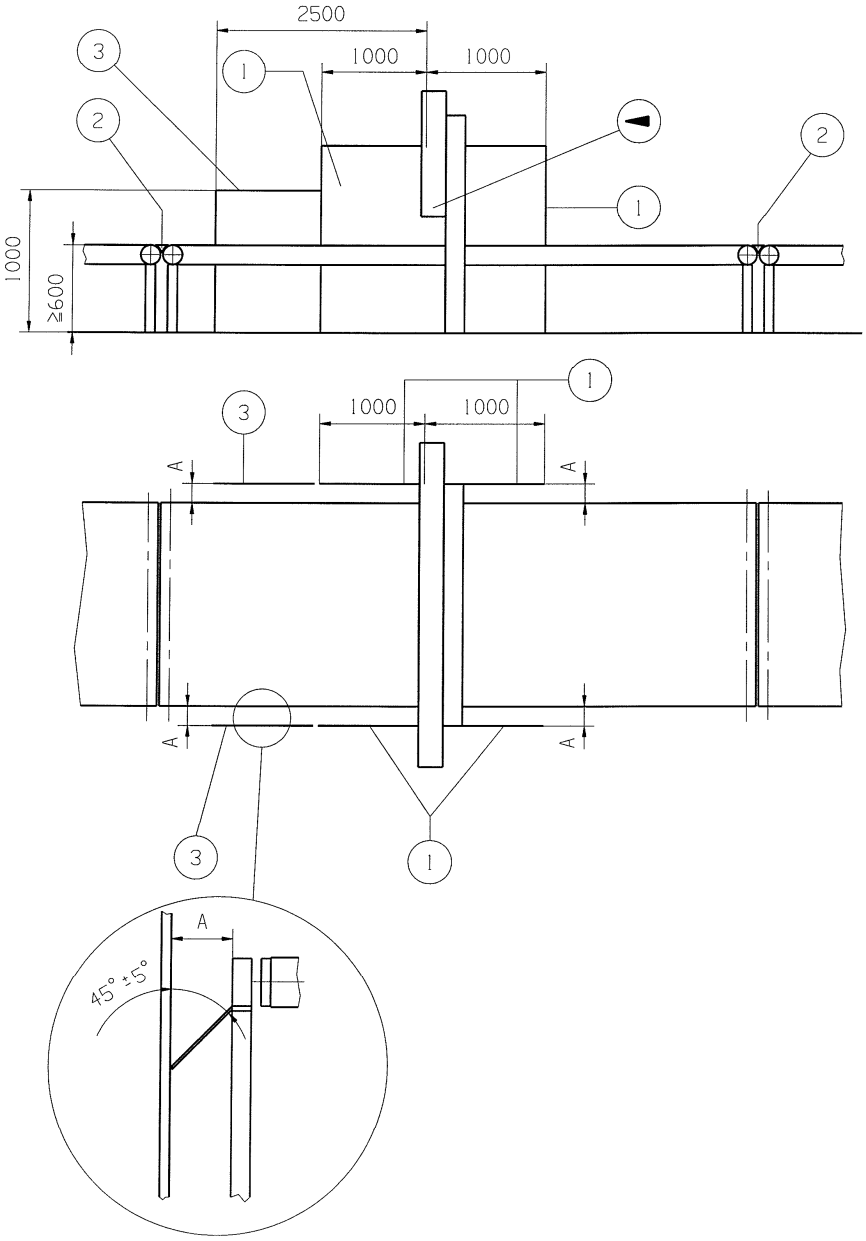


Key

1 Guard
2 Impeding device along the side of the machine
Cutting edge of the bandknife

Figure 7 — Horizontal bandknife cutting machine with conveyor belt

Dimensions in millimetres

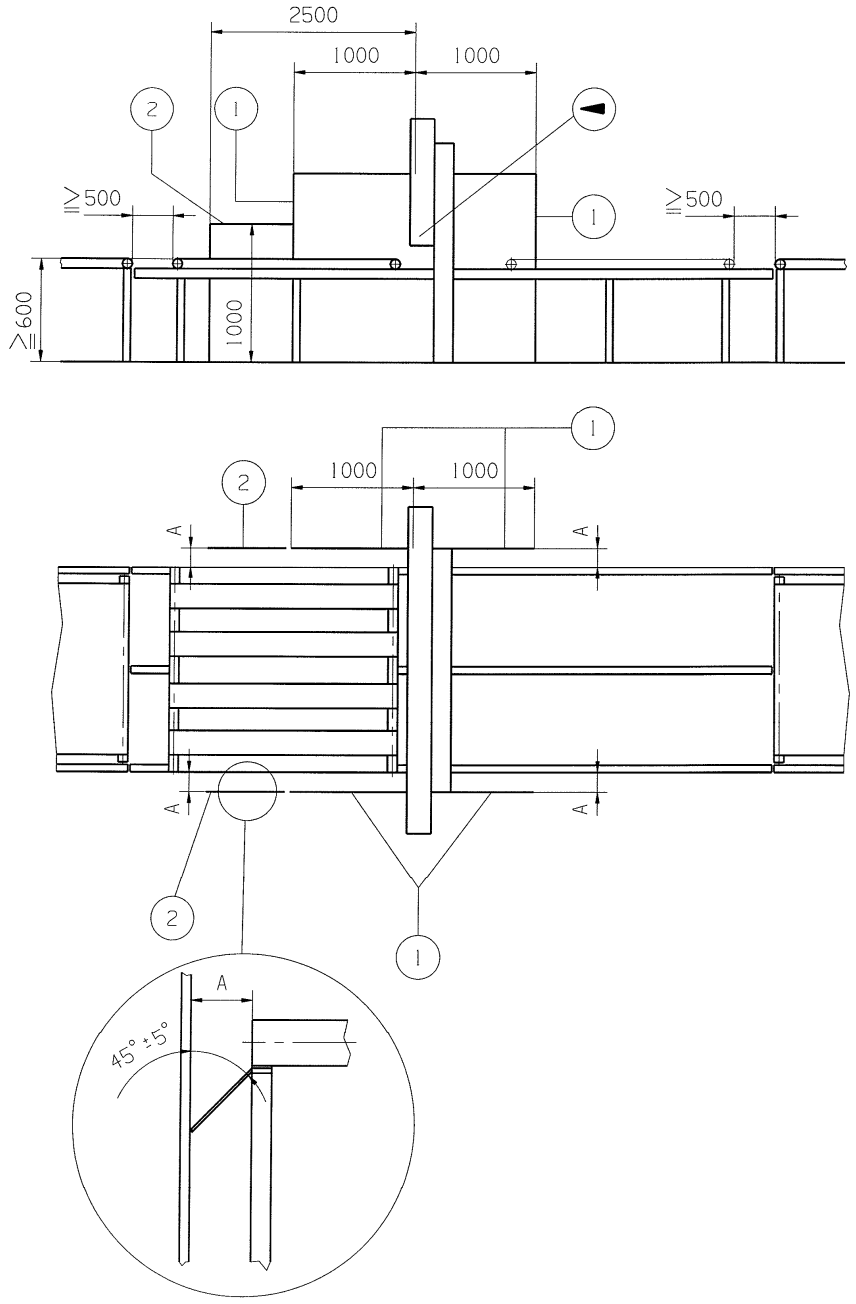


Key

1 Guard
2 Cover between adjacent conveyors
3 Impeding device at the side of the machine
Cutting edge of the bandknife

Figure 8 — Horizontal bandknife cutting machine with conveyor belt and ancillary loading and unloading conveyors

Dimensions in millimetres



Key

1 Guard
2 Impeding device at the side of the machine
Cutting edge of the bandknife

Figure 9 — Horizontal bandknife cutting machine with shuttle table (with conveyor belts) and ancillary loading and unloading conveyors

5.3.3.1.1 Mechanical hazards

5.3.3.1.1.1 Cutting by the moving bandknife

Access to the moving bandknife shall be prevented or restricted as follows.

— In the area of the cutting unit access to the usable part of the bandknife shall be prevented by fixed or interlocking guards (item 1 in Figures 6 to 9). The guards shall extend a horizontal distance of at least 1 000 mm from the bandknife in both the infeed and outfeed directions. This requirement does not apply to the outfeed side of horizontal bandknife cutting machines with manual take off of single sheets. Opening interlocking guards shall automatically stop the bandknife.

— Quick access to the cutting edge of the bandknife from beyond the guards described in the previous indent shall be prevented as described below.

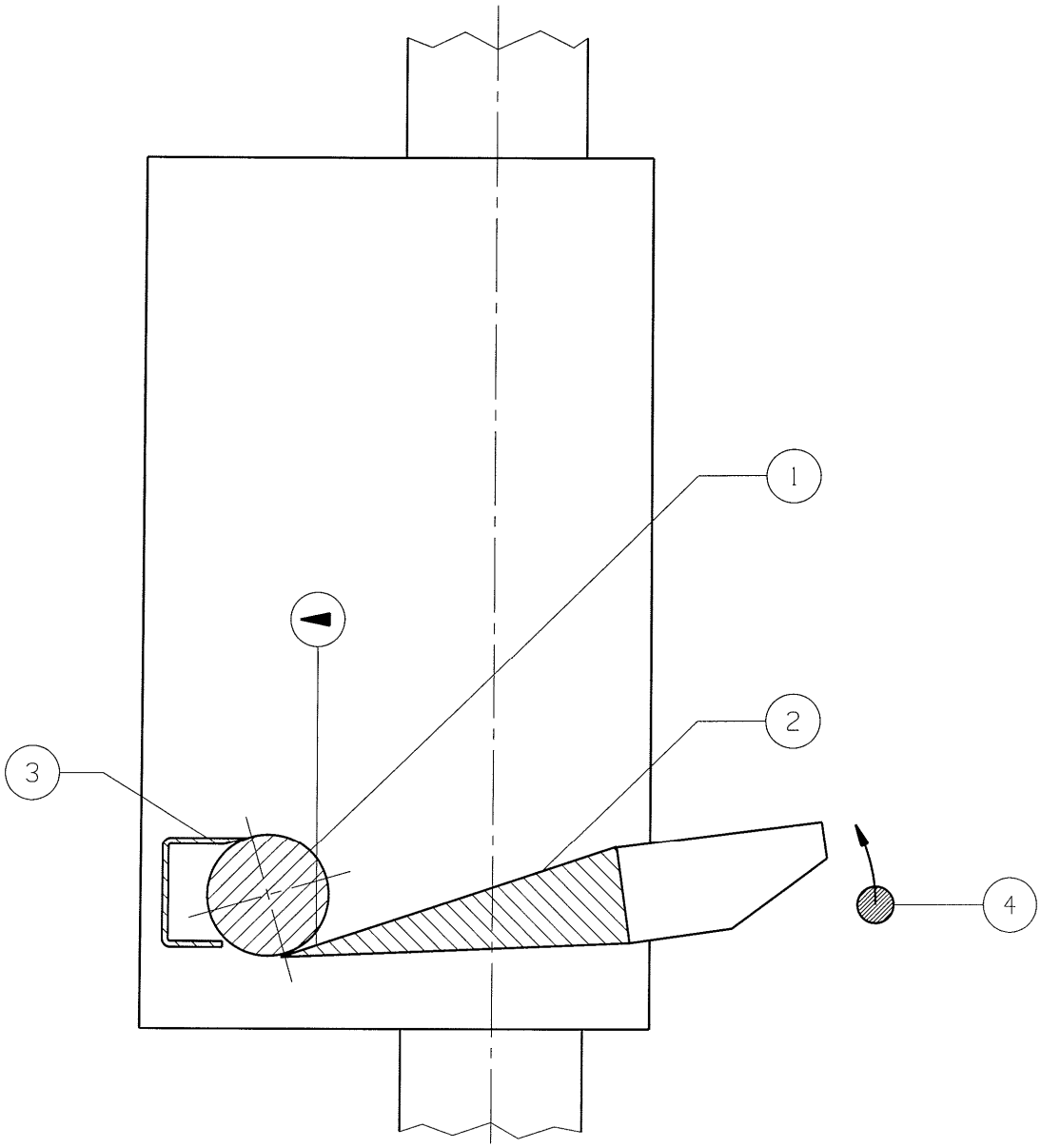
  An impeding device as described in 3.15, at a height of 1 000 mm and extending horizontally ≥ 2 500 mm from the bandknife, shall be fitted along the sides of the machine as shown in Figures 6 to 9.

  For horizontal bandknife cutting machines as shown in Figures 6 and 7, if the distance between the cutting edge of the bandknife and the end of the table support or conveyor belt is < 2 500 mm the impeding device as specified above shall extend around the end of the table support/conveyor, with a minimum clearance of 200 mm from the end of the table support/conveyor.

  For horizontal bandknife cutting machines as shown in Figure 6, if the distance between the cutting edge of the bandknife and the end of the table support is ≥ 2 500 mm an impeding device shall be positioned at the end of the table support to reduce the probability of access between the rails of the table support. This impeding device shall be at the height of the table support or at a minimum height of 600 mm whichever is greater. The minimum clearance between the impeding device and the end of the table support shall be 200 mm.

— For horizontal bandknife cutting machines with manual take off of single sheets the pressure roller situated on the upper side of the knife beam shall be equipped with a stripper bar. See Figure 10, 5.3.3.1.1.8 and 7.1.3.6.

Dimensions in millimetres



Key

1 Pressure roller
2 Knife beam
3 Stripper bar
4 Protective device, here a pressure sensitive bar

Cutting edge of the bandknife

Figure 10 — Horizontal bandknife cutting machine with manual take off of single sheets

5.3.3.1.1.2 Shearing and crushing during vertical movement of the cutting unit

Access to the danger areas shall be prevented or restricted by:

— fixed guards; or

— the safeguards referred to in 5.3.3.1.1.1; opening an interlocking guard shall automatically stop the movement of the cutting unit.

