BS EN 1870-15:2012

BSI Standards Publication

Safety of woodworking machines — Circular sawing machines

Part 15: Multi-blade cross-cut sawing machines with integrated feed of the workpiece and manual loading and/or unloading

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National foreword

This British Standard is the UK implementation of EN 1870-15:2012. It supersedes BS EN 1870-15:2004+A1:2009 which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee MTE/23, Woodworking machines.

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

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Foreword

This document (EN 1870-15:2012) has been prepared by Technical Committee CEN/TC 142 “Woodworking machines - Safety”, 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of an identical text or by endorsement, at the latest by April 2013, and conflicting national standards shall be withdrawn at the latest by April 2013.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN 1870-15:2004+A1:2009.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s).

For relationship with EU Directive(s), see informative Annex ZA, which is an integral part of this document.

The main technical modification to the 2009 edition relates to the introduction of performance levels (PL).

Organisations contributing to the preparation of this document include European Committee of Woodworking Machinery Manufacturers Association "EUMABOIS".

EN 1870, *Safety of woodworking machines — Circular sawing machines,* consists of the following parts:

Part 1: Circular saw benches (with and without sliding table), dimension saws and building site saws;

Part 3: Down cutting cross-cut saws and dual purpose down cutting cross-cut saws/circular saw benches;

Part 4: Multiblade rip sawing machines with manual loading and/or unloading;

Part 5: Circular sawbenches/up-cutting cross-cut sawing machines;

Part 6: Circular sawing machines for firewood and dual purpose circular sawing machines for firewood/circular saw benches, with manual loading and/or unloading;

Part 7: Single blade log sawing machines with integrated feed table and manual loading and/or unloading;

Part 8: Single blade edging circular rip sawing machines with power driven saw unit and manual loading and/or unloading;

Part 9: Double blade circular sawing machines for cross-cutting with integrated feed and with manual loading and/or unloading;

Part 10: Single blade automatic and semi-automatic up-cutting cross-cut sawing machines;

Part 11: Semi-automatic and automatic horizontal cross-cut sawing machines with one saw unit (radial arm saws);

Part 12: Pendulum cross-cut sawing machines;

Part 13: Horizontal beam panel sawing machines;

Part 14: Vertical panel sawing machines;

Part 15: Multi-blade cross-cut sawing machines with integrated feed of the workpiece and manual loading and/or unloading;

Part 16: Double mitre sawing machines for V-cutting;

Part 17: Manual horizontal cutting cross-cut sawing machines with one saw unit (radial arm saws);

Part 18: Dimension saws (at Enquiry stage at the time of publication of the present document);

Part 19: Circular saw benches (with and without sliding table) and building site saws (at Enquiry stage at the time of publication of the present document).

The European Standards produced by CEN/TC 142 are particular to woodworking machines and complement the relevant A and B Standards on the subject of general safety (see introduction of EN ISO 12100:2010 for a description of A, B and C standards).

According to the CEN/CENELEC Internal Regulations, the national standards organisations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

Introduction

This document has been prepared to be a harmonised standard to provide one means of conforming to the essential safety requirements of the Machinery Directive, and associated EFTA regulations.

This document is a type C standard as defined in EN ISO 12100:2010.

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

When provisions of this type C standard are different from those which are stated in type A or B standards, the provisions of this C type standard take precedence over the provisions of other standards, for machines that have been designed and built according to the provisions of this type C standard.

The requirements of this document are directed to manufacturers and their authorised representatives of multi-blade cross-cut sawing machines with integral feed of the work-piece and manual loading and/or unloading. It is also useful for designers and importers.

This document also includes information to be provided by the manufacturer to the user.

Common requirements for tooling are given in EN 847-1:2005+A1:2007.

1 Scope

This European Standard specifies all requirements and/or measures to reduce the hazards and limit the risks on multi-blade cross-cut sawing machines (with minimum two saw unit) with integrated feed of the work-piece and manual loading and/or unloading fitted with a saw blade drive motor for each saw unit, hereinafter referred to as “machines”, designed to cut solid wood, chipboard, fibreboard, plywood and also these materials where they are covered with plastic edging and/or plastic/light alloy laminates, when they are used as intended and under the conditions foreseen by the manufacturer including reasonably foreseeable misuse.

This document deals with all significant hazards, hazardous situations and events which are relevant to these machines as stated in Clause 4. It does not deal with any hazards relating to the mechanical loading and/or unloading of the work-piece or which result from the combination of the machine with any other.

This document does not cover machines designed for climb cutting (see 3.2.10).

The requirements of this document apply to all machines whatever their method of control e.g. electromechanical and/or electronic and/or pneumatic.

This document is not applicable to multi-blade cross-cut sawing machines with integrated feed of the work-piece and manual loading and/or unloading which are manufactured before the date of its publication as EN.

NOTE Machines covered by this document are listed under 1.3 of Annex IV of the Machinery Directive.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 614-1:2006+A1:2009, *Safety of machinery — Ergonomic design principles — Part 1: Terminology and general principles*

EN 614-2:2000+A1:2008, *Safety of machinery — Ergonomic design principles — Part 2: Interactions between the design of machinery and work tasks*

EN 847-1:2005+A1:2007, *Tools for woodworking — Safety requirements — Part 1: Milling tools, circular saw blades*

EN 894-1:1997+A1:2008, *Safety of machinery — Ergonomics requirements for the design of displays and control actuators — Part 1: General principles for human interactions with displays and control actuators*

EN 894-2:1997+A1:2008, *Safety of machinery — Ergonomics requirements for the design of displays and control actuators — Part 2: Displays*

EN 894-3:2000+A1:2008, *Safety of machinery — Ergonomics requirements for the design of displays and control actuators — Part 3: Control actuators*

EN 1005-1:2001+A1:2008, *Safety of machinery — Human physical performance — Part 1: Terms and definitions*

EN 1005-2:2003+A1:2008, *Safety of machinery — Human physical performance — Part 2: Manual handling of machinery and component parts of machinery*

EN 1005-3:2002+A1:2008, *Safety of machinery — Human physical performance — Part 3: Recommended force limits for machinery operation*

EN 1005-4:2005+A1:2008, *Safety of machinery — Human physical performance — Part 4: Evaluation of working postures and movements in relation to machinery*

EN 1037:1995+A1:2008, *Safety of machinery — Prevention of unexpected start-up*

EN 1088:1995+A2:2008, *Safety of machinery — Interlocking devices associated with guards – Principles for design and selection*

EN 1837:1999+A1:2009, *Safety of machinery — Integral lighting of machines*

EN 12779:2004+A1:2009, *Safety of woodworking machines — Chip and dust extraction systems with fixed installation — Safety related performances and safety requirements*

EN 50370-1:2005, *Electromagnetic compatibility (EMC) — Product family standard for machine tools — Part 1: Emission*

EN 50370-2:2003, *Electromagnetic compatibility (EMC) — Product family standard for machine tools — Part 2: Immunity*

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

EN 60439-1:1999,[1)] *Low-voltage switchgear and controlgear assemblies — Part 1: Type-tested and partially type-tested assemblies (IEC 60439-1:1999)*

EN 60529:1991,[2)] *Degrees of protection provided by enclosures (IP Code) (IEC 60529:1989)*

EN 60825-1:2007, *Safety of laser products — Part 1: Equipment classification and requirements (IEC 60825-1:2007)*

EN 61310-1:2008, *Safety of machinery — Indication, marking and actuation — Part 1: Requirements for visual, acoustic and tactile signals (IEC 61310-1:2007)*

EN 61800-5-2:2007, *Adjustable speed electrical power drive systems — Part 5-2: Safety requirements — Functional (IEC 61800-5-2:2007)*

EN ISO 3743-1:2010, *Acoustics — Determination of sound power levels and sound energy levels of noise sources using sound pressure — Engineering methods for small movable sources in reverberant fields — Part 1: Comparison method for a hard-walled test room (ISO 3743-1:2010)*

EN ISO 3743-2:2009, *Acoustics — Determination of sound power levels of noise sources using sound pressure – Engineering methods for small, movable sources in reverberant fields — Part 2: Methods for special reverberation test rooms (ISO 3743-2:1994)*

EN ISO 3744:2010, *Acoustics — Determination of sound power levels and sound energy levels of noise sources using sound pressure — Engineering method in an essentially free field over a reflecting plane (ISO 3744:2010)*

EN ISO 3745:2009,[3)] *Acoustics — Determination of sound power levels of noise sources using sound pressure — Precision methods for anechoic and semi-anechoic rooms (ISO 3745:2003)*

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1) EN 60439-1:1999 is amended by EN 60439-1:1999/A1:2004, based on IEC 60439-1:1999/A1:2004.

2) EN 60529:1991 is amended by EN 60529:1991/A1:2000, based on IEC 60529:1989/A1:1999.

3) EN ISO 3745:2009 is superseded by EN ISO 3745:2012.

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EN ISO 3746:2010, *Acoustics — Determination of sound power levels and sound energy levels of noise sources using sound pressure — Survey method using an enveloping measurement surface over a reflecting plane (ISO 3746:2010)*

EN ISO 4413:2010, *Hydraulic fluid power — General rules and safety requirements for systems and their components (ISO 4413:2010)*

EN ISO 4414:2010, *Pneumatic fluid power — General rules and safety requirements for systems and their components (ISO 4414:2010)*

EN ISO 4871:2009, *Acoustics — Declaration and verification of noise emission values of machinery and equipment (ISO 4871:1996)*

EN ISO 9614-1:2009, *Acoustics — Determination of sound power levels of noise sources using sound intensity — Part 1: Measurements at discrete points (ISO 9614-1:1993)*

EN ISO 11202:2010, *Acoustics — Noise emitted by machinery and equipment — Determination of emission sound pressure levels at a work station and at other specified positions applying approximate environmental corrections (ISO 11202:2010)*

EN ISO 11204:2010, *Acoustics — Noise emitted by machinery and equipment — Determination of emission sound pressure levels at a work station and at other specified positions applying accurate environmental corrections (ISO 11204:2010)*

EN ISO 11688-1:2009, *Acoustics — Recommended practice for the design of low noise machinery and equipment — Part 1: Planning (ISO/TR 11688-1:1995)*

EN ISO 12100:2010, *Safety of machinery — General principles for design — Risk assessment and risk reduction (ISO 12100:2010)*

EN ISO 13849-1:2008, *Safety of machinery — Safety-related parts of control systems — Part 1: General principles for design (ISO 13849-1:2006)*

EN ISO 13850:2008, *Safety of machinery — Emergency stop — Principles for design (ISO 13850:2006)*

EN ISO 13857:2008, *Safety of machinery — Safety distances to prevent hazard zones being reached by upper and lower limbs (ISO 13857:2008)*

ISO 7960:1995, *Airborne noise emitted by machine tools — Operating conditions for woodworking machines*

3 Terms and definitions

3.1 General

For the purposes of this document, the terms and definitions given in EN ISO 12100:2010 and the following apply.

3.2 Definitions

3.2.1

multi-blade cross-cut sawing machine with integrated feed of the work-piece and manual loading and/or unloading

machine with two or more saw spindles located below the work-piece support, where each saw unit is equipped with a saw-spindle drive motor, the distance between the saw units is adjustable either manually or under power

Note 1 to entry: The position of the saw-blade(s) is fixed during cutting. The work-piece is fed to the saw-blades by chains and held down during cutting by a top pressure device combined with the upper saw blade guard or mounted separately (see Figure 1).

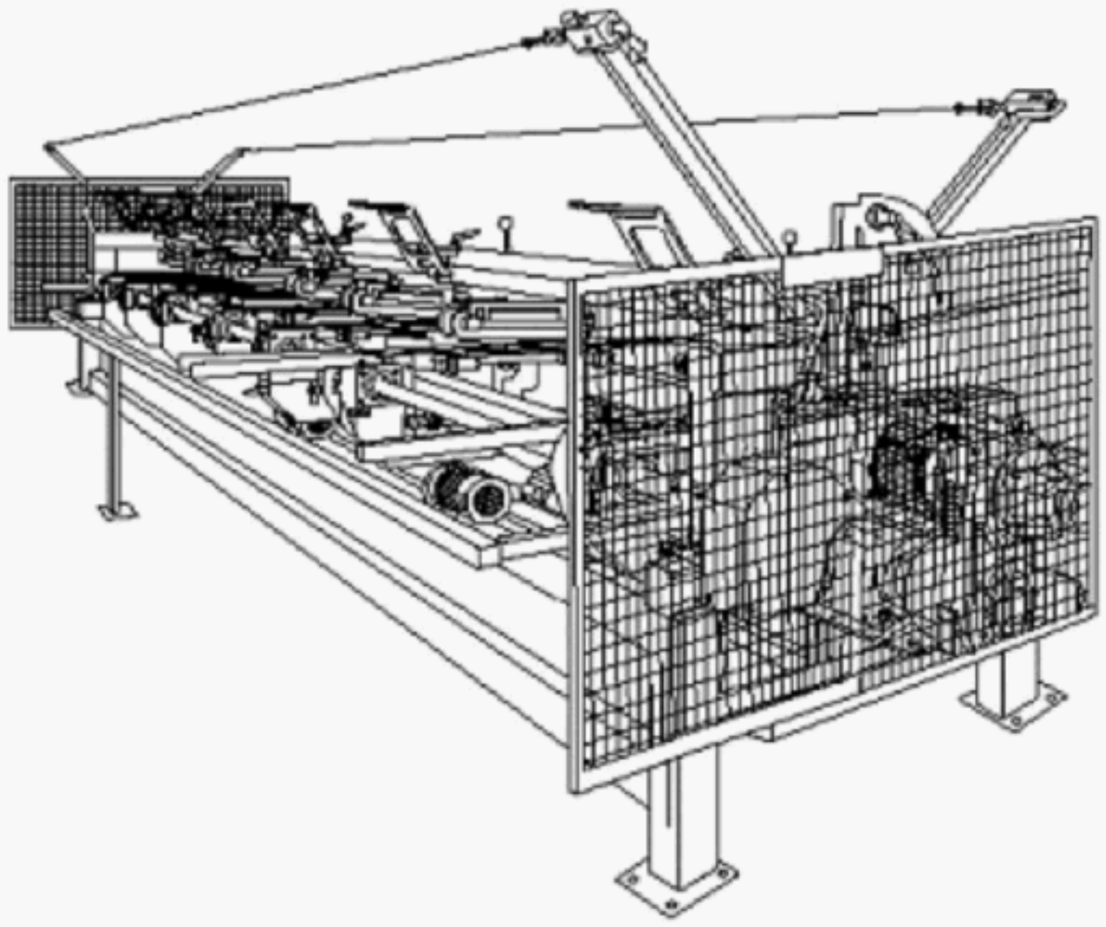

Figure 1 — Example of multi-blade cross-cut sawing machine with integrated feed of the work-piece and manual loading and/or unloading (guards are partially not represented for clarity)

3.2.2

top pressure device

device located above each saw-blade which holds the work-piece against the chains e.g. by belts or rollers

3.2.3

saw unit

part(s) of the machine incorporating the saw spindle with its drive motor, the top pressure device and a chain/chains for the feed of the work-piece

Note 1 to entry: The saw spindle may be fixed or retractable manually or under power to a non-cutting position.

3.2.4

integrated feed of multi-blade cross-cut sawing machines

feed mechanism for the work-piece or saw blade which is integrated with the machine and where the work-piece or machine element with incorporated tool is held and controlled mechanically during the machining operation

3.2.5

stationary machine

machine designed to be located on or fixed to the floor or other parts of the structure of the premises and to be stationary during use

3.2.6

displaceable machine

machine which is located on the floor, stationary during use and equipped with devices, such as wheels, which allows it to be moved between locations

3.2.7

cutting area of the saw-blade

area of the saw-blade which is covered by the work-piece during the cutting process

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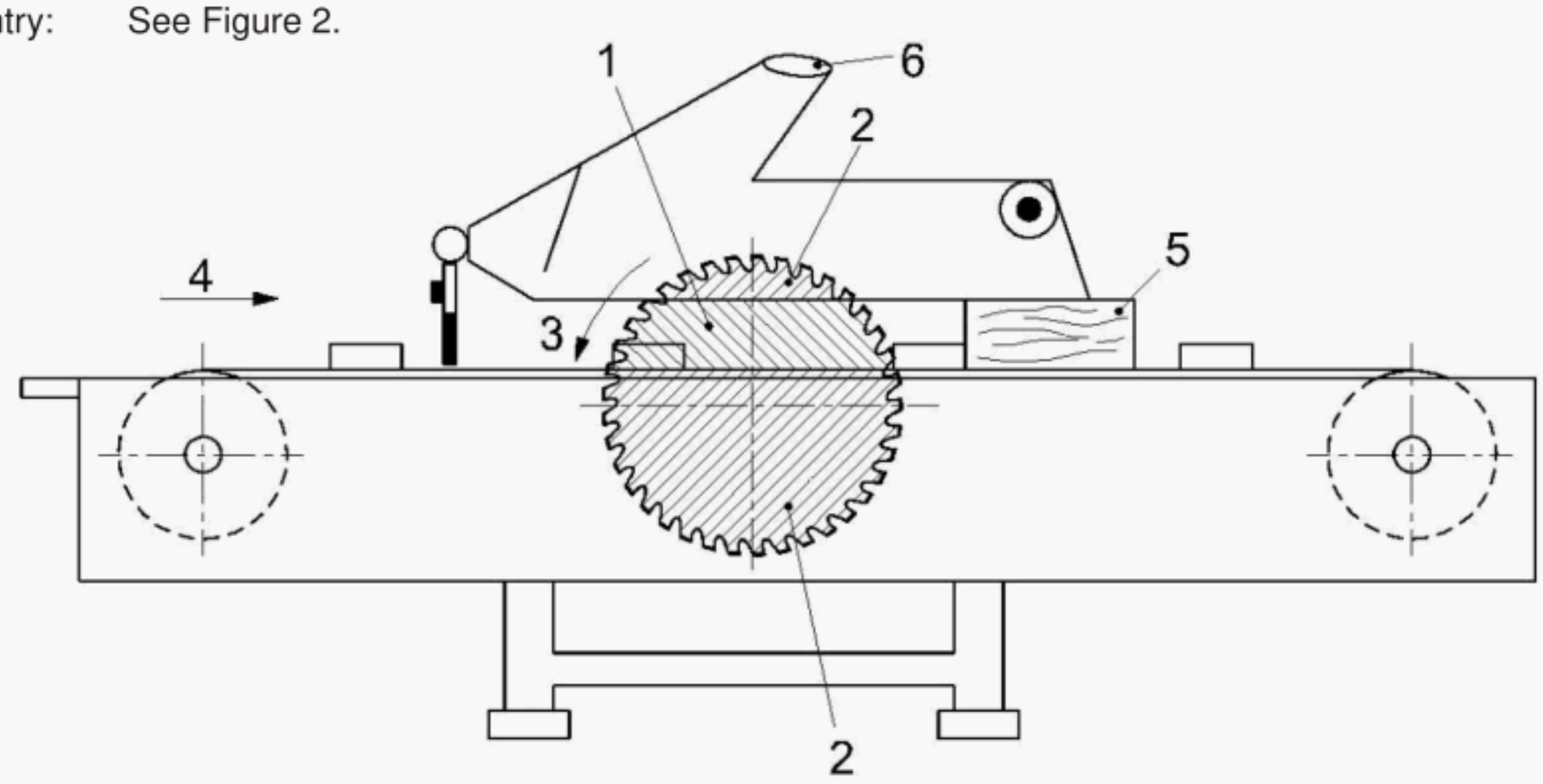
Note 1 to entry: See Figure 2.