5.3.3.1.1.3 Impact caused by table movement

Pressure sensitive edges shall be provided as shown in Figure 6, which, when actuated by a force > 200 N, shall stop the table.

5.3.3.1.1.4 Whiplash of the bandknife if it breaks

In addition to 5.1.2.3, breakage of the bandknife shall automatically stop the table and the conveyors.

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

The machine shall preferably be designed so that manual intervention at the grinding unit can be performed outside the area protected by the guards specified in 5.3.3.1.1.1.

Otherwise, a fixed guard with an interlocking door shall be provided to surround the grinding area. Unintentional contact with the bandknife from inside the guarded area shall be prevented by an additional guard. This guard shall be designed so that from the position in which the operator stands during manual intervention at the grinding unit direct access to, or falling into, the bandknife is prevented.

A mode selector switch shall be installed. If the mode selector switch is in the "operating" position, opening the interlocking door shall result in an emergency stop. If the mode selector switch is in the "grinding" position, any movement of the table and the cutting unit shall be prevented.

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

For machines of the types shown in Figure 8 and Figure 9, drawing-in hazards at the transfer areas of the ancillary loading and unloading conveyors shall be prevented by:

— synchronous operation of the machine and ancillary conveyors, even in case of failure of the energy supply to one of the conveyors, ensured by the design of the control circuit for the overall installation; or

— a cover, the gap between cover and conveyor shall be ≤ 4 mm; or

— fixed guards.

5.3.3.1.1.7 Crushing at the transfer areas between the reversing table and ancillary loading/unloading conveyors (Figure 9)

For machines of the type shown in Figure 9, the minimum distance between the reversing table and the ancillary loading/unloading conveyors during the cutting process shall never be less than 500 mm. Moving the reversing table closer to the ancillary conveyors for manual and automatic loading or unloading purposes shall only be possible with a speed less than 100 mm/s.

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

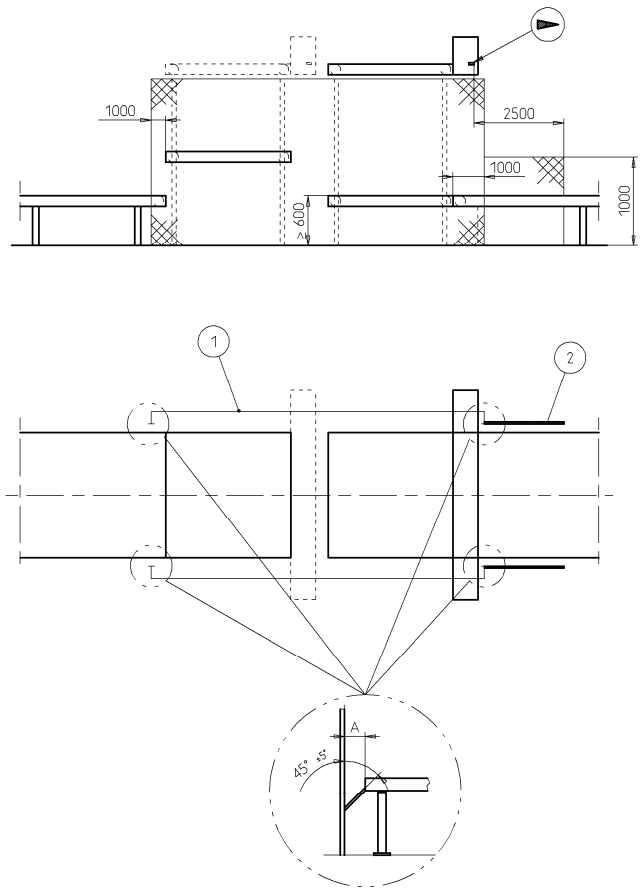
Access to the nip point between the material and the knife guide at the back of the machine shall be prevented during the return movement of the table or conveyor by a pressure sensitive edge or bar, a pressure sensitive wire or ESPE (see Figure 10). Actuation or interruption of these devices during the return movement of the table or conveyor shall stop the return movement of the table or conveyor.

5.3.3.1.2 Electrical hazards

For machines with manual take off of single sheets, see 7.1.3.7.

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

Dimensions in millimetres



Key

1 Fixed guard
2 Impeding device
Cutting edge of the bandknife

Figure 11 — Horizontal bandknife cutting machine with vertically movable table or conveyor

5.3.3.2.1 The same requirements and/or measures as in 5.3.3.1.1.4, 5.3.3.1.1.5, 5.3.3.1.1.6 and 5.3.3.1.1.7 plus the following shall apply.

5.3.3.2.2 Cutting by the bandknife (moving or at rest)

The bandknife shall be positioned out of reach from the reference plane in accordance with Table 1 of EN 294:1992.

Quick access to the cutting edge of the bandknife shall be prevented by an impeding device (item 2 in Figure 11). This impeding device shall have a height of 1 000 mm and extend horizontally ≥ 2 500 mm from the bandknife when it is at the extreme limit of its travel (on the right side in Figure 11).

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

The danger area(s) created by the vertical movement of the table(s) or conveyor(s) shall be safeguarded by a fixed guard (item 1 in Figure 11). This guard shall extend, at the loading and unloading sides, a horizontal distance of at least 1 000 mm from the danger area(s).

Where there are no ancillary loading or unloading conveyors, the loading and unloading sides shall be safeguarded by interlocking guards or electro-sensitive protective equipment (ESPE). If ESPE is used, it shall have at least two horizontal beams. The beams shall be arranged at heights of 400 mm and 900 mm above floor level. Opening the interlocking guard or interrupting the ESPE shall automatically stop the table or conveyor, the bandknife and the cutting unit.

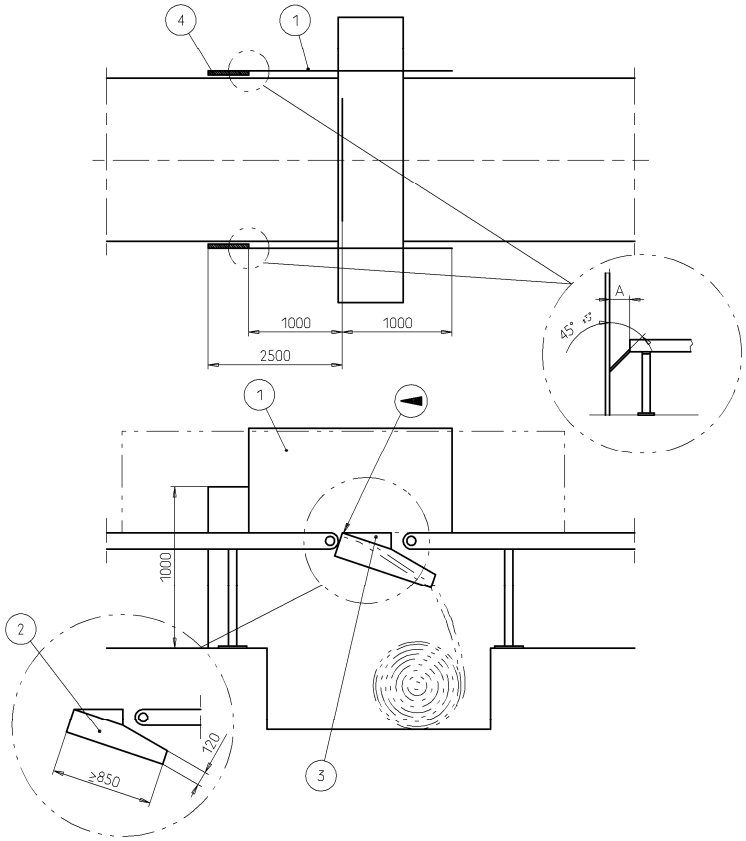
5.3.4 Horizontal bandknife cutting machines for block trimming

5.3.4.1 Top trimming

The same requirements and/or measures as in 5.3.3.1 shall apply.

5.3.4.2 Bottom trimming (Figure 12)

Dimensions in millimetres



Key

1 Fixed guard
2 Tunnel guard
3 Knife beam
4 Impeding device

Cutting edge of the bandknife

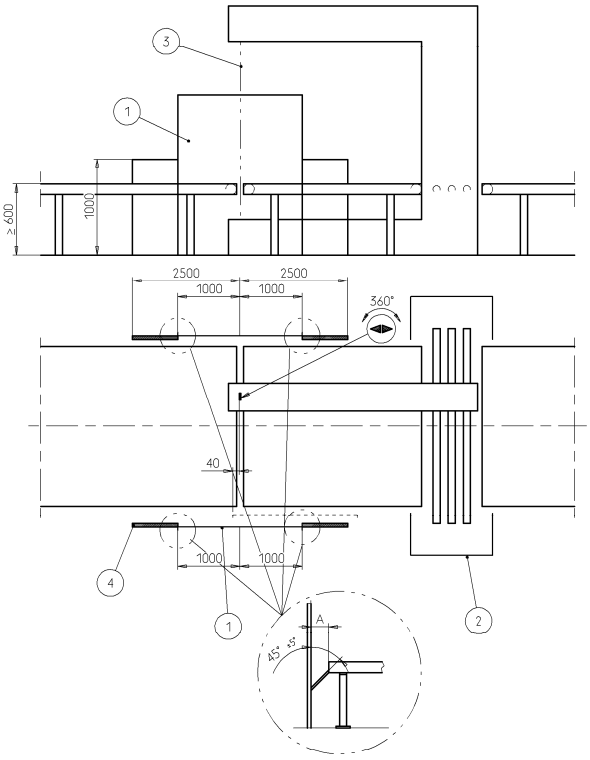
Figure 12 — Horizontal bandknife cutting machine for bottom trimming

The same requirements and/or measures as in 5.3.3.1 shall apply.

In addition, a protective device, e.g. a tunnel guard (item 2 in Figure 12) with dimensions in accordance with Table 4 of EN 294:1992 shall be provided. If parts of this protective device can be opened, they shall be interlocked. Opening these parts shall automatically stop the conveyor and the bandknife.

5.3.5 Vertical bandknife cutting machines for block trimming (Figures 13, 14 and 15)

Dimensions in millimetres



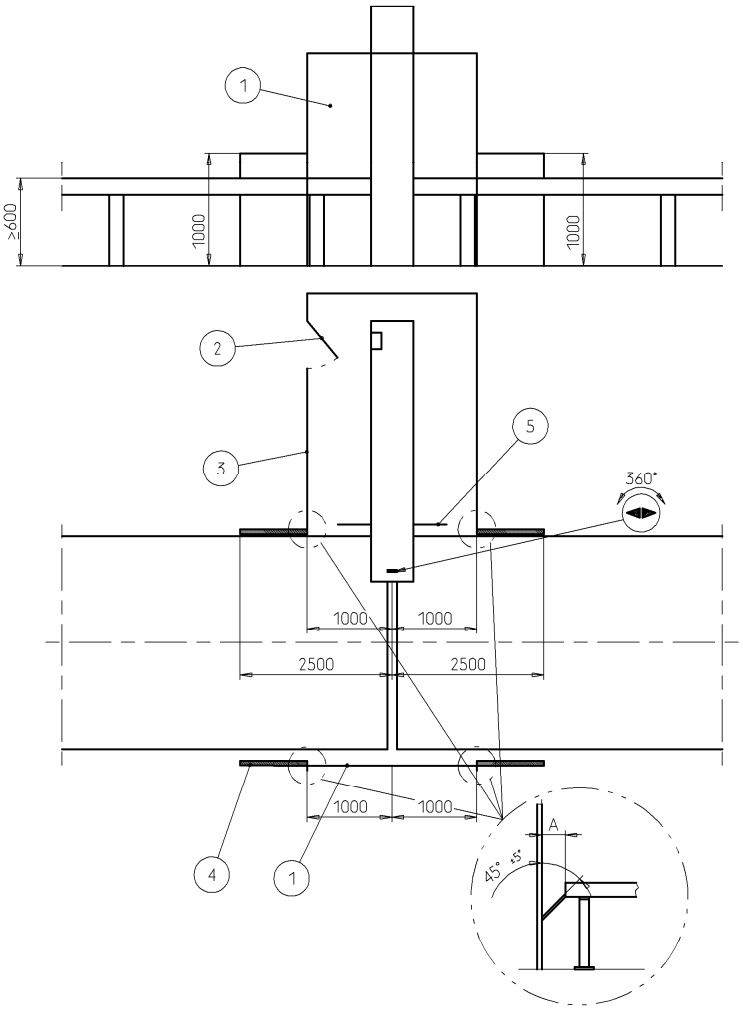
Key

1 Interlocking guard
2 Fixed guard
3 Bandknife
4 Impeding device

Cutting edge of the bandknife

Figure 13 — Vertical bandknife cutting machine for block trimming, type 1

Dimensions in millimetres



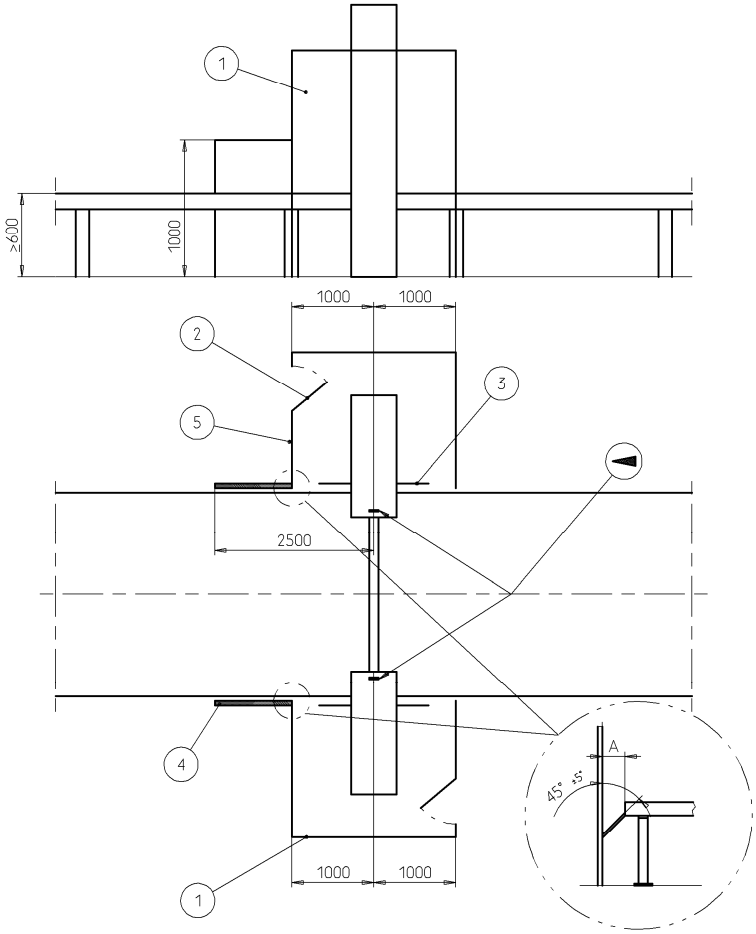
Key

1 Fixed guard
2 Interlocking door
3 Fixed guard
4 Impeding device
5 Guard specified in 5.3.5.5, 2nd paragraph

Cutting edge of the bandknife

Figure 14 — Vertical bandknife cutting machine for block trimming, type 2

Dimensions in millimetres



Key

1 Fixed guard
2 Interlocking door
3 Guard specified in 5.3.5.5, second paragraph
4 Impeding device
5 Fixed guard

Cutting edge of the bandknife

Figure 15 — Vertical bandknife cutting machine for block trimming, type 3

5.3.5.1 Cutting by the moving bandknife

Access to the moving bandknife shall be prevented by fixed guards (items 1 in Figure 13 to Figure 15). The distance between the vertical edges of the fixed guards and the bandknife shall be at least 1000 mm on each side of the bandknife at the front and back of the machine.

Quick access to the cutting edge of the bandknife from beyond the fixed guards shall be prevented by impeding devices installed as shown in Figure 13 to Figure 15 (item 4). These impeding devices shall have a height of 1 000 mm and extend horizontally ≥ 2 500 mm from the bandknife.

To further reduce the probability of access to the bandknife from the sides:

— the height of the conveyor shall be ≥ 600 mm; and

— a warning not to climb on the table shall be affixed to the machine. See 7.1.3.3 and Annex B.

5.3.5.2 Cutting due to unintentional contact with the bandknife while it is at rest

For machines of the type shown in Figure 13, guard 1 on the operator's side may be a horizontally-movable, interlocking guard to allow easier loading and unloading. Unintentional contact with the bandknife at rest during loading and unloading shall then be prevented by limiting the movement of the interlocking guard so that the distance between the vertical edge of the guard and the bandknife is never less than 40 mm.

Moving the interlocking guard out of its position for normal operation shall stop the bandknife, cutting unit and conveyor.

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

This danger zone is safeguarded by the guards mentioned in 5.3.5.1 and 5.3.5.2.

5.3.5.4 Whiplash of the bandknife when it breaks

In addition to 5.1.2.3 breakage of the bandknife shall automatically stop the cutting unit and the conveyor.

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

The machines shall preferably be designed so that manual intervention at the grinding unit can be performed outside the area protected by the fixed guard specified at 5.3.5.1.

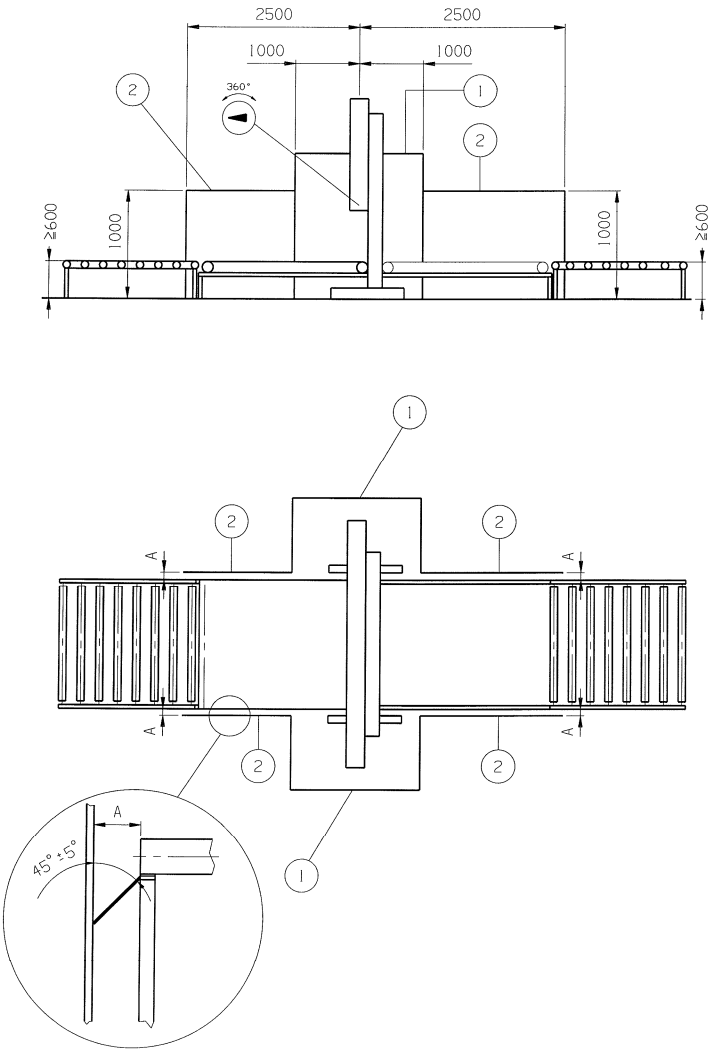
Otherwise, a fixed guard with an interlocking door shall be provided to surround the grinding area. Unintentional contact with the bandknife from inside the guarded area shall be prevented by an additional guard. This guard shall be designed so that from the position in which the operator stands during manual intervention at the grinding unit direct access to, or falling into, the bandknife is prevented.

A mode selector switch shall be installed. If the mode selector switch is in the "operating" position, opening the interlocking door shall result in an emergency stop. If the mode selector switch is in the "grinding" position, any movement of the cutting unit and the table/conveyor shall be prevented.

5.3.6 Contour cutting machines

5.3.6.1 Horizontal contour cutting machines (Figures 16, 17, 18 and 19)

Dimensions in millimetres

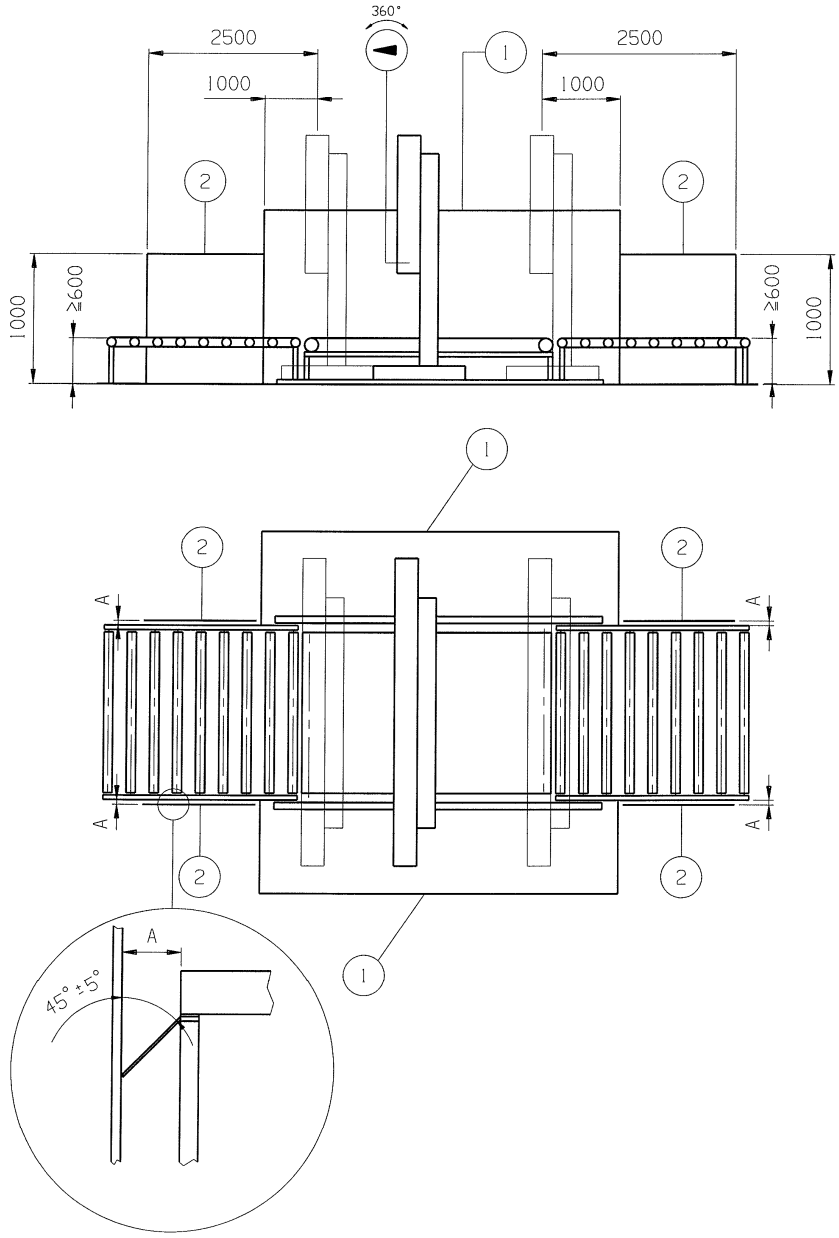


Key

1 Fixed or interlocking guard
2 Impeding device
360° Cutting edge of the bandknife

Figure 16 — Horizontal contour cutting machine with fixed cutting unit and loading/unloading conveyor

Dimensions in millimetres



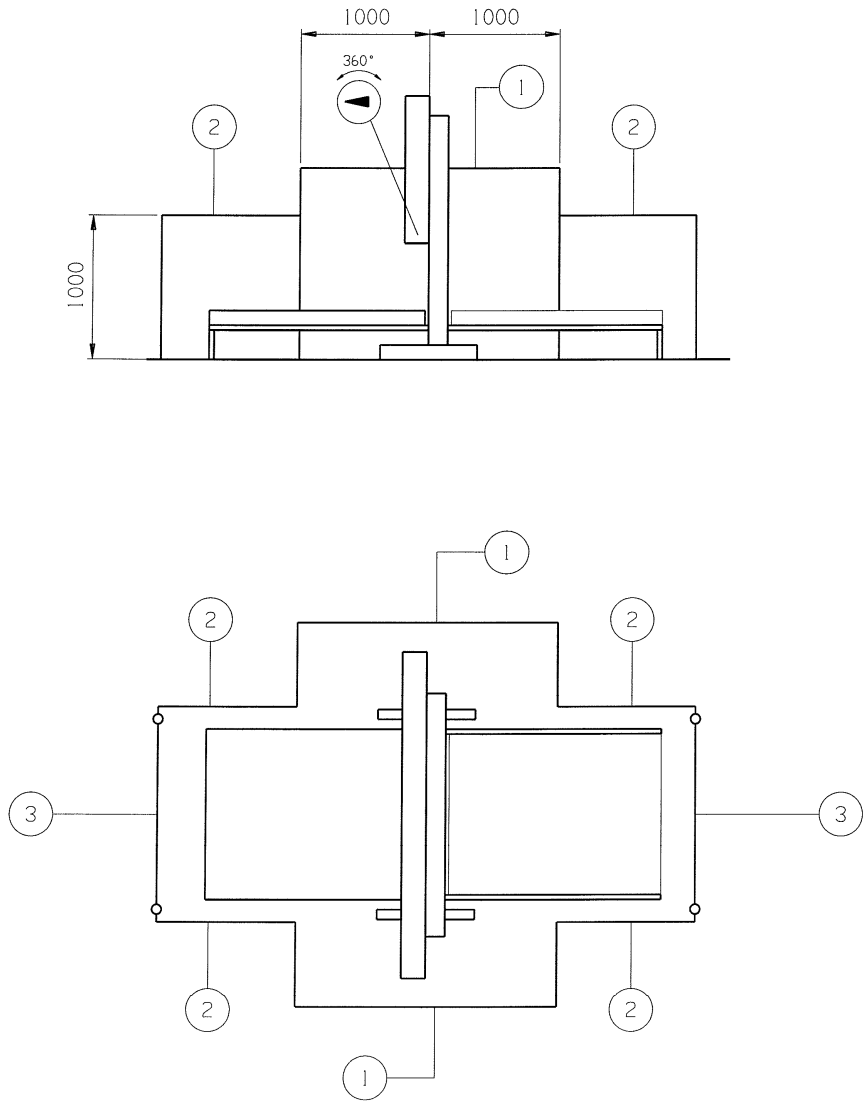
Key

1 Fixed or interlocking guard
2 Impeding device

360° Cutting edge of the bandknife

Figure 17 — Horizontal contour cutting machine with mobile cutting unit and loading/unloading conveyor