3.2.8

non-cutting area of the saw-blade

area of the saw-blade which is not covered by the work-piece during the cutting process

Note 1 to entry: See Figure 2.



Key

1 cutting area of the saw-blade
2 non-cutting area of the saw-blade
3 direction of saw-blade rotation
4 feed direction
5 work-piece
6 extraction outlet

Figure 2 — Cutting/non-cutting area of the saw-blade

3.2.9

non-cutting position of the saw blade

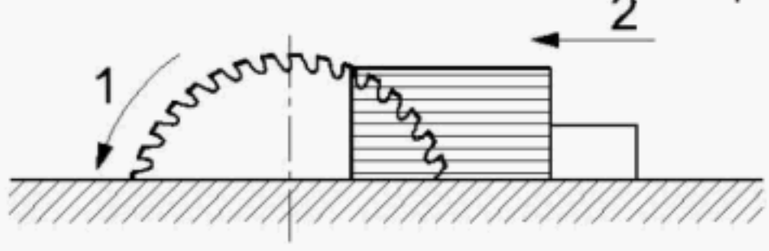
position of a saw unit with its saw blade outside the maximum cutting width for which the machine is designed or where the saw blade is retracted to a position such that the saw blade with the maximum saw blade diameter for which the machine is designed does not protrude over the work-piece support

3.2.10

climb cutting

event where the rotation of the saw-blade and the movement of the work-piece are in the same direction

Note 1 to entry: See Figure 3.



Key

1 direction of saw-blade rotation
2 work-piece feed

Figure 3 — Climb cutting

3.2.11

ejection

unexpected movement of the work-piece or parts of it or part of the machine from the machine during processing

3.2.12

kickback

particular form of ejection describing the unexpected movement of the work-piece or parts of it or parts of the machine opposite to the direction of feed during processing

3.2.13

run-up time

time elapsed from the actuation of the start control device until the spindle reaches the intended speed

3.2.14

run-down time

time elapsed from the actuation of the stop control device up to the spindle standstill

3.2.15

machine actuator

power mechanism used to effect the motion of the machine

3.2.16

information from the supplier

statements, sales literature, leaflets or other documents, where a manufacturer (supplier) declares either the characteristics of a material or product or the compliance to a relevant standard

3.2.17

performance level

PL

discrete level used to specify the ability of safety-related parts of control systems to perform a safety function under foreseeable conditions

[SOURCE: EN ISO 13849-1:2008, 3.1.23]

4 List of significant hazards

This clause contains all significant hazards, hazardous situations and events (see EN ISO 12100:2010), identified by risk assessment as significant for the machines as defined in the scope and which require action to eliminate or reduce the risk.

This document deals with these significant hazards by defining safety requirements and/or measures or by reference to relevant standards.

These hazards are listed in Table 1.

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Table 1 — List of significant hazards

No	Hazards, hazardous situations and hazardous events	EN ISO 12100:2010	Relevant clause of this document
1	**Mechanical hazards** due to:		
	- machine parts or work-pieces:		
	a) shape;	6.2.2.1, 6.2.2.2, 6.3	5.3.2, 5.3.7
	b) relative location;		5.3.2, 5.3.3, 5.3.7, Annex A
	c) mass and stability (potential energy of elements which may move under the effect of gravity);		5.3.1, Annex B
	d) mass and velocity (kinetic energy of elements in controlled or uncontrolled motion);		5.3.3, 5.3.5, 5.3.7, 6.2
	e) mechanical strength.		5.3.2, 5.3.3, Annex B
	- accumulation of energy inside the machinery:		
	f) elastic elements (springs);	6.2.10, 6.3.5.4	5.3.4
	g) liquids and gases under pressure		5.4.7, 5.4.8
1.1	Crushing hazard		5.3.3, 5.3.7
1.2	Shearing hazard		5.3.3, 5.3.7
1.3	Cutting or severing hazard		5.3.3, 5.3.4, 5.3.7
1.4	Entanglement hazard		5.3.7
1.5	Drawing-in or trapping hazard		5.3.7
1.6	Impact hazard		5.3.5, 6.2 a)
1.8	Friction or abrasion hazard		5.3.4
2	**Electrical hazards** due to:		
2.1	Contact of persons with live parts (direct contact)	6.2.9, 6.3.5.4	5.4.4, 5.4.13
2.2	Contact of persons with parts which have become live under faulty conditions (indirect contact)	6.2.9	5.4.4, 5.4.13
		6.2.9, 6.3.5.4	5.4.4, 6.4
2.3	Approach to live parts under high voltage		
2.4	Electrostatic phenomena	6.2.9	5.4.11
4	**Hazards generated by noise**, resulting in:	6.2.2.2, 6.3	5.4.2
4.1	Hearing loss (deafness), other physiological disorders (loss of balance, loss of awareness)		
4.2	Interference with speech communication, acoustic signals		5.4.2
6	**Hazards generated by radiation**		
6.5	Lasers	6.3.4.5	5.4.10

Table 1 *(continued)*

No	Hazards, hazardous situations and hazardous events	EN ISO 12100:2010	Relevant clause of this document
7	**Hazards generated by materials and substances** (and their constituent elements) processed or used by the machinery		
7.1	Hazards from contact with or inhalation of harmful fluids and dusts	6.2.3, 6.2.4	5.4.3
7.2	Fire hazard	6.2.4	5.4.1, 5.4.3
8	**Hazards generated by neglecting ergonomic principles in machinery design** related to:		
8.1	Unhealthy postures or excessive effort	6.2.7, 6.2.8, 6.2.11.12, 6.3.5.5, 6.3.5.6	5.2.2, 5.4.5
8.2	Hand-arm or foot-leg anatomy	6.2.8.3	5.2.2, 5.4.5
8.4	Local lighting	6.2.8.6	5.4.6, 6.4
8.6	Human error, human behaviour	6.2.8, 6.2.11.8, 6.2.11.10, 6.3.5.2, 6.4	5.2.4, 5.2.7, 5.3.3, 6.4
8.7	Design, location or identification of manual controls	6.2.8.f, 6.2.11.8	5.2.2, 5.2.5, 5.3.7.3, 5.4.5
8.8	Design or location of visual display units	6.2.8, 6.4.2	5.4.5
9	**Combination of hazards**	6.3.2.1	5.2.7, 5.4.3,
10	**Unexpected start-up, unexpected overrun/overspeed** (or any similar malfunction) from:		
10.1	Failure/disorder of the control system	6.2.11, 6.3.5.4	5.2.1, 5.2.3, 5.4.14
10.2	Restoration of energy supply after an interruption	6.2.11.4 6.2.11.11	5.2.8, 5.4.14 5.4.9
10.3	External influences on electrical equipment	6.2.8, 6.2.11.8, 6.2.11.10, 6.3.5.2, 6.4	
10.6	Errors made by the operator (due to mismatch of machinery with human characteristics and abilities, see 8.6)		5.2.4, 5.2.7, 5.3.3, 6.3, 6.4
11	**Impossibility of stopping the machine in the best possible conditions**	6.2.11.1, 6.2.11.3, 6.3.5.2	5.2.4, 5.2.5, 5.2.8, 5.4.13, 6.4 l)
13	**Failure of the power supply**	6.2.11.1, 6.2.11.4	5.2.8
14	**Failure of the control circuit**	6.2.11, 6.3.5.4	5.2.1
15	**Errors of fitting**	6.2.7, 6.4.5	5.3.3, 5.4.12, 6.2, 6.3, 6.4
16	**Break-up during operation**	6.2.3	5.2.6, 5.3.2, 5.3.3, 6.4
17	**Falling or ejected objects or fluids**	6.2.3, 6.2.10	5.2.6, 5.3.2, 5.3.5, 5.3.6, 5.4.7, 5.4.8, 6.2
18	**Loss of stability / overturning of machinery**	6.3.2.6	5.3.1

5 Safety requirements and/or measures

5.1 General

The machine shall comply with the safety requirements and/or protective measures of this clause.

In addition, the machine should be designed according to the principles of EN ISO 12100:2010 for hazards relevant but not significant, which are not dealt with by this document (e.g. sharp edges of the machine frame).

For guidance in connection with risk reduction by design, see EN ISO 12100:2010, 6.2, and for safeguarding measures, see EN ISO 12100:2010, 6.3.

5.2 Controls

5.2.1 Safety and reliability of control systems

5.2.1.1 General

For the purposes of this document a safety related part of control system means the system from the initial device, e.g. push button or position detector or sensor up to and including the power control element of the final machine actuator or element, e.g. motor or brake. The safety related parts of control system of this machine are those for the following functions and they shall fulfil at least the requirements of the PL given below in accordance with the requirements of EN ISO 13849-1:2008:

starting and restarting of the saw-blade(s) rotation, the movements of the saw unit(s), the work-piece feed mechanism: PL=c (see 5.2.3, 5.2.6);

normal stopping: PL=c (see 5.2.4);

emergency stop: PL=c (see 5.2.5);

interlocking: PL=c (see 5.3.7);

interlocking between the feed chain motor with the position of the saw spindles: PL=c (see 5.2.6);

interlocking with guard locking: PL=c (see 5.3.7);

prevention unexpected start-up after failure of the power supply: PL=c (see 5.2.8);

hold-to run control: PL=c (see 5.3.7.3);

control duplication (where fitted): PL=c (see 5.2.7);

initiation of the braking system: PL=b or PL=c (see 5.3.4).