Dimensions in millimetres



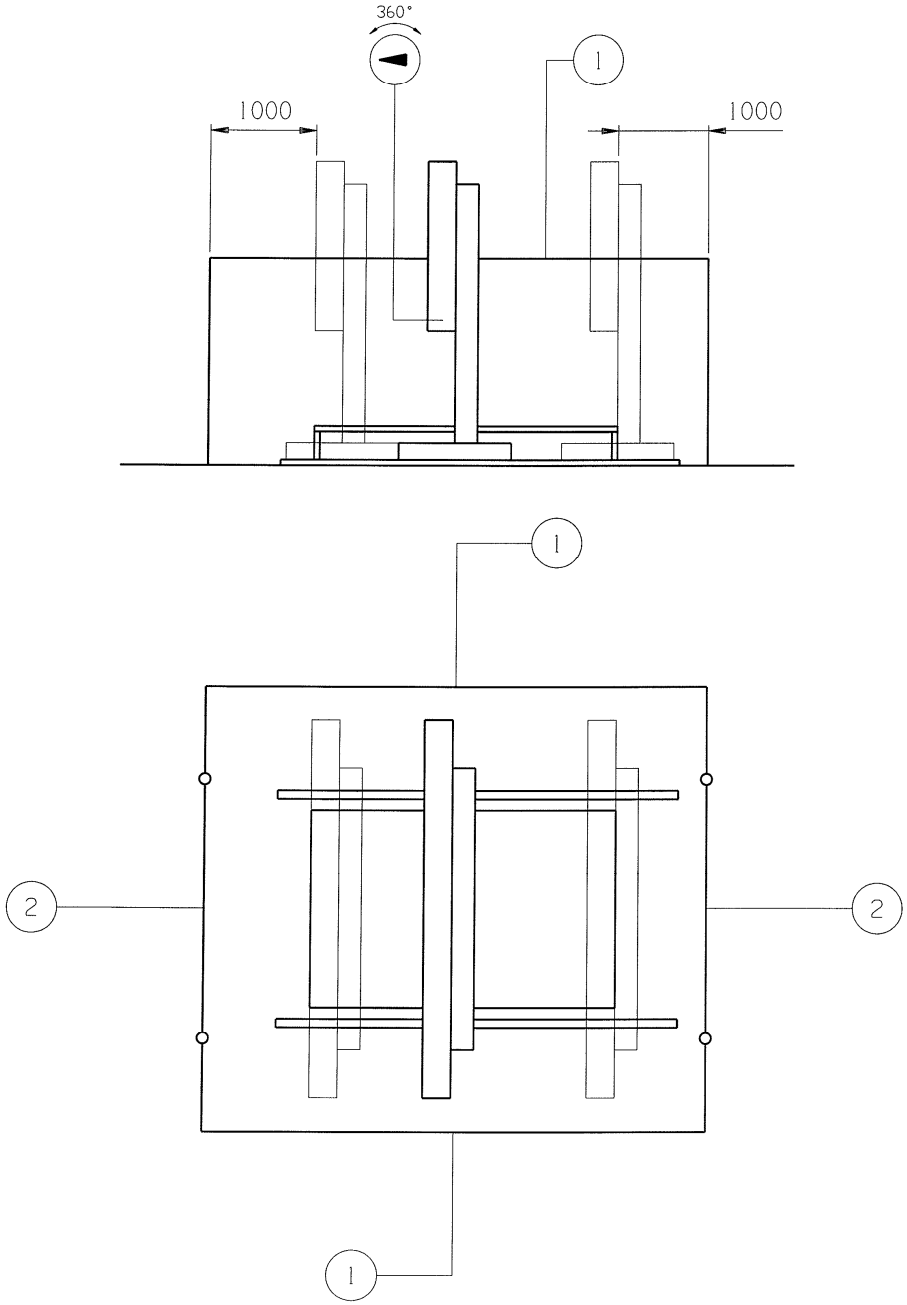
Key

1 Fixed or interlocking guard
2 Impeding device
3 Electro-sensitive protective equipment

360°
Cutting edge of the bandknife

Figure 18 — Horizontal contour cutting machine with fixed cutting unit and without loading/unloading conveyor

Dimensions in millimetres



Key

1 Fixed or interlocking guard
2 Electro-sensitive protective equipment
360° Cutting edge of the bandknife

Figure 19 — Horizontal contour cutting machine with mobile cutting unit and without loading/unloading conveyor

5.3.6.1.1 Cutting by the moving bandknife

In the area of the cutting unit access to the usable part of the bandknife shall be prevented by fixed or interlocking guards. Opening the interlocking guards shall automatically stop the bandknife. The guards shall extend at least 1 000 mm from the bandknife on both sides of the machine and on both sides of the bandknife as shown in Figures 16 to 19.

For stand alone machines of the type shown in Figure 19 the fixed or interlocking guards shall in all cases extend to the end of the table support or conveyor. Openings in the fixed or interlocking guards shall be fitted with electro-sensitive protective equipment (ESPE, item 2) that shall have at least two horizontal beams arranged at heights of 400 mm and 900 mm.

For machines of the types shown in Figures 16 to 18, quick access to the cutting edge of the bandknife from beyond the guards described in the first paragraph above shall be prevented as follows.

— For in-line machines as shown in Figures 16 and 17, an impeding device as defined in 3.15 with a height of 1000 mm and extending horizontally ≥ 2 500 mm from the bandknife on both sides of the machine and on both sides of the bandknife shall be provided.

— For stand alone machines as shown in Figure 18, an impeding device with a height of 1 000 mm, extending to the end of the table support or conveyor shall be provided. Electro-sensitive protective equipment (ESPE) (item 3 in Figure 18) as specified above shall be installed.

Loading or unloading conveyors that contribute to keeping operators away from the danger area shall be installed so that they cannot be moved away from the machine to gain access to the guarded area.

The loading or unloading conveyors shall have a minimum height of 600 mm. Otherwise, electro-sensitive protective equipment (ESPE) shall be installed transversely at the end of the impeding devices. It shall have at least two horizontal beams arranged at heights of 400 mm and 900 mm above the loading or unloading conveyor.

Interruption of any ESPE shall automatically stop the bandknife, the conveyors and all movements of the table and the cutting unit.

5.3.6.1.2 Shearing and crushing during vertical movement of the cutting unit

The danger areas are protected by the fixed or interlocking guards already described in 5.3.6.1.1 and, in the case of machines of the type shown in Figure 19, also by the ESPE. In addition to the action specified in 5.3.6.1.1, opening the interlocking guards shall stop the vertical movement of the cutting unit.

5.3.6.1.3 Impact caused by table movement

The danger areas shall be protected by the fixed or interlocking guards already described in 5.3.6.1.1. In addition to the action specified in 5.3.6.1.1, opening the interlocking guards shall stop the table.

5.3.6.1.4 Whiplash of the bandknife if it breaks

In addition to 5.1.2.3, breakage of the bandknife shall automatically stop the cutting unit, the table and the conveyors.

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

The machines shall preferably be designed so that manual intervention at the grinding unit can be performed outside the area protected by the guards specified at 5.3.6.1.1.

Otherwise a fixed guard with an interlocking door shall be provided to surround the grinding area. Unintentional contact with the bandknife from inside the guarded area shall be prevented by an additional

guard. This guard shall be designed so that from the position in which the operator stands during manual intervention at the grinding unit direct access to, or falling into, the bandknife is prevented.

A mode selector switch shall be installed. If the mode selector switch is in the "operating" position, opening the interlocking door shall result in an emergency stop. If the mode selector switch is in the "grinding" position, any movement of the table and the cutting unit shall be prevented.

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

Drawing-in hazards at the transfer areas of the ancillary loading and unloading conveyors shall be prevented by:

— synchronous operation of the machine and ancillary conveyors, even in case of failure of the energy supply to one of the conveyors, ensured by the design of the control circuit for the overall installation; or

— a cover, the gap between cover and conveyor shall be ≤ 4 mm; or

— fixed guards.

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

For a machine with reversing table as shown in Figure 16:

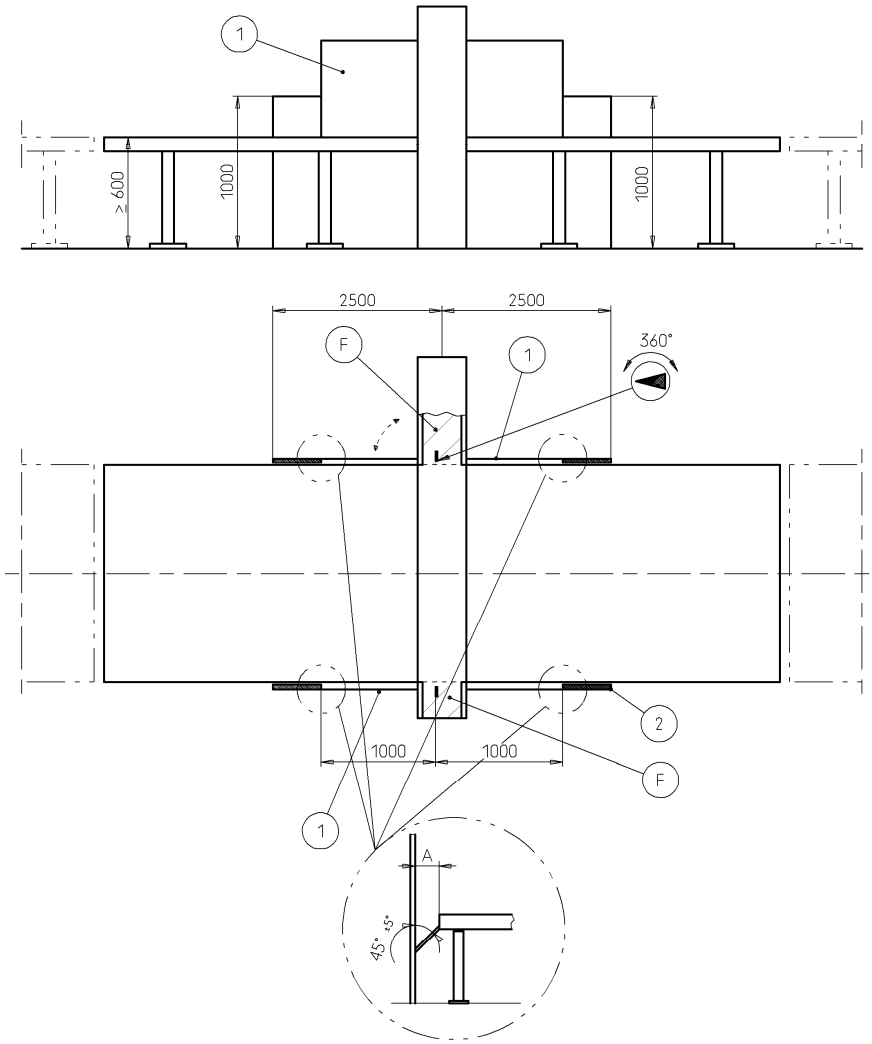
— during the cutting process the minimum distance between the reversing table and the ancillary loading or unloading conveyors shall be ≥ 500 mm; and

— moving the reversing table closer to the ancillary conveyors for manual and automatic loading or unloading purposes shall only be possible with reduced speed less than 100 mm/s.

For a machine with reversing loading or unloading conveyor as shown in Figure 17, the combination of fixed, or interlocking, guards and the impeding devices shall prevent access to the danger area.

5.3.6.2 Vertical contour cutting machines (Figure 20)

Dimensions in millimetres



Key

1 Fixed or interlocking guard
2 Impeding device
360° Cutting edge of the bandknife

Figure 20 — Vertical contour cutting machine

5.3.6.2.1 Cutting by the moving bandknife

Access to the moving bandknife shall be prevented or restricted as follows.

In the area of the cutting unit access to the usable part of the bandknife shall be prevented by fixed or interlocking guards. Opening the interlocking guards shall automatically stop the bandknife. The guards shall extend at least 1 000 mm on each side of the bandknife as shown in Figure 20.

Quick access to the cutting edge of the bandknife from beyond the guards described in the previous indent shall be prevented by an impeding device as described in 3.15 with a height of 1 000 mm and extending ≥ 2 500 mm from the bandknife along the sides of the machine as shown in Figure 20.

5.3.6.2.2 Cutting due to unintentional contact with the bandknife at rest

During automatic operation, before the material which has been cut is unloaded, the bandknife shall automatically be positioned in one of the guarded areas F (see Figure 20).