For all components exposed to environmental conditions, e.g. dust, fumes and/or gases, these conditions shall be taken into account.

Verification: By checking the relevant drawings and/or circuit diagrams and inspection of the machine.

NOTE For the component characteristics a confirmation from the manufacturer of the component can be useful.

5.2.1.2 Use of protective devices

Protective devices shall be in accordance with the specific standards. For the devices listed below the following requirements apply:

a) magnetic/proximity switches shall be in accordance with the requirements of EN 1088:1995+A2:2008, 6.2 and the related control system shall be at least PL=c in accordance with the requirements of EN ISO 13849-1:2008;

b) if a time delay is used it shall be of fail safe technique e.g. of capacity type conforming to the requirements of at least PL=c in accordance with the requirements of EN ISO 13849-1:2008.

~~*Verification*~~: By checking the relevant drawings and/or circuit diagrams, inspection of the machine and relevant functional testing of the machine.

NOTE For the components characteristics a confirmation from the components' manufacturers can be useful.

5.2.2 Position of controls

Hand-operated control devices for start and stop of the motor for the saw spindles, emergency stop, integrated feed and hold-to run shall be located in an area between 600 mm and 1700 mm above the floor level.

NOTE For electric control devices see also EN 60204-1:2006, 10.1.1.

Where controls are located on a separate movable control console it shall be of the type with cable connection to the machine and its position relative to the machine shall be indicated in the instruction handbook (see 6.4).

For positions of emergency stop, see 5.2.5 and for the position of the hold-to-run control devices, see 5.3.7.3.

~~*Verification*~~: By checking the relevant drawings and/or circuit diagrams, inspection and relevant functional testing on the machine.

5.2.3 Starting

The requirements of EN ISO 12100:2010, 6.2.11 and EN 60204-1:2006, 9.2.5.2 apply and in addition:

Before starting or restarting the machine all the safeguards shall be in place and functional. This is achieved by the interlocking arrangements described in 5.3.7. Start or restart shall only be possible by actuation of the start control device provided for that purpose.

Starting of the saw spindle drive motor(s), the powered movements of the saw units and the powered movements of the saw spindles (if provided) shall only be possible by manually operated control devices.

For starting the feed chain motor, see 5.2.6.

For starting the feed chain drive motor, either a manually operated control device or a foot pedal shall be provided. Where for initiating the movement of the feed chain a foot pedal is used this control device shall in accordance with the following requirements:

a) it shall be of the hold-to-run control type;

b) it shall be shrouded against unintentional activation;

c) the force required to actuate the foot pedal shall not exceed 350 N;

d) the safety related parts of the control system shall conform to at least PL=c in accordance with the requirements of EN ISO 13849-1:2008.

Indication when power is supplied to a saw spindle motor and the integrated feed motor shall be provided. Means of indication shall be e.g. by a light signal near to the start control or integrated in the start button or by a two-position switch.

For electrically started machines, see EN 60204-1:2006, 9.2.5.2.

The safety related part of control systems for start and restart function (see 5.2.1) shall conform to at least PL=c in accordance with the requirements of EN ISO 13849-1:2008.

~~*Verification*~~: By checking the relevant drawings and/or circuit diagrams, inspection and relevant functional testing on the machine.

5.2.4 Normal stopping

The machine shall be fitted with a stop control system, which when actuated, shall disconnect power from all machine actuators unless STO according to EN 61800-5-2:2007 is used and actuate the brakes (if provided).

For normal stopping of PDS(SR) (power drive system, safety related) see EN 61800-5-2:2007, 4.2.2.2 "safe torque off (STO)" and 4.2.2.3 “safe stop 1 (SS1)”.

If the machine is fitted with spring operated mechanical brakes this stop control shall be of Category 0 in accordance with the requirements of EN 60204-1:2006, 9.2.2.

If the machine is fitted with any other type of brakes e.g. electrical brakes this stop control shall be of Category 1 in accordance with the requirements of EN 60204-1:2006, 9.2.2 and the stopping sequence shall be:

a) cut power to the integrated feed motor, the saw spindle drive motors, the spindle vertical positioning actuators (if provided), the motors of spindle unit positioning (if provided) and actuate the brakes;

b) cut power to the brakes after braking sequence is complete.

The stopping sequence shall be satisfied at the level of control systems. If a time delay device is used, time delay shall conform to 5.2.1.2 b) and be at least the maximum run-down time. Either the time delay shall be fixed, or the time delay adjustment device shall be sealed.

It shall be possible to stop each saw spindle drive motor separately when the saw-spindle is in a non-cutting position.

The safety related part of control systems for the normal stop function (see 5.2.1) shall conform to at least PL=c in accordance with the requirements of EN ISO 13849-1:2008.

~~*Verification*~~: By checking the relevant drawings and/or circuit diagrams, inspection and relevant functional testing on the machine.

5.2.5 Emergency stop

The requirements of EN ISO 13850:2008 shall apply and in addition:

The machine shall be fitted with emergency stop control devices, which when actuated shall stop all machine actuators. The emergency stop control device shall be at any time of self latching type.

On electric driven machines the emergency stop control system shall conform to EN 60204-1:2006, 9.2.5.4 and 10.7. EN 60204-1:2006, 10.7.4 however does not apply.

When actuated the emergency stop shall include disconnection from energy supply and shall actuate the brake (if provided) unless STO is used.

For emergency stop of PDS(SR) see EN 61800-5-2:2007, 4.2.2.2 "safe torque off (STO)" and 4.2.2.3 “safe stop 1 (SS1)”.

Emergency stop control devices shall be located at the main control panel and at the loading and unloading positions of the machine at a height between 600 mm and 1 800 mm and not more than 800 mm behind the deterring/impeding device required in 5.3.7.1.2.

The emergency stop control devices shall consist of either:

a) emergency stop buttons so positioned that there is always one button within reach distance along the length of the loading and unloading positions; or

b) a wire or a bar along the whole length of the machine used as the emergency stop actuator.

If the machine is fitted with spring operated mechanical brakes the emergency stop shall be of Category 0 and shall sustain on electromechanical components only in accordance with the requirements of EN 60204-1:2006, 9.2.2.

If the machine is fitted with any other type of brakes e.g. electrical brakes the emergency stop shall be of Category 1 in accordance with the requirements of EN 60204-1:2006, 9.2.2 and the stopping sequence shall be:

1) cut power to the integrated feed motor, the saw spindle drive motors, the spindle vertical positioning actuators (if provided), the motors of spindle unit positioning (if provided) and actuate the brakes;

2) cut power to the brakes after braking sequence is complete.

The stopping sequence shall be satisfied at the level of control systems. If a time delay device is used, it shall conform to 5.2.1.2 b) and the time delay shall be at least the maximum run-down time. Either the time delay shall be fixed, or the time delay adjustment device shall be sealed.

The safety related part of control systems for the emergency stop function (see 5.2.1) shall be at least PL=c in accordance with the requirements of EN ISO 13849-1:2008.

Verification: By checking the relevant drawings and/or circuit diagrams, inspection, measurement and relevant functional testing on the machine.

5.2.6 Integrated feed

It shall not be possible to start the feed chain motor unless the drive motors of all spindles which are in a cutting position have been started.

The safety related part of the control systems (see also 5.2.1) for the interlocking arrangement shall be at least PL=c in accordance with the requirements of EN ISO 13849-1:2008.

Verification: By checking the relevant drawings and/or circuit diagrams, inspection and relevant functional testing on the machine.

5.2.7 Control duplication

Where the machine is fitted with two separate control devices for starting the saw spindle drive motors and/or the feed chain motor and/or saw unit positioning motors the control circuit shall be so designed that only one starting device is active at a time.

The safety related part of control systems for the interlocking function (see 5.2.1) shall be at least PL=c in accordance with the requirements of EN ISO 13849-1:2008.

~~Verification~~: By checking the relevant drawings and/or circuit diagrams, inspection and relevant functional testing on the machine.

5.2.8 Failure of the power supply

On electrically driven machines an automatic restart in the case of a supply interruption after the restoration of the voltage shall be prevented in accordance with EN 60204-1:2006, paragraphs 1 and 3 of 7.5.

Where the machine is fitted with pneumatic actuators, an under pressure device shall be provided which stops the machine if the pneumatic pressure is less than 80 % of the normal pressure stated. The safety related part of the control system for detecting the pressure drop shall be at least PL=c in accordance with the requirements of EN ISO 13849-1:2008.

The restoration of the energy supply shall not result in a restart of any machine actuator (see EN 1037:1995+A1:2008).

The safety related part of the control system to prevent automatic restart shall be at least PL=c in accordance with the requirements of EN ISO 13849-1:2008.

~~Verification~~: By checking the relevant drawings and/or circuit diagrams, measurement, inspection and relevant functional testing on the machine.

5.3 Protection against mechanical hazards

5.3.1 Stability

It shall be possible to fix stationary machines to a suitable stable structure e.g. floor. Facilities for fixing are e.g. fixing holes in the machine frame or the necessary fixing devices (see also 6.4 e)).