5.3.6.2.3 Crushing or drawing-in at the transfer area of ancillary loading/unloading conveyors

The crushing and drawing-in hazards at the transfer areas of the ancillary loading and unloading conveyors shall be prevented by:

— synchronous operation of the machine and ancillary conveyors, even in case of failure of the energy supply to one of the conveyors, ensured by the design of the control circuit for the overall installation; or

— a cover, the gap between cover and conveyor shall be ≤ 4 mm; or

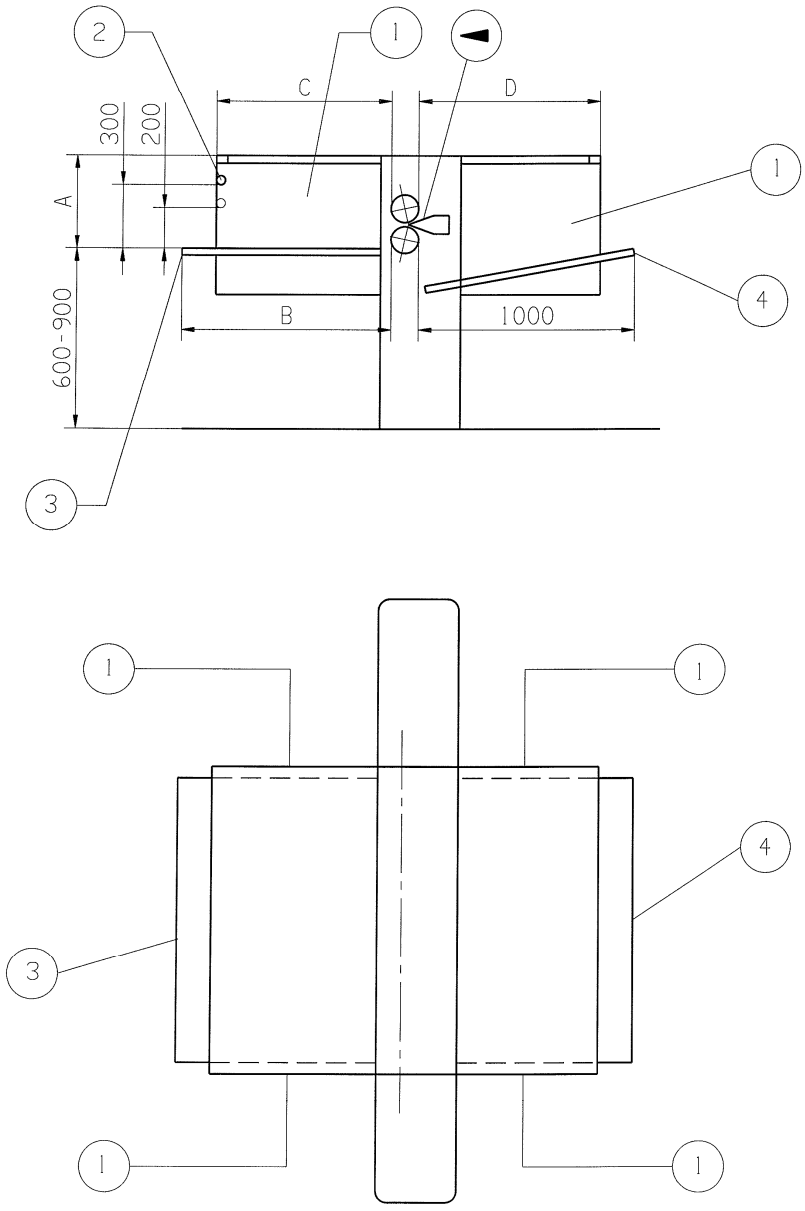
— fixed guards.

5.3.6.2.4 Whiplash of the bandknife if it breaks

In addition to 5.1.2.3 breakage of the bandknife shall automatically stop the cutting unit.

5.3.7 Profile cutting and splitting machines (Figure 21 and Figure 22)

Dimensions in millimetres



Key

1 Tunnel guard side wall
2 Bar
3 Loading table
4 Unloading table
Cutting edge of the bandknife

Figure 21 — Profile cutting / splitting machine

5.3.7.1 Mechanical hazards

5.3.7.1.1 Drawing-in by the two rollers, or between a roller and fixed parts of the machine, at the front, rear and sides of the machine and subsequent cutting by the bandknife

Tunnel guards with dimensions in accordance with Table 1 of this standard shall be provided as shown in Figure 21. The tops of the tunnel guards shall allow a good view of the cutting process.

If A ≤ 120 mm, dimensions B, C and D in Figure 21 shall be in accordance with Table 4 of EN 294:1992. If A > 120 mm dimensions B, C and D shall be in accordance with Table 1 of this standard.

In addition a bar that is easily installable at the positions indicated in Table 1, shall be supplied to prevent the operator from bending into the tunnel. See also 7.1.3.8.

Table 1 — Tunnel guard dimensions and bar positioning (Dimensions in mm)

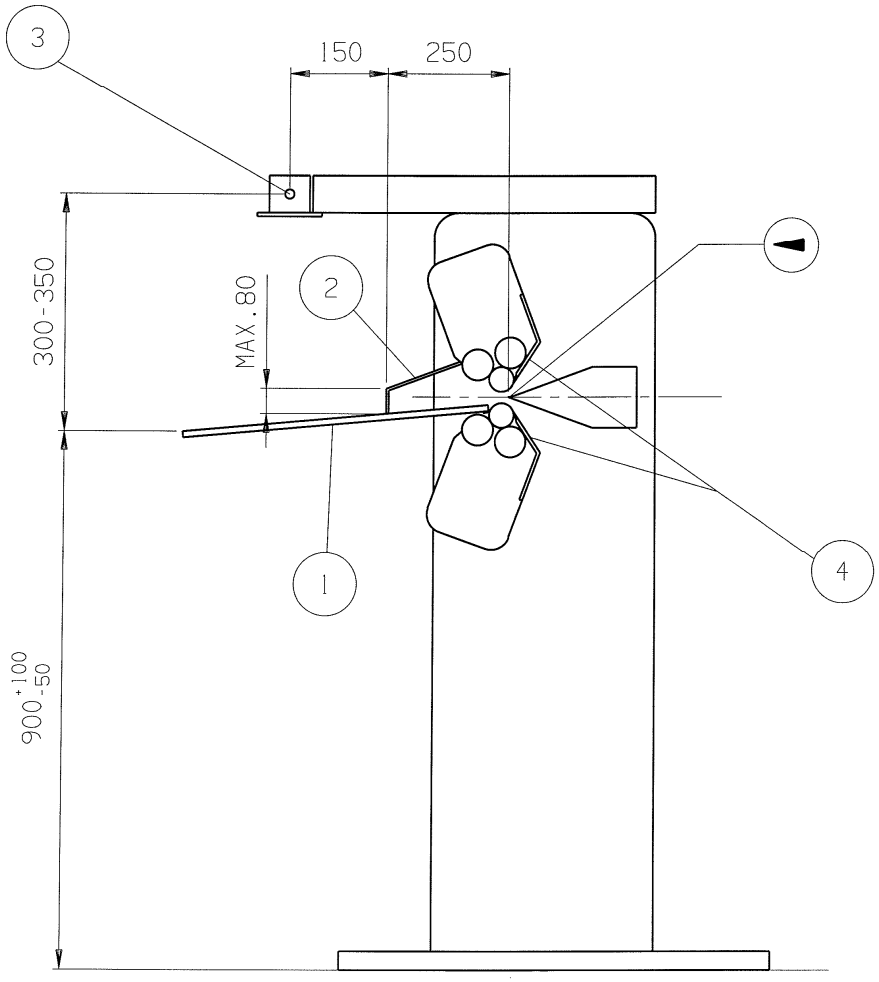
A	B	C	D	Height of the bar above table
> 120 to ≤ 300	≥ 1 250	≥ 850	≥ 850	-
> 300 to ≤ 400	≥ 1 250	≥ 850	≥ 850	200
> 400; ≤ 680	≥ 1 250	≥ 850	≥ 850	300

The tunnel guards shall include openings covered by interlocking guards in order to allow removal of blocked material. Opening these guards shall stop the bandknife, the rollers and the conveyor.

In the case of machines with infeed and outfeed conveying systems extending ≥ 2 500 mm from the bandknife and interlocked with the machine, the tunnel guards may be replaced by a combination of vertical fixed guards and impeding devices, with no gap between them, at each side of the machine. The fixed guards shall have a height in accordance with EN 294 Table 2 and extend 1 000 mm from the nip between the rollers. The impeding devices shall have a height of 1 000 mm and extend ≥ 2 500 mm from the nip between the rollers.

In the case of tables or conveyors that are removable, they shall be interlocked so that when they are removed, the feed rollers, bandknife and feed conveyors shall be stopped.

Dimensions in millimetres



Key

1 Loading table
2 Tunnel
3 Pressure sensitive bar
4 Stripper plate

Cutting edge of the bandknife

Figure 22 — Heavy duty splitting machine

In the case of heavy duty splitting machines (Figure 22) access to the moving feed rollers and bandknife shall be restricted as follows.

— A tunnel guard shall be provided at the infeed to the bandknife as shown in Figure 22. The tunnel guard shall extend ≥ 250 mm from the nip point between the feed rollers and the material being fed. The maximum height of the feed opening of the tunnel guard shall be 80 mm. The top cover of the tunnel guard shall be made adjustable to the height of the material to be cut. See 7.1.3.9.

— A horizontal pressure sensitive bar extending the full width of the tunnel guard shall be provided above the feed table as shown in Figure 22. The trip bar shall meet the following requirements:

  — it shall be located a horizontal distance of 150 mm in front of the tunnel guard feed opening and at a height between 300 mm and 350 mm above the feed table;

  — it shall be actuated by a displacement not exceeding 4 mm towards the feed rollers;

  — actuation of the bar shall not require a force greater than 150 N and shall stop the movements of the feed rollers and bandknife;

  — it shall be equipped with at least one position sensor at each end;

  — return of the trip bar to its rest position shall not cause the feed rollers and bandknife to restart.

— The height of the feed table shall be $900\ ^{+100}_{-50}$ mm.

5.3.7.1.2 Shearing, crushing and drawing-in between the lower roller and fixed parts of the machine underneath the table

Access to the danger areas shall be prevented by fixed guards, or restricted by e.g. fixed bars, flexible flaps, at the infeed and outfeed sides.

5.3.7.1.3 Drawing-in and crushing by the upper roller when reaching from the rear of the machine (Figure 21)

Access from the rear to the upper roller shall be prevented by a stripper plate on the upper roller or by ESPE.

A stripper plate shall not be used with profiling machines.

The ESPE shall be installed at a vertical distance ≤ 50 mm above the largest diameter upper roller used on the machine and at a horizontal distance ≤ 100 mm from the cutting edge of the bandknife. Interrupting the ESPE shall stop the bandknife and the rollers.

5.3.7.1.4 Drawing-in and crushing between the pressure and supporting rollers when reaching from the rear of the machine (Figure 22)

Access from the rear of the machine to the nip between the pressure and supporting rollers shall be prevented by stripper plates as shown in Figure 22.

5.3.7.2 Electrical hazards

See 7.1.3.7.

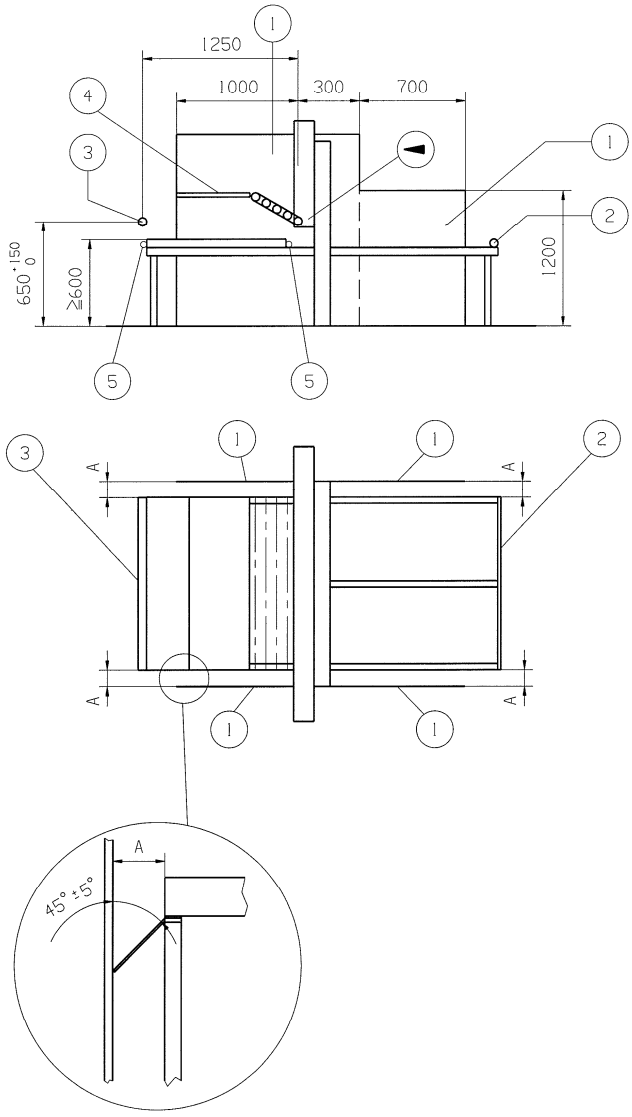
5.3.7.3 Hazards generated by neglecting ergonomic principles of machinery design

The height of the table for manual unloading shall be (750 ± 150) mm.

The machine design shall allow easy installation and removal of heavy rollers. See also 7.1.3.10.

5.3.8 Compression cutting machines (Figure 23)

Dimensions in millimetres



Key

1 Fixed guard
2 Ejectable bar
3 Pressure sensitive edge, bar or wire
4 Collection tray
5 Pressure sensitive edge

Cutting edge of the bandknife

Figure 23 — Compression cutting machine

5.3.8.1 Cutting by the moving bandknife

Access to the moving bandknife shall be prevented or restricted as follows.

— The distance between the bandknife and the edge of the table support on the infeed side shall be ≥ 1 250 mm.

— Access to the usable part of the bandknife shall be prevented or restricted by a fixed guard (item 1 in Figure 23) at each side of the machine. At the infeed side the guard shall have a height in accordance with EN 294:1992, Table 2 and extend a horizontal distance of at least 1 000 mm from the bandknife. At the outfeed side the guard shall have a height in accordance with EN 294:1992, Table 2 for a horizontal distance of 300 mm from the bandknife, then a height of 1 200 mm for a further horizontal distance of 700 mm to allow manual take off of the material.

— To reduce the probability of access to the bandknife from the outfeed side the following shall apply.

  — The height of the table shall be ≥ 600 mm.