Displaceable machines fitted with wheels shall have facilities to make them stable during cutting (see 6.4 f)). Such facilities are e.g.:

a) brakes for the wheels; or

b) a combination of wheels and stabilisers; or

c) a device to retract the wheels from the floor.

~~Verification~~: By checking relevant drawings, inspection and relevant functional testing of the machine.

5.3.2 Risk of break-up during operation

The guards for the saw-blades shall be manufactured from:

a) steel with an ultimate tensile strength of at least 350 N mm^{-2} and a wall thickness of at least 2 mm;

b) light alloy with characteristics in accordance with Table 2;

Table 2 — Characteristics of light alloy saw-blade guards

Ultimate tensile strength ~~N mm^{-2}~~	Minimum thickness mm
~~180~~	~~5~~
~~240~~	~~4~~
300	3

c) polycarbonate with a wall thickness of at least 5 mm or other plastic material passing the test in Annex E;

d) cast iron with a minimum tensile strength of 200 N mm^{-2} and a minimum wall thickness of 5 mm.

Verification: By checking the relevant drawings, measurement, for materials with characteristics other than those given for polycarbonate in c) above by performing the test in Annex E and inspection of the machine.

NOTE For the ultimate tensile strength a confirmation from the manufacturer of the material can be useful.

5.3.3 Tool holder and tool design

5.3.3.1 Saw-blade design

If the machine is fitted with saw blades, they shall be in accordance with the requirements of EN 847-1:2005+A1:2007. Also see 6.4 i).

5.3.3.2 Saw spindle design

Saw spindles shall be manufactured in steel with an ultimate tensile strength of at least 580 N mm^{-2} and to at least the specifications given in Annex A.

The saw-blade mounting diameter of the saw spindle shall be ≥ 30 mm.

~~*Verification*~~ : By checking the relevant drawings and by measurement.

NOTE For the ultimate tensile strength a confirmation from the manufacturer of the material can be useful.

5.3.3.3 Saw-blade mounting

It shall not be possible to fit a saw-blade of greater diameter than the largest saw-blade for which the machine is designed (see also 6.4 d)).

Saw flanges (or in the case of flush mounted saw-blades a flange) shall be provided. The diameter of the flanges shall be at least $D/4$ (where D = diameter of the largest saw-blade for which the machine is designed).

Where two flanges are provided, both outside diameters of the saw flanges shall be within a tolerance of ± 1 mm. The clamping surface shall be at least 5 mm in width and recessed to the centre (see Figure 4).

Precautions shall be taken to ensure that the saw-blade does not come loose during start up, running, run-down or braking, e.g. by using a positive connection between the spindle and saw-blade (see EN ISO 12100:2010, 6.2.5), or by using a positive connection between the front saw flange and the saw spindle.

The flanges shall be manufactured from steel with an ultimate tensile strength of at least 350 N mm^{-2}.

~~*Verification*~~: By checking the relevant drawings, measurement, inspection and relevant functional testing on the machine.

NOTE For the ultimate tensile strength a confirmation from the manufacturer of the material can be useful.

Dimensions in millimetres

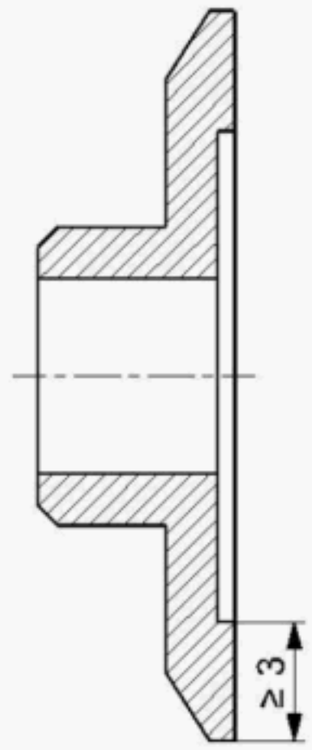


Figure 4 — Saw flange detail (clamping surface)

5.3.3.4 Spindle locking

When it is necessary to hold the spindle stationary for saw-blade changing, a spindle holding device shall be provided. This may be e.g. a double spanner arrangement or an integral locking bar inserted through the spindle. This bar shall have a minimum diameter of 8 mm and be made from steel with an ultimate tensile strength of 350 N mm^{-2}.

Locking bars shall prevent the spindle from rotating if the spindle drive motor is inadvertently switched on.

~~*Verification*~~: By checking the relevant drawings, inspection, measurement, and relevant functional testing of the machine. Alternatively on machines with locking bars by the following test: after starting the spindle drive motor with the locking bar in place the spindle shall remain stationary and shall not be deformed.

NOTE For the ultimate tensile strength a confirmation from the manufacturer of the material can be useful.

5.3.3.5 Positioning of the saw-spindle/saw unit

It shall be possible to move saw spindles/saw units not intended for use to a non-cutting position of the saw blade (for definition, see 3.2.9).

Where powered adjustment of the saw unit position is possible the unit shall remain fixed in position when adjusted e.g. by a self-locking drive.

Powered lateral adjustment of the saw units shall only be possible if:

a) no workpiece is between the saw blades or

b) power to the saw spindles is cut off.

The safety related parts of the control systems for adjustment of saw units shall be designed to meet at least PL=c in accordance with the requirements of EN ISO 13849-1:2008.

For the safeguarding of powered movements of the saw spindle and/or saw units see 5.3.7.3.

~~*Verification*~~: By checking relevant drawings, inspection and relevant functional testing of the machine.

5.3.4 Braking

An automatic brake shall be provided for the saw spindles where the un-braked run-down time exceeds 10 s.

The braked run-down time shall not exceed 10 s.

On electrical brakes in the case of failure of electrical power supply this run-down time may be exceeded.

A PL of at least c for the braking function shall be achieved.

The braking torque shall not be applied directly to the saw blade itself or the saw blade flange(s).

Where a spring operated mechanical brake or any other type of brake not using electronic components is fitted the last paragraph of 9.3.4 of EN 60204-1:2006 does not apply and the minimum life time of the friction coating and method of replacement shall be given (see 6.4 t)).

For electrical braking, reverse current injection braking shall not be used.

As an exception where an electrical brake with electronic control system is fitted, its control system shall be designed, as a minimum, in PL=b in accordance with the requirements of EN ISO 13849-1:2008 and be designed in category 2 in accordance with the requirements of EN ISO 13849-1:2008 with the exception that the test rate requirement in EN ISO 13849-1:2008, 4.5.4 is not applicable. The safety related part of the control system for braking shall be tested periodically, e.g. by monitoring braked run down time. The feed back shall come from either the encoder fitted to the spindle motor or from the measurement of the residual current in the wires powering the motor.

The test shall:

a) be independent from the basic control system for braking;

b) be independent from the intention of the operator;

c) be performed at each spindle stop.

Where the test result is negative more than three times in succession, it shall not be possible to operate the machine. A negative test result shall be indicated.

The diagnostic coverage (DC_{avg}) shall be ≥ 60 %.

See EN ISO 13849-1:2008, Annex E for DC estimation.

As an exception, a simple electronic brake (using simple electronic parts like rectifiers, transistors, triacs, diodes, resistors, thyristors) may be PL=b and designed in category 1 in accordance with the requirements of EN ISO 13849-1:2008 if the “mean time to a dangerous failure” (MTTFd) according to EN ISO 13849-1:2008, Table 5 reaches a value of “high” (at least 30 years).

NOTE Complex electronic components like e.g. microprocessors or PLCs cannot be considered as well tried under the scope of EN ISO 13849-1:2008 and do therefore not fulfil the requirements of category 1.

For calculating the probability of a dangerous failure (PFH) for a simple electronic brake component with no fault detection (no DC) and no testing capability (category 1) the procedure described in EN ISO 13849-1:2008, Annex D can be used.

~~*Verification*~~: By checking the relevant drawings and/or circuit diagrams, inspection of the machine and relevant functional testing of the machine. For the determination of un-braked run-down time and braked run-down time, if relevant, the appropriate tests given in Annex D apply.

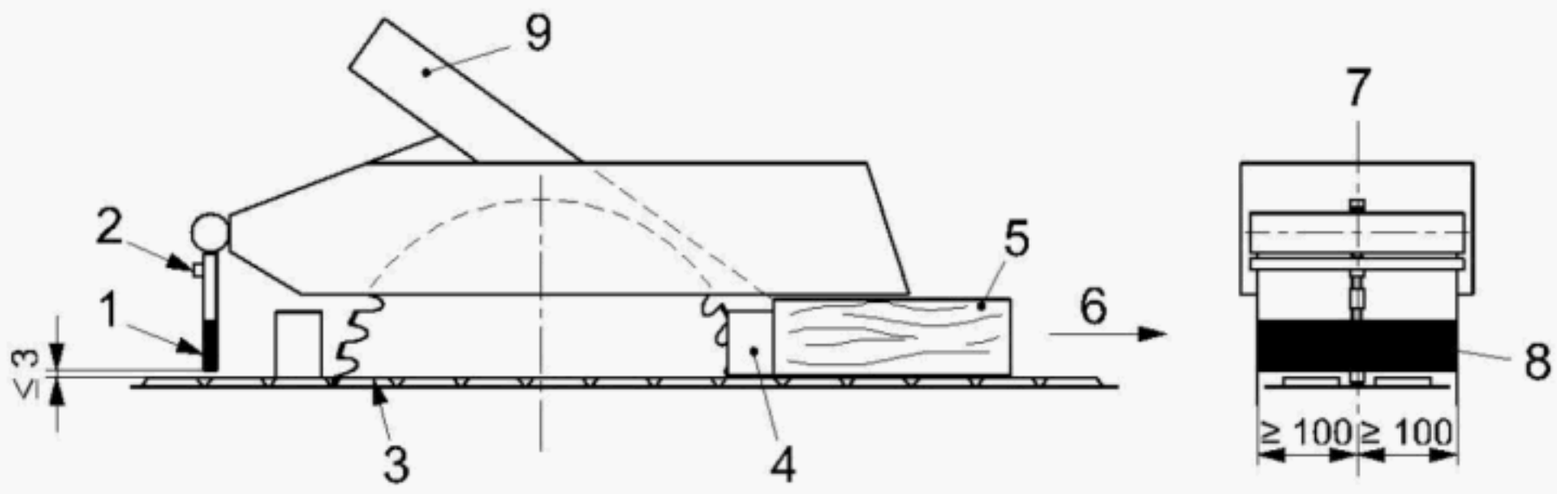
5.3.5 Devices to minimise the possibility or the effect of ejection

5.3.5.1 Ejection of off-cuts

To prevent off-cuts being ejected, deflectors shall be provided in front of each saw-blade (see Figure 5).