  — At the end of the table supports, an ejectable bar, positioned at a height of ≥ 600 mm shall be provided. The force required for ejecting the bar shall be not more than 200 N. The bar shall be interlocked so that partial or total ejection stops the table and the bandknife.

  — Warning notices in accordance with Annex B shall be affixed at the infeed and outfeed of the machine.

5.3.8.2 Shearing and crushing during vertical movement of the cutting unit

Access to the danger areas shall be prevented by:

— fixed guards; or

— the guard specified at 5.3.8.1.

5.3.8.3 Drawing-in between the belt or rollers that compress the material and the material itself or the table.

Access to the danger area shall be prevented or restricted by a pressure sensitive edge, pressure sensitive bar, or a pressure sensitive wire, positioned at a height of $650\,^{+150}_{-0}$ mm, at a distance of 1 250 mm from the bandknife and extending over the whole width of the supporting structure of the table (see item 3 in Figure 23). If the horizontal distance between the first table support cross-member at the infeed side and the bandknife exceeds 1 250 mm the pressure sensitive edge, pressure sensitive bar, or wire, shall be positioned at the front end of the table support. Actuation of the pressure sensitive edge, pressure sensitive bar, or wire, shall stop the compression belt or rollers, table and bandknife. Following a stop triggered by actuation of the pressure sensitive edge, pressure sensitive bar, or wire, it shall be possible to reverse the drive of the compression belt, or rollers, and the table.

Crushing between the support of the pressure sensitive edge, pressure sensitive bar and the table shall be prevented either by making the bar ejectable or by preventing access between the table and the bar or the edge support by providing a telescopic cover.

An emergency stop actuator shall be positioned at the beginning of the table support structure on each side of the machine.

A collection tray shall be provided in front of the compression belt or rollers. It shall extend a horizontal distance of 1 000 mm in front of the bandknife. Alternatively a conveyor belt controlled by a hold-to-run control device may be provided.

5.3.8.4 Impact, crushing and shearing caused by movement of the table

Impact and crushing are prevented by the measures described in 5.3.8.3.

In addition pressure sensitive edges shall be fixed on both sides of the table (see item 5 in Figure 23).

These pressure sensitive edges also protect against the shearing hazard. In addition the minimum clearance between movable table and the cross-member shall be 100 mm.

5.3.8.5 Whiplash of the bandknife when it breaks

In addition to 5.1.2.3 breakage of the bandknife shall automatically stop the table and the compression belt or rollers.

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

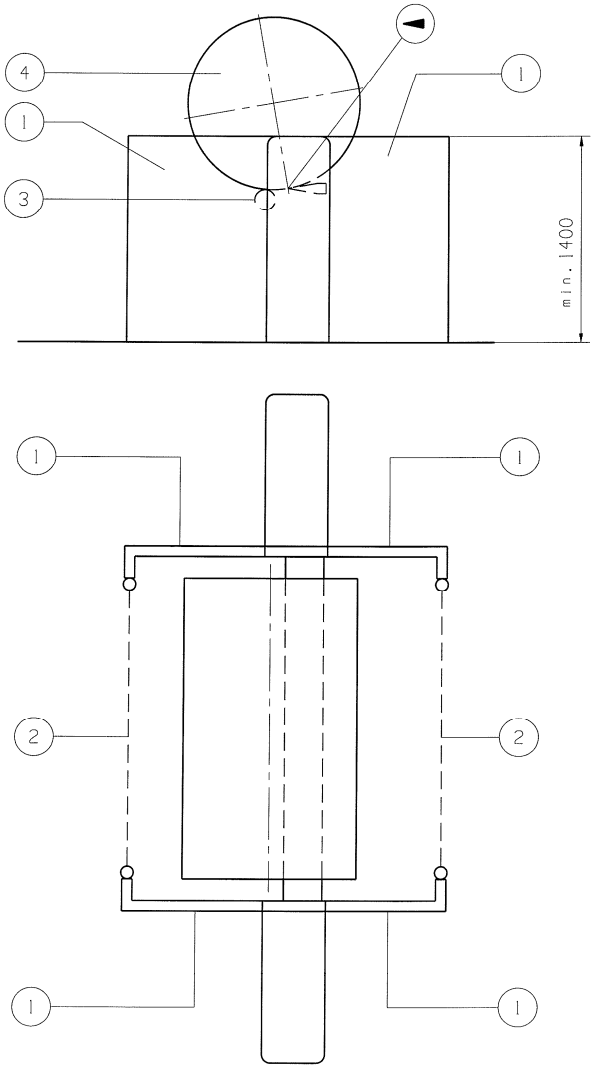
The machines shall preferably be designed so that manual intervention at the grinding unit can be performed outside the area protected by the guards specified at 5.3.8.1.

Otherwise a fixed guard with an interlocking door shall be provided to surround the grinding area. Unintentional contact with the bandknife from inside the guarded area shall be prevented by an additional guard. This guard shall be designed so that from the position in which the operator stands during manual intervention at the grinding unit direct access to, or falling into, the bandknife is prevented.

A mode selector switch shall be installed. If the mode selector switch is in the "operating" position, opening the interlocking door shall result in an emergency stop. If the mode selector switch is in the "grinding" position, any movement of the table and of the compression belt or rollers shall be prevented.

5.3.9 Peeling machines (Figure 24)

Dimensions in millimetres



Key

1 Fixed guard
2 ESPE
3 Pressure roller
4 Material to be peeled
Cutting edge of the bandknife

Figure 24 — Peeling machine

5.3.9.1 Mechanical hazards

5.3.9.1.1 Cutting by the moving bandknife and drawing-in between the pressure roller and the material

Access to the moving bandknife and the pressure roller shall be prevented by a fixed guard with a minimum height of 1 400 mm surrounding the whole machine except for the loading and unloading opening(s). Access through the opening(s) shall be prevented by an interlocking guard, or ESPE consisting of two horizontal beams at the heights of 400 mm and 900 mm above floor, positioned so that it is not possible to gain access to the bandknife before it has come to rest. If this is not possible, interlocking guards with guard locking shall be fitted. Opening the interlocking guards, or interrupting the ESPE, shall stop the pressure roller, bandknife and winder, if any.

Parts of the exposed bandknife inside the maximum cutting zone that are not in use during cutting shall be covered, for example by solid, hinged flaps. The exposed length of the bandknife on each side of the material shall be no more than 200 mm. See also 7.1.3.11.

For start-up a mode selector switch shall be provided outside the safeguards specified in the first paragraph of this subclause, in a position that allows a good view of the danger area.

In start-up mode with a maximum circumferential speed of the material of 10 m/min the interlocking guards or ESPE described above may be muted, so that the bandknife and pressure roller continue moving when the operator gains access to the danger area.

NOTE Winders, being ancillary equipment, are outside the scope of this standard.

5.3.9.1.2 Cutting due to unintentional contact with the bandknife while it is at rest

This hazard shall be prevented by covers (for example, the flaps mentioned in 5.3.9.1.1) or by the pressure roller. See also 7.1.3.11.

5.3.9.1.3 Whiplash of the bandknife when it breaks

In addition to 5.1.2.3 breakage of the bandknife shall automatically stop the pressure roller.

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

The machines shall preferably be designed so that manual intervention at the grinding unit can be performed outside the area protected by the safeguards specified at 5.3.9.1.1.

Otherwise a fixed guard with an interlocking door shall be provided to surround the grinding area. Unintentional contact with the bandknife from inside the guarded area shall be prevented by an additional guard. This guard shall be designed so that from the position in which the operator stands during manual intervention at the grinding unit direct access to, or falling into, the bandknife is prevented.

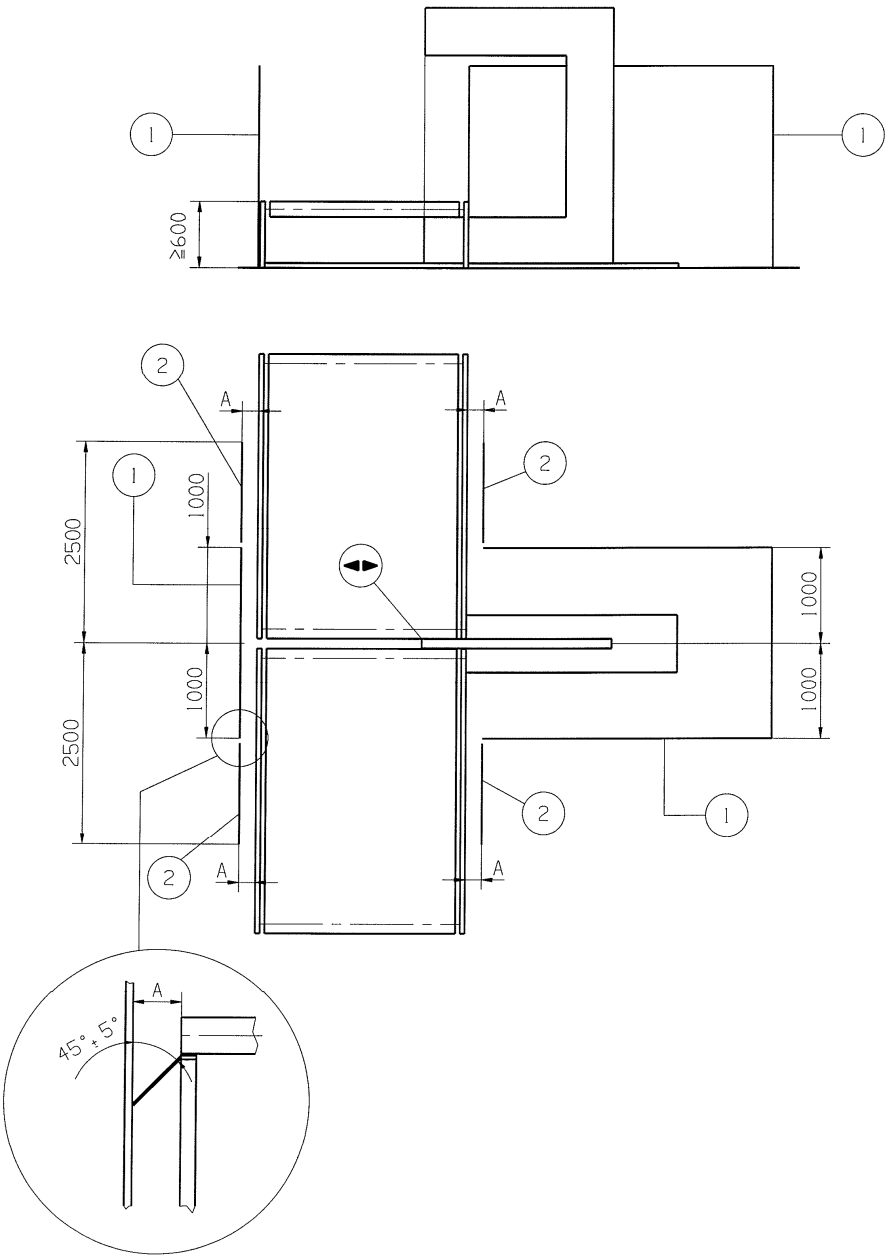
A mode selector switch shall be installed. If the mode selector switch is in the "operating" position, opening the interlocking door shall result in an emergency stop. If the mode selector switch is in the "grinding" position, any movement of the pressure roller shall be prevented.

5.3.9.2 Electrical hazards

See 7.1.3.7.