Deflectors shall extend downwards to within not more than 3 mm to the level of the work-piece support and shall extend at least 100 mm either side of the saw line. Its movement in the direction of ejection shall be limited by a stop (see Figure 5). The lower end of the deflectors shall be made from flexible material.

Dimensions in millimetres



Key

1	deflector
2	stop
3	work-piece support (feed chain)
4	feed dog
5	work-piece
6	feed direction
7	saw line
8	flexible material
9	chips and dust outlet

Figure 5 — Deflector dimensions

It shall not be possible for the deflector to contact the saw-blade.

Verification: By checking the relevant drawings, measurement, inspection and relevant functional testing on the machine.

5.3.5.2 Anti kick-back devices

On machines fitted with feed chains without dogs the work-piece shall be retained during its passage through the cutting area by means of a top pressure device at each saw unit consisting of e.g. belts or rollers to prevent the work-piece from being kicked-back. The pressure shall be applied before cutting starts.

The top pressure device may be combined with the top guard.

At machines fitted with feed chains with dogs, either:

a) the top guard shall act as an anti-lift device, shall be adjustable down to the work-piece support, be lockable in position and extend at least 100 mm either side of the saw line; or

b) a separate anti-lift device or top pressure device shall be provided which shall be adjustable down to the work-piece support, be lockable in position and extend at least 100 mm either side of the saw line.

See also 6.2.

~~Verification~~: By checking the relevant drawings, measurement, inspection and relevant functional testing of the machine. A board of soft wood (cross section 20 mm x 200 mm, rough surface from first cut) is fed to the cutting area to a position which corresponds to a cutting distance of 100 mm (half of board cross section). The saw blade may be dismounted. The feed is stopped. A force of 100 N is applied to the board in cutting line against feed direction. The board shall rest below the top pressure device.

5.3.6 Work-piece supports and guides

For manually unloaded machines an extension work-piece support (see Figure 6) shall be provided at the out feed end. This shall extend at least as far as the deterring/impeding device at the rear of the machine (see also 5.3.7.1.2).

~~Verification~~: By checking the relevant drawings, inspection and relevant functional testing on the machine.

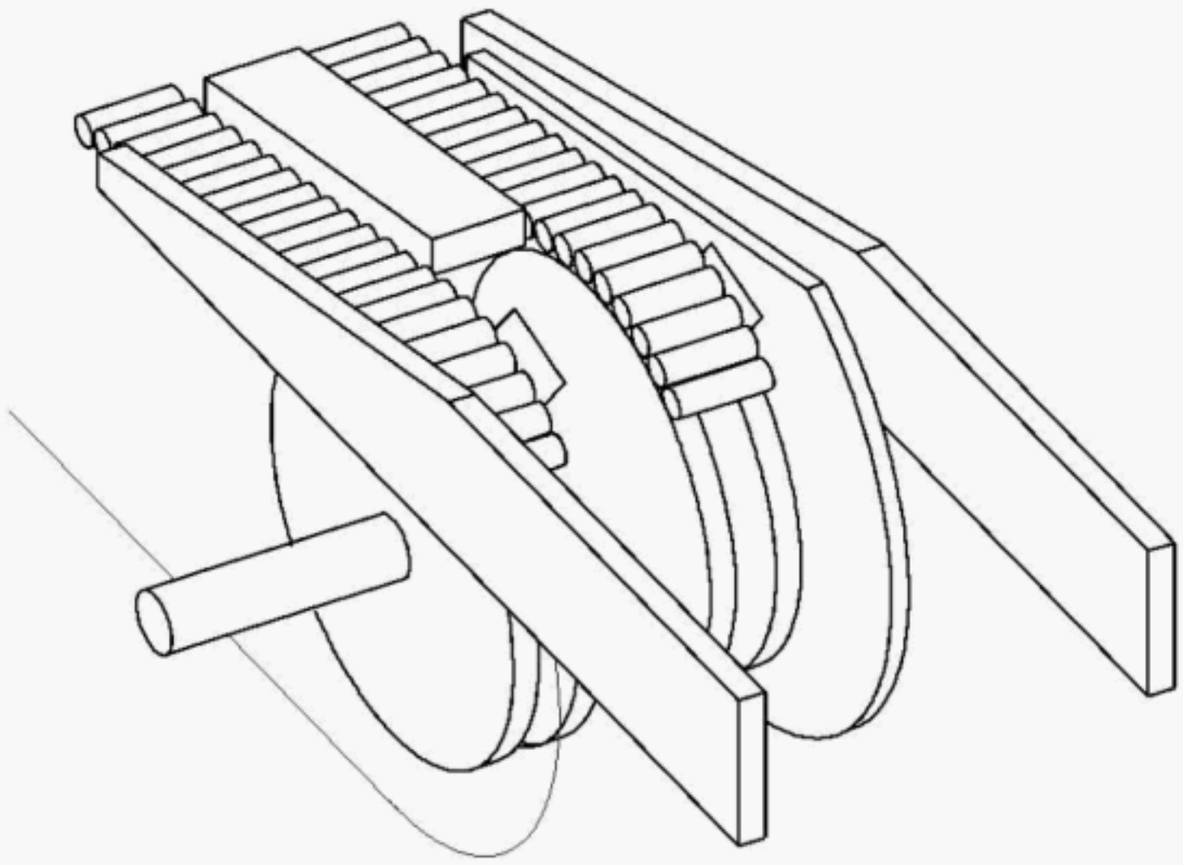


Figure 6 — Example of an extension work-piece support at out feed end

5.3.7 Prevention of access to moving parts

5.3.7.1 Guarding of the saw-blades

5.3.7.1.1 Guarding of the non-cutting area

Access to the non-cutting area of the saw-blades below the work-piece supports (feed chains) shall be prevented by fixed guards e.g. parts of the frame. Access to the running saw-blade through the chip outlet required in 5.4.3 shall be prevented.

If the fixed guards are to be demounted by the user e.g. for maintenance, cleaning purposes, their fixing systems shall remain attached to the guard or to the machine when the guard is removed, e.g. fitted with unlosable screws, see 6.4 z).

If for saw-blade changing a moveable guard is provided, this guard shall be interlocked with guard locking to the saw-spindle drive by at least a manually operated delay device in accordance with EN 1088:1995+A2:2008, Annex N.

The safety related part of the control systems for the interlocking with guard locking function (see 5.2.1) shall be at least PL=c in accordance with the requirements of EN ISO 13849-1:2008.

Access to the non-cutting area of each saw-blade above the work-piece support (feed chain) shall be prevented by an adjustable guard (top guard) which shall be designed:

a) to encompass the maximum saw-blade for which the machine is designed when the saw-blade is in its highest cutting position;

b) for machines fitted with feed chains with feed dogs to provide a maximum clearance of 5 mm between the lower edge of this guard and the level of the top of the highest dog for which the machine is designed. Feed dogs shall have rounded edges up to 2 mm radius;

c) for machines fitted with feed chains without dogs to provide a maximum clearance of 5 mm between its lower face and the surface of the feed chain;

d) to have a maximum internal width of 200 mm.

The chip outlet in the top guard shall be so designed that the safety distances of EN ISO 13857:2008, Table 4 are fulfilled.

The top guard may be combined with the anti-kickback device (top pressure device) required in 5.3.5.2.

See also the deterring/impeding device required in 5.3.7.1.2.

~~*Verification*~~: By checking the relevant drawings and/or circuit diagrams; inspection, measurement and relevant functional testing on the machine.

5.3.7.1.2 Guarding of the cutting area

Access to the cutting area shall be minimised by a combination of fixed guards on both sides of the machine and of deterring/impeding devices at the in feed and out feed ends of the machine (see Figure 7).

If the fixed guards are to be demounted by the user e.g. for maintenance, cleaning purposes, their fixing systems shall remain attached to the guard or to the machine when the guard is removed, e.g. fitted with un-losable screws, see 6.4 z).

The fixed guards on both sides of the machine shall have a height of at least 1 400 mm from the floor level and its vertical edges shall have a distance of at least 850 mm to the foremost respectively to the rearmost tooth of the largest saw-blade for which the machine is designed when it is adjusted to the maximum cutting height (see Figure 7).