5.3.10 Cross-cutting machines (Figures 25, 26, 27 and 28)

Dimensions in millimetres

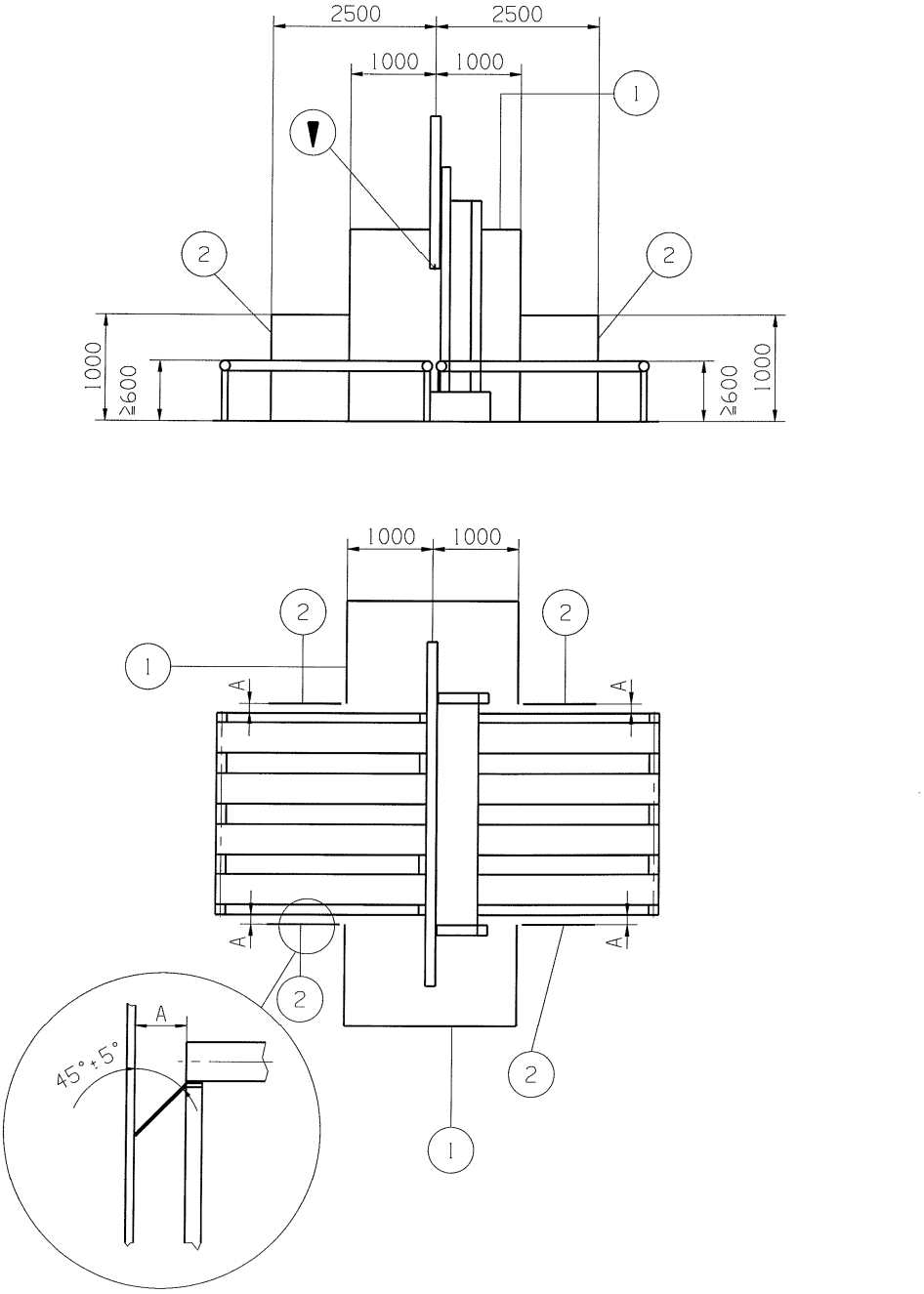


Key

1 Fixed or interlocking guard
2 Impeding device
Cutting edge of the bandknife

Figure 25 — Off-line cross-cutting machine, type 1

Dimensions in millimetres



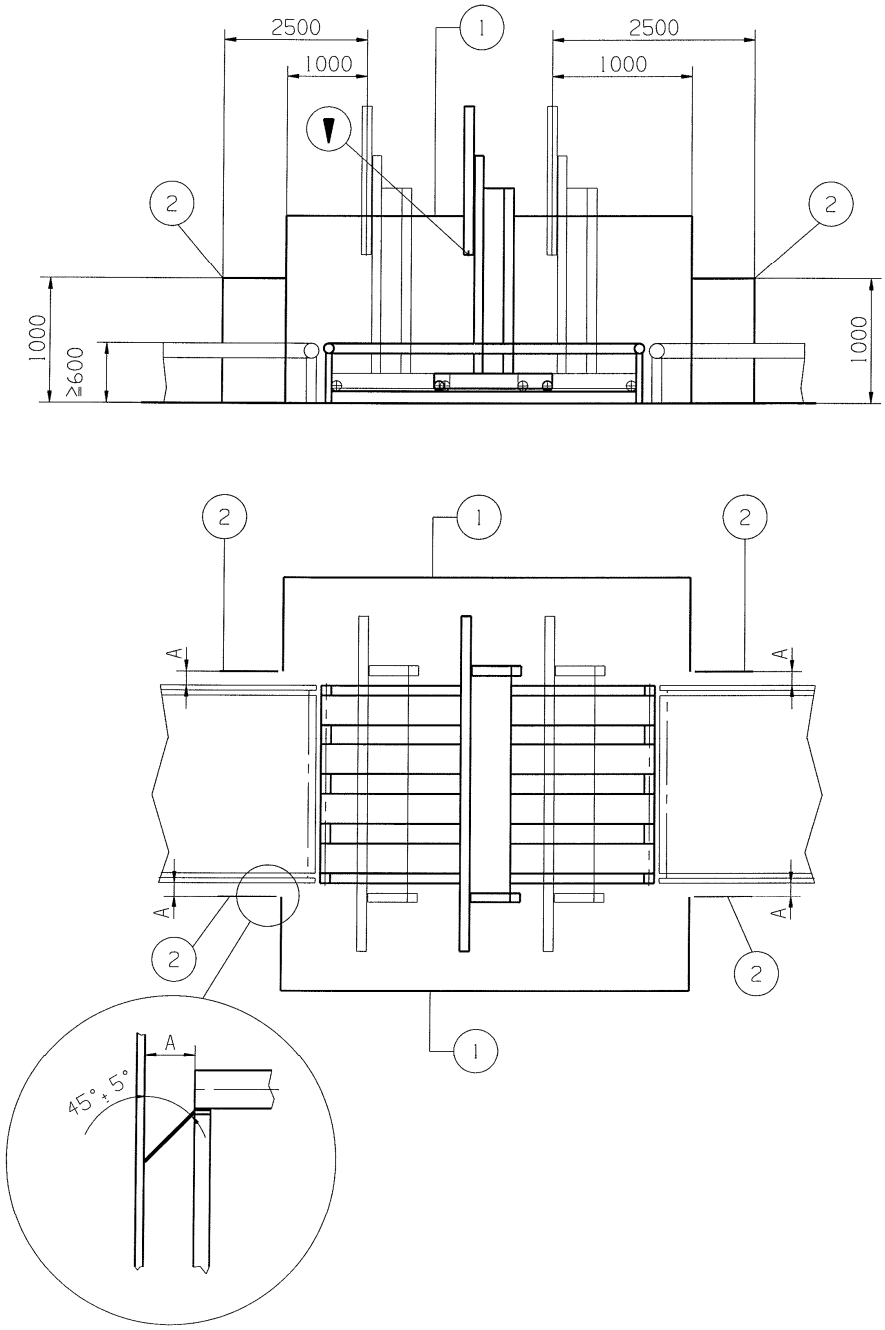
Key

1 Fixed or interlocking guard
2 Impeding device

Cutting edge of the bandknife

Figure 26 — Off-line cross-cutting machine, type 2

Dimensions in millimetres

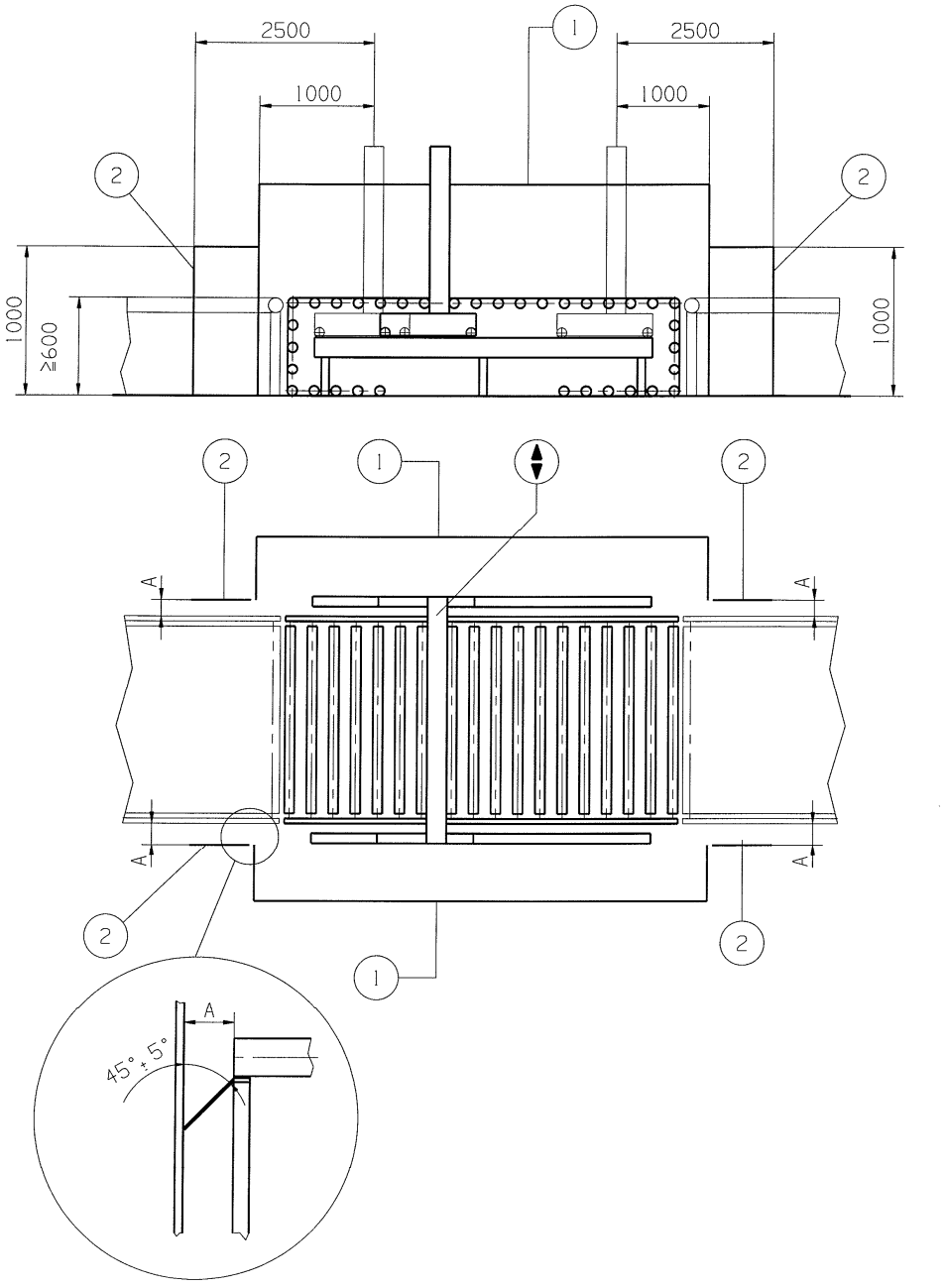


Key

1 Fixed or interlocking guard
2 Impeding device
Cutting edge of the bandknife

Figure 27 — In-line cross-cutting machine, type 1

Dimensions in millimetres



Key

1 Fixed or interlocking guard
2 Impeding device
Cutting edge of the bandknife

Figure 28 — In-line cross-cutting machine, type 2

5.3.10.1 Cutting by the moving bandknife

Access to the moving bandknife shall be prevented or restricted as follows.

— For off-line (stationary) cross-cutting machines (Figure 25 and Figure 26), access to the usable part of the bandknife shall be prevented by fixed and/or interlocking guards. For in-line (travelling) cross-cutting machines (Figure 27 and Figure 28), access to the usable part of the bandknife shall be prevented by fixed and/or interlocking guards with guard locking.

— The guards (item 1 in Figure 25 to Figure 28) shall extend a horizontal distance of at least 1 000 mm from the bandknife.

— Quick access to the cutting edge of the bandknife from beyond the guards described in the previous indents shall be prevented as described below.

  — An impeding device as defined in 3.15, at a height of 1 000 mm and extending ≥ 2 500 mm from the bandknife, shall be fitted along the sides of the machine as shown in Figure 25 to Figure 28. If the distance between the cutting edge of the bandknife and the end of the conveyor belt is < 2 500 mm the impeding device shall extend around the end of the conveyor, with a minimum clearance of 200 mm from the end of the conveyor.

  — The height of the conveyor belt shall be ≥ 600 mm.

  — Warning notices in accordance with Annex B shall be affixed on both sides of each conveyor.

— For in-line cross-cutting machines, initiation of the first cut of the automatic operation shall be possible only by manual operation of an actuator.

5.3.10.2 Shearing, crushing and impact due to movement of the cutting unit

The fixed or interlocking guards in accordance with 5.3.10.1 shall also prevent access to the moving cutting unit.

5.3.10.3 Whiplash of the bandknife when it breaks

In addition to 5.1.2.3, breakage of the bandknife shall automatically stop the cutting unit. However, for in-line cross-cutting machines, movement of the cutting unit shall continue until the knife guide is outside the material.

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

Off-line cross-cutting machines shall preferably be designed so that manual intervention at the grinding unit can be performed outside the area protected by the guards specified at 5.3.10.1.

Otherwise, a fixed guard with an interlocking door shall be provided. For in-line cross-cutting machines this interlocking door shall be with guard locking.

Unintentional contact with the bandknife from inside the guarded area shall be prevented by an additional guard. This guard shall be designed so that from the position in which the operator stands during manual intervention at the grinding unit direct access to, or falling into, the bandknife is prevented.

A lockable mode selector switch shall be installed.

If the mode selector switch is in the “operating” position, opening the interlocking door of an off-line cross-cutting machine shall result in an emergency stop.

If the mode selector switch is in the "grinding" position:

— for off-line cross-cutting machines any movement of the cutting unit and the conveyor shall be prevented;

— for in-line cross-cutting machines the door shall be kept closed by the guard locking, until the knife guide is outside the material and all movements of the cutting unit have stopped.

6 Verification of safety requirements and/or protective measures

Type tests shall be used to verify the safety requirements and/or protective measures in accordance with Table 2.

Table 2 — Verification methods

Subclauses	Verification method			
	Visual checking	Functional testing	Measuring	Checking of compliance with B-standards
5.1	X	X	X	X
5.1.2.1	X	X	X	X
5.1.2.2	X			
5.1.2.3		X		
5.1.2.4	X	X	X	X
5.1.2.5	X			X
5.1.2.6	X			
5.1.3.1				X
5.1.3.2				X
5.1.3.3				X
5.1.3.4				X
5.1.3.5	X	X		X
5.1.3.6	X	X		X
5.1.4		X		X

Subclauses	Verification method			
	Visual checking	Functional testing	Measuring	Checking of compliance with B-standards
5.1.5	X			
5.1.6	X	X		
5.1.7	X	X		
5.2.1.1.1	X	X	X	X
5.2.1.1.2	X			
5.2.1.1.3	X	X		
5.2.1.2			X	
5.2.1.3	X			
5.2.2.1.1	X	X	X	X
5.2.2.1.2	X			
5.2.2.1.3	X	X		
5.2.2.2			X	
5.2.2.3	X			
5.3.1.1.1	X	X	X	X
5.3.1.1.2	X	X	X	
5.3.1.1.3	X	X	X	X
5.3.1.1.4	X		X	
5.3.1.1.5		X		
5.3.1.1.6	X		X	
5.3.1.1.7	X	X	X	X
5.3.1.2			X	

Subclauses	Verification method			
	Visual checking	Functional testing	Measuring	Checking of compliance with B-standards
5.3.2.1	X	X	X	X
5.3.2.2	X	X	X	X
5.3.2.3	X	X	X	X
5.3.2.4	X	X	X	X
5.3.2.5		X		
5.3.3.1.1.1	X	X	X	X
5.3.3.1.1.2	X	X	X	X
5.3.3.1.1.3	X	X	X	X
5.3.3.1.1.4		X		
5.3.3.1.1.5	X	X	X	X
5.3.3.1.1.6	X	X	X	X
5.3.3.1.1.7	X	X	X	X
5.3.3.1.1.8	X	X		X
5.3.3.1.2	X			
5.3.3.2.1	X	X	X	X
5.3.3.2.2	X	X	X	X
5.3.3.2.3	X	X	X	X
5.3.4.1	X	X	X	X
5.3.4.2	X	X	X	X
5.3.5.1	X	X	X	X
5.3.5.2	X	X	X	

Subclauses	Verification method			
	Visual checking	Functional testing	Measuring	Checking of compliance with B-standards
5.3.5.3	X	X	X	X
5.3.5.4		X		
5.3.5.5	X	X	X	X
5.3.6.1.1	X	X	X	X
5.3.6.1.2	X	X	X	X
5.3.6.1.3	X	X	X	
5.3.6.1.4		X		
5.3.6.1.5	X	X	X	X
5.3.6.1.6	X	X	X	X
5.3.6.1.7	X	X	X	X
5.3.6.2.1	X	X	X	X
5.3.6.2.2	X	X		
5.3.6.2.3	X	X	X	X
5.3.6.2.4		X		
5.3.7.1.1	X	X	X	X
5.3.7.1.2	X		X	X
5.3.7.1.3	X	X	X	X
5.3.7.1.4	X			
5.3.7.2	X			
5.3.7.3	X		X	
5.3.8.1	X	X	X	X

Subclauses	Verification method			
	Visual checking	Functional testing	Measuring	Checking of compliance with B-standards
5.3.8.2	X	X	X	X
5.3.8.3	X	X	X	X
5.3.8.4	X	X	X	X
5.3.8.5		X		
5.3.8.6	X	X	X	X
5.3.9.1.1	X	X	X	X
5.3.9.1.2	X			
5.3.9.1.3		X		
5.3.9.1.4	X	X	X	X
5.3.9.2	X			
5.3.10.1	X	X	X	X
5.3.10.2	X	X	X	X
5.3.10.3		X		
5.3.10.4	X	X	X	X

Functional testing includes verifying the function and efficiency of the guards and protective devices on the basis of:

— descriptions given in the information for use;

— safety related design documents;

— the requirements given in clause 5 of this standard and other quoted standards.

Functional testing of guards and protective devices on which the safety related parts of the control system are in accordance with category 2 or 3 of EN 954-1:1996 shall also include simulation of faults which are likely to occur.

7 Information for use

7.1 Instruction handbook

7.1.1 General

Each bandknife cutting machine shall be accompanied by a handbook giving general instructions for use (see 6.5 of EN ISO 12100-2:2003) and the following information.

7.1.2 General information for all bandknife cutting machines

7.1.2.1 The manufacturer shall explain the meaning of the yellow (amber) warning light(s).

7.1.2.2 The manufacturer shall describe the proper way of mounting, dismounting, changing and grinding the bandknife and how to verify correct tensioning.

The manufacturer shall recommend that personal protective equipment should be used when replacing or changing the bandknife.

7.1.2.3 The manufacturer shall indicate that when adjusting the grindstones with the observation flap temporarily open, eye protection should be used.

7.1.2.4 The manufacturer shall provide information on how to install the bandknife cutting machine including anchorage plans.

7.1.2.5 The manufacturer shall indicate the procedure and time intervals for testing the braking system.

7.1.2.6 The manufacturer shall:

— give information on methods of installation to minimise noise emission such as avoiding positions close to noise reflecting surfaces where possible;

— give information explaining that it is necessary to cover the unused part of the vacuum table;

— if necessary, recommend the wearing of personal hearing protection and specify the minimum characteristics of such equipment.

7.1.2.7 The manufacturer shall:

— give the declared noise emission values of the bandknife cutting machine in accordance with A.7 of Annex A of this standard and A.2.2 of EN ISO 4871:1996, as dual-number noise emission values;

— refer to the noise test code specified in Annex A of this standard on which determination of the noise emission values of the bandknife cutting machine is based and state which basic noise measurement standards have been used.

7.1.2.8 The manufacturer shall indicate that the grinding area should be kept free from any flammable material.

7.1.2.9 The manufacturer shall indicate that cutting some materials may generate harmful dust and that in this case it is the responsibility of the user to install an exhaust ventilation system. The manufacturer shall give guidance on the positioning of the exhaust ventilation system.

7.1.3 Additional information for particular bandknife cutting machines

7.1.3.1 The manufacturer shall indicate that the height adjustable guard should be kept adjusted to within approximately 20 mm from the material to be cut and that, if the machine is not in use, the guard should be adjusted to its lowest possible position.

7.1.3.2 The manufacturer shall indicate that for freehand cutting suitable head protection should be used and that appropriate cut-resistant gloves should be worn; however gloves should not be worn when working with toothed bandknives.

7.1.3.3 The manufacturer shall indicate that access onto the table should only be allowed for maintenance purposes.

7.1.3.4 The manufacturer shall indicate that the locking device should be used to prevent movement of the table during loading and unloading. The manufacturer shall specify how loading and unloading should be performed.

7.1.3.5 The manufacturer shall indicate that the working area should be kept clean and free from obstacles.

7.1.3.6 The manufacturer shall indicate that the pressure roller should be lowered to its lowest position relative to the bandknife as soon as the cutting program is finished or as soon as the cutting unit has reached its lowest position relative to the table.

7.1.3.7 The manufacturer shall indicate that cutting certain materials may generate electrostatic charges and that in these cases the user should take appropriate measures to reduce the risk.

7.1.3.8 The manufacturer shall indicate that the bar should be fitted wherever possible.

7.1.3.9 The manufacturer shall inform the user that the top cover of the tunnel should always be adjusted to the height of the foam blocks.

7.1.3.10 For profile cutting machines the manufacturer shall indicate the correct methods for handling heavy rollers.

7.1.3.11 The manufacturer shall indicate that exposed parts of the bandknife inside the maximum cutting zone that are not in use during cutting should be guarded, for example using the solid, hinged flaps provided.

7.2 Marking

The minimum markings shall include:

— the designation of the machinery;

— the name and address of the manufacturer and supplier;

— the business name and full address of the authorised representative (where applicable);

— CE marking;

— year of construction;

— designation of series or type;

— serial number, if any, or machine number;

— electrical connection values;

— net mass of the bandknife cutting machine.

Annex A
(normative)

Noise test code

A.1 Introduction

This noise test code specifies all the information needed for carrying out efficiently, and under standardised conditions, the determination, declaration and verification of the airborne noise emission values of bandknife cutting machines. It specifies the noise measurement methods, the measurement positions and operating and mounting conditions for the test.

Noise emission characteristics include emission sound pressure levels at operators' positions and the sound power level. Determination of these quantities is necessary for:

— designers of bandknife cutting machines to control noise at source at the design stage;

— manufacturers of bandknife cutting machines to declare the noise emitted;

— users to compare the noise emitted by bandknife cutting machines placed on the market.

Use of this noise test code ensures reproducibility of the measurements and comparability of the airborne noise emission values within specified limits determined by the grade of accuracy of the basic measurement method used. Noise measurement methods allowed by this noise test code are engineering and survey methods.

A.2 Determination of the A-weighted emission sound pressure level at the operator's position

For all bandknife cutting machines the identified operator's position is at the control panel. Measurement of the A-weighted emission sound pressure level shall be carried out at that position using either EN ISO 11201:1995 or EN ISO 11202:1995.

Whenever practicable, the engineering method (i.e. EN ISO 11201) shall be used.

Measurements shall be carried out as defined in A.5.

A.3 Determination of the A-weighted sound power level

If the A-weighted emission sound pressure level at the operator's position specified in A.2 exceeds 85 dB, determination of the A-weighted sound power level shall be carried out using either EN ISO 3744:1995 or EN ISO 3746:1995.

NOTE When Directive 2006/42/EC comes into force this value reduces to 80 dB.

Whenever practicable, the engineering method (i.e. EN ISO 3744) shall be used.

Measurements shall be carried out at the different measurement positions; they may be carried out in sequence.

A.4 Installation and mounting conditions for noise measurement

The bandknife cutting machine shall be mounted and connected as specified in the instruction handbook.

The bandknife cutting machine shall preferably be placed on a plane reflecting concrete surface. If isolation mounts are placed between the machine and the supporting surface their technical characteristics shall be recorded.

A.5 Operating conditions

The operating conditions shall be identical for determining emission sound pressure and sound power levels.

The noise measurement shall be carried out with:

— the bandknife and material conveying system running at maximum speeds;

— the grinding unit in operation;

— all the holes in the vacuum table obstructed;

— 50 % of the holes in the vacuum conveyor obstructed.

A minimum of five measurements of at least 10 s each shall be taken.

A.6 Measurement uncertainty

The measurement uncertainty is 2,5 dB with an engineering method and 4 dB with a survey method.

A.7 Information to be recorded and reported

A.7.1 Information to be recorded

The information to be recorded shall include all the data required by the basic standards used i.e. precise identification of the bandknife cutting machine under test, acoustic environment, instrumentation, presence and position(s) of the operator(s) if any and as a minimum the data specified in A.7.2.

Any deviation from the test code or from the basic measurement standard(s) used shall be recorded.

A.7.2 Information to be reported

A.7.2.1 General data

— type, serial number if any, year of manufacture of the bandknife cutting machine;

— date of test, location, person responsible for the test;

— ambient temperature.

A.7.2.2 Technical data of the bandknife cutting machine

Number of vacuum blowers if any.

A.7.2.3 Standards and instrumentation used

— measurement standards;

— instruments used.

A.7.2.4 Mounting and operating conditions

Description of the mounting conditions and operating conditions as defined in A.4 and A.5.

A.7.2.5 Acoustic data

— location of measurement positions;

— noise emission values obtained in accordance with A.2 and where applicable A.3.

Any deviation from this noise test code or from the basic measurement standard(s) used shall be reported.

A.8 Declaration and verification of noise emission values

The noise declaration shall be a dual-number declaration as defined in EN ISO 4871:1996 i.e. the measured value and the measurement uncertainty shall be indicated separately. Both the measurement uncertainty and the variations in production parameters shall be taken into account (see Annex A of EN ISO 4871:1996).

The noise declaration shall include:

— the value of the A-weighted emission sound pressure level at the operator's position where this value exceeds 70 dB; where this value does not exceed 70 dB, this fact shall be indicated;

— the value of the A-weighted sound power level only if the declared A-weighted emission sound pressure level at the operator's position exceeds 85 dB.

NOTE When Directive 2006/42/EC comes into force this value reduces to 80 dB.

The noise declaration shall mention explicitly that noise emission values have been obtained in accordance with this noise test code and indicate which basic measurement standard(s) has (have) been used. The noise declaration shall clearly indicate any deviation from this noise test code and/or from the basic standard(s) used.

If undertaken, verification of declared values shall be conducted in accordance with 6.2 of EN ISO 4871:1996 by using the same installation, mounting and operating conditions as those used for initial determination of noise emission values.

Annex B
(normative)

Prohibition sign: "No access"

Figure B.1 — No access

NOTE The content of this annex is taken from EUROMAP Recommendation 68 (http://www.EUROMAP.org/recommendations).
EUROMAP Recommendations are elaborated by the European Committee of Machinery Manufacturers for the Plastics and Rubber industries.
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Annex ZA
(informative)

Relationship between this European Standard and the Essential Requirements of EU Directive 98/37/EC

This European Standard has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association to provide one means of conforming to Essential Requirements of the New Approach Directive.

For Machinery Directive 98/37/EC amended by Directive 98/79/EC.

Once this standard is cited in the Official Journal of the European Communities under that Directive and has been implemented as a national standard in at least one Member State, compliance with the normative clauses of this standard confers, within the limits of the scope of this standard, a presumption of conformity with the relevant Essential Requirements of that Directive and associated EFTA regulations.

WARNING — Other requirements and other EU Directives may be applicable to the product(s) falling within the scope of this standard.

Annex ZB
(informative)

Relationship between this European Standard and the Essential Requirements of EU Directive 2006/42/EC

This European Standard has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association to provide one means of conforming to Essential Requirements of the New Approach Directive 2006/42/EC on machinery.

Once this standard is cited in the Official Journal of the European Communities under that Directive and has been implemented as a national standard in at least one Member State, compliance with the normative clauses of this standard confers, within the limits of the scope of this standard, a presumption of conformity with the relevant Essential Requirements of that Directive and associated EFTA regulations.

WARNING — Other requirements and other EU Directives may be applicable to the product(s) falling within the scope of this standard.

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[2] EN ISO 11688-2, Acoustics – Recommended practice for the design of low-noise machinery and equipment – Part 2: Introduction to the physics of low-noise design (ISO/TR 11688-2:1998)

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