The deterring/impeding devices shall:

a) be situated at a height *D* between 800 mm from floor level and the height of the work-piece support and shall have a horizontal distance of at least 900 mm to the foremost respectively to the rearmost tooth of the largest saw-blade for which the machine is designed when it is adjusted to the maximum cutting height (see Figure 7) (also see 5.4.5);

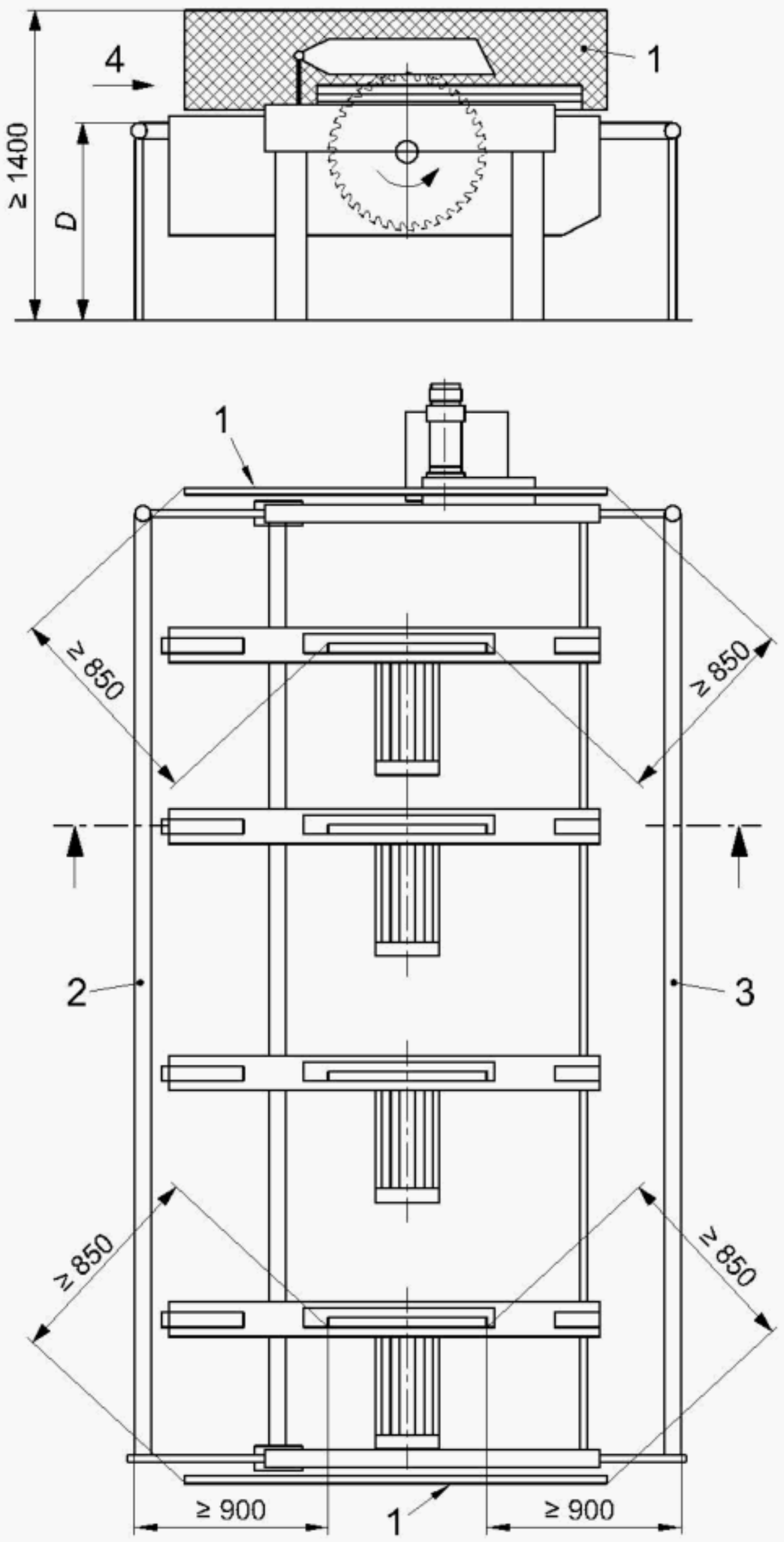
b) consist of a rigid structure (e.g. a bar of at least 50 mm diameter) and shall fulfil the requirements of the test given in Annex B;

c) be either movable or shall include a moveable section. All movable parts shall be interlocked with the saw spindle drive motors and feed drive motors.

The safety related part of the control systems for the interlocking function (see 5.2.1) shall be at least PL=c in accordance with the requirements of EN ISO 13849-1:2008.

~~*Verification*~~: By checking the relevant drawings and/or circuit diagrams; inspection, measurement and relevant functional testing of the machine.

Dimensions in millimetres



Key

1	fixed guard
2	deterring/impeding device at in feed
3	deterring/impeding device at out feed
4	feed direction
D	height of the deterring/impeding device

Figure 7 — Cutting area guarding

5.3.7.2 Guarding of feed chains

Access to the parts of the chains not required for feeding the work-piece shall be prevented by fixed guards.

If the fixed guards are to be demounted by the user e.g. for maintenance, cleaning purposes, their fixing systems shall remain attached to the guard or to the machine when the guard is removed, e.g. fitted with un-losable screws, see 6.4 z).

Access to parts of the chains needed for feeding the work-piece shall be minimised by the deterring/impeding devices required in 5.3.7.1.2.

Access to any trapping point between the uprising and down going dogs of a chain and any fixed part of the machine shall be prevented either:

a) by plain internal surfaces of the neighbouring fixed parts with a maximum distance of 8 mm between neighbouring fixed parts and the external surface of the dog; or

b) by fixed guards (for example, see Figures 6 and 8).

Access to parts of the chains needed for manual unloading of the work-piece shall be minimised by the deterring/impeding devices required in 5.3.7.1.2 and the extension work-piece support required in 5.3.6.

The path of the down going dogs shall remain open, to prevent entanglement.

The crushing hazard between the closing pads of chains where applicable shall be minimised by adequate design of the chain (see Figure 9) or provision of fixed guards (see Figure 8).

~~*Verification*~~: By checking the relevant drawings, inspection, measurement and relevant functional testing on the machine.

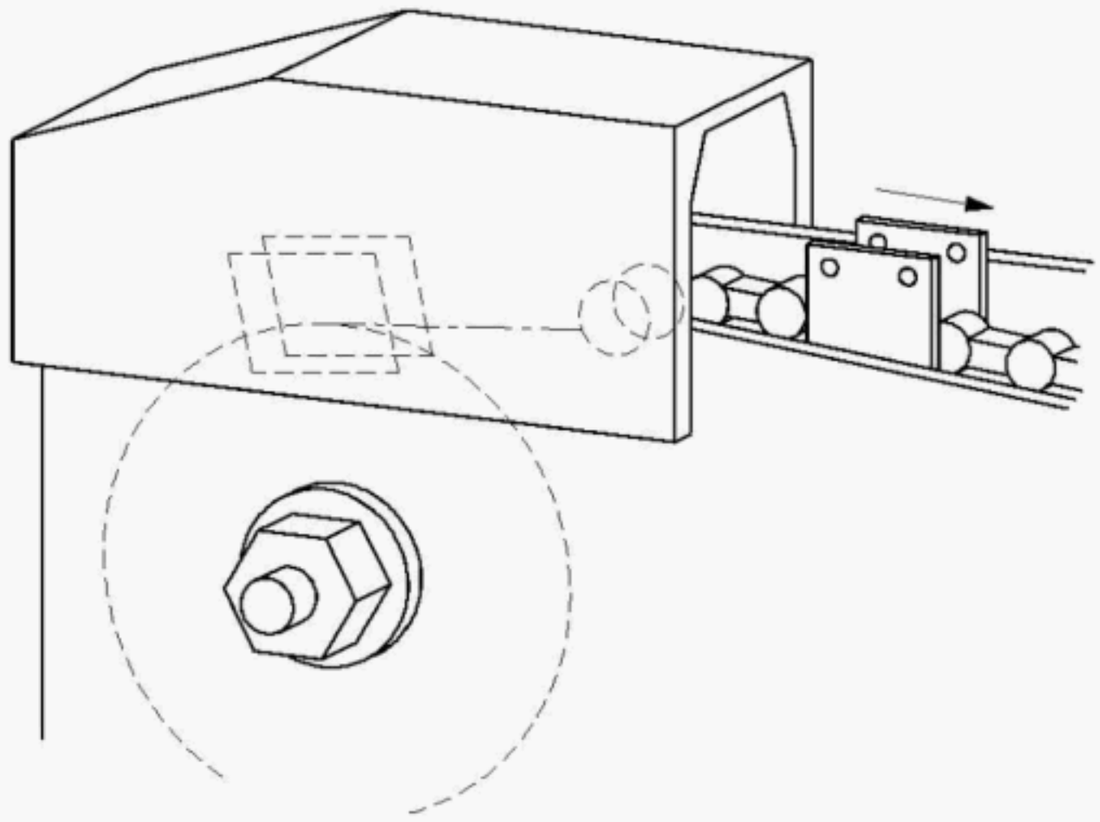


Figure 8 — Example of safeguarding of uprising dogs by fixed guards

Dimensions in millimetres

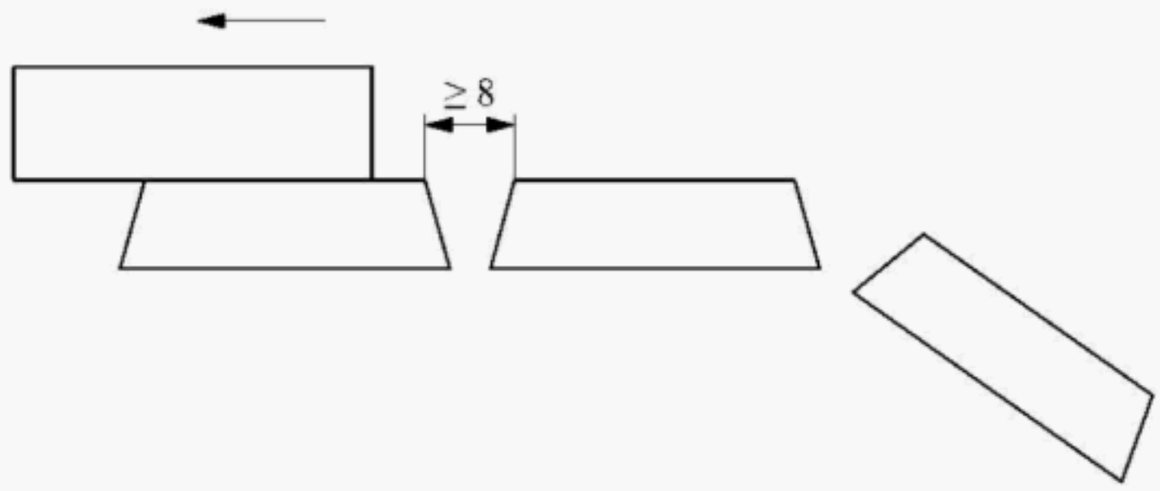


Figure 9 — Feed chain detail

5.3.7.3 Guarding of powered movement of the saw unit and saw spindle

Where the lateral movement of the saw units is under power the hazard of a person being crushed between closing saw units shall be prevented, either:

a) by fitting a limiting device to the machine which prevents the saw units coming closer together than 500 mm, except under the control of a hold-to-run control device which is operated by one hand and positioned outside the area defined by the position of the deterring/impeding devices required in 5.3.7.1.2 and such that the operator can maintain a clear view along the length of the machine; or

b) by fitting a hold-to-run control device which is operated by one hand and which shall be the only method of controlling the lateral movement of saw units across their full range of lateral movement. It shall be positioned outside the area defined by the position of the deterring/impeding devices required in 5.3.7.1.2 and such that the operator can maintain a clear view along the length of the machine.

Where powered vertical adjustment of spindle position is possible the hazard of crushing/shearing during adjustment shall be minimised either:

1) by limiting the adjustment speed to 10 mm s-1 or less. The safety related part of the control systems for the speed limiting function shall be PL=c in accordance with the requirements of EN ISO 13849-1:2008; or

2) by the use of a hold-to-run control device for the adjusting movement which shall be positioned outside the area defined by the position of the deterring/impeding devices required in 5.3.7.1.2 and such that the operator can maintain a clear view along the length of the machine.

The safety related part of the control systems for the hold-to-run function shall be at least PL=c in accordance with the requirements of EN ISO 13849-1:2008.

Verification: By checking the relevant drawing and/or circuit diagrams, inspection, measurement and relevant functional testing on the machine.

5.3.7.4 Guarding of drives

Access to the drive mechanisms for the saw-blades and integrated feed etc., other than the feed cross-drive shaft shall be prevented by fixed guards or moveable guard which are interlocked with the drive motor.

If the fixed guards are to be demounted by the user e.g. for maintenance, cleaning purposes, their fixing systems shall remain attached to the guard or to the machine when the guard is removed, e.g. fitted with un-losable screws, see 6.4 z).

If fitted with moveable interlocked guards and where it is possible to gain access to the saw blade teeth or other dangerous points and the run-down time of the saw blades exceeds 10 s, these guards shall be fitted

with guard locking, in accordance with at least unconditional unlocking in accordance with the requirements of EN 1088:1995+A2:2008, Annex N, if it is possible to gain access to the revolving saw blades with the guards open.

The feed-cross drive shaft shall be positioned inside the area limited by the position of the deterring/impeding device at the infeed and outfeed ends of the machine required in 5.3.7.1.2 and out of direct reach from the operator.

Interlocking devices, with and without guard locking, shall comply with EN 1088:1995+A2:2008. Guard locking shall be achieved by at least an interlocking device with guard locking, with manually operated delay device in accordance with EN 1088:1995+A2:2008, Annex N.

The safety related part of the control systems for the interlocking and interlocking with guard locking functions (see 5.2.1) shall be at least PL=c in accordance with the requirements of EN ISO 13849-1:2008.

~~*Verification*~~: By checking the relevant drawing and/or circuit diagrams, inspection and relevant functional testing on the machine.

5.4 Protection against non-mechanical hazards

5.4.1 Fire

To minimise fire hazards, the requirements of 5.4.3 and 5.4.4 shall be met.

Fire risk is not present where electrical power circuits are protected against over current in accordance with EN 60204-1:2006, 7.2.2.

~~*Verification*~~: By checking the relevant drawings and inspection on the machine.

5.4.2 Noise

5.4.2.1 Noise reduction at the design stage

When designing machinery, the information and technical measures to reduce noise at source given in EN ISO 11688-1:2009 shall be taken into account. The most relevant noise source are the rotating saw-blades.

5.4.2.2 Noise emission measurement

Operating conditions for noise measurement shall comply with Annex C of this document.

Mounting and operating conditions of the machine shall be identical for the determination of emission sound pressure levels at the work station and sound power levels.

Emission sound power levels shall be measured according to the enveloping surface measuring method shown in EN ISO 3746:2010 with the following modifications:

a) the environmental indicator K_{2A} shall be equal to or less than 4 dB;

b) the difference between the background sound pressure level and the machine sound pressure level at each measuring point shall be equal to or greater than 6 dB. The correction formula for this difference is given in EN ISO 3746:2010, 8.3.3, Formula 12;

c) only the parallelepiped measurement surface shall be used at 1 m from the reference surface;

d) where the distance from the machine to an auxiliary unit is less than 2 m the auxiliary unit shall be included in the reference surface;

e) the accuracy of the test shall be better than 3 dB;

f) the number of microphone positions shall be 9 in accordance with Annex C of this document.

Alternatively, where the facilities exist and the measurement method applies to the machine type emission sound power levels may also be measured according to a method with higher precision i.e. EN ISO 3743-1:2010, EN ISO 3743-2:2009, EN ISO 3744:2010 and EN ISO 3745:2009 without the preceding modifications.

For determination of emission sound power level by the sound intensity method, use EN ISO 9614-1:2009, (subject to agreement between the supplier and the purchaser).

Emission sound pressure levels at the workstation shall be measured in accordance with EN ISO 11202:2010 with the following modifications:

1) the environmental indicator K_{2A} and the local environmental factor K_{3A} shall be equal to or less than 4 dB;

2) the difference between the background emission sound pressure level and the sound pressure level at the workstation shall be equal to or greater than 6 dB in accordance with EN ISO 11202:2010, 6.4.1, accuracy grade 2 (Engineering);

3) the correction of the local environmental factor K_{3A} shall be calculated in accordance with EN ISO 11204:2010, A.2 with the reference restricted to EN ISO 3746:2010 instead of the method given in EN ISO 11202:2010, Annex A, or in accordance with EN ISO 3743-1:2010 or EN ISO 3743-2:2009 or EN ISO 3744:2010 or EN ISO 3745:2009 where one of these standards has been used as the measuring method.

For noise declaration 6.4 u) shall be met.

5.4.3 Emission of chips and dust

Provision shall be made on the machine to enable it to be connected to a separate collection system for the extraction of chips and dusts. This includes that each saw unit shall be fitted with a chip outlet at the fixed guard below the work-piece support and a chip outlet at the adjustable guard (top guard).

The opening of the capture device shall be large enough to capture the chips and dust projected.

NOTE 1 The size of the opening of the capture device depends on the emission pattern and the distance between the emission source and the opening of the capture device.

The capture device shall be designed in order to minimise pressure drop and material build up e.g. by avoiding abrupt change of direction of extracted chips and dust, sharp angles and obstacles causing a risk for hanging of chip and dust.

The conveying of chips and dust between the capture device and the machine connection to the CADES (chip and dust extraction system), especially flexible connections of moving units, shall follow the requirements to minimise pressure drop and material build up.

To ensure that the chips and dust extracted from the point of origin are conveyed to the collection system, the design of the hoods, ducts and baffles shall be based on an average conveying velocity of extracted air in the duct of 20 m s^{-1} for dry chips and 28 m s^{-1} for wet chips (moisture content 18 % or above).

The pressure drop between the inlet of all capture devices and the connection to the CADES should be maximum 1 500 Pa (for the nominal air flow rate).

A low dust emission can be expected if the air flow rate ≥ 900 $m^3 h^{-1}$ per unit is ensured.

See also 6.4 o), p), q).

~~Verification~~: By checking of drawings, visual inspection and the following procedure:

- Measure the pressure drop at the chosen air flow rate by measurement under the condition given for noise measurement in this standard.

- Run the machine (without processing a work piece) under the conditions for noise measurement in this standard. The CADES shall be disconnected. Check if the machine creates an air flow from the inlet(s) of the capture device(s) to the connection outlet(s) to the CADES by use of smoke at the connection outlet(s).

NOTE 2 For measurement of chip and dust extraction system performance two standardised methods are useful: concentration method (EN 1093-9:1998+A1:2008) and index method (EN 1093-11:2001+A1:2008).

5.4.4 Electricity

With the exception of 6.3, the requirements of EN 60204-1:2006 shall apply unless stated otherwise in this document.

See EN 60204-1:2006, 6.2 for the requirements regarding prevention of electric shock due to direct contact and EN 60204-1:2006, Clause 7 for the requirements regarding protection against short circuits and overloading.

The protection of people against electrical shock due to indirect contacts should be normally ensured by automatic isolation of the electrical power supply of the machine by the operation of a protective device installed by the user in the line powering the machine (see the information provided by the manufacturer in the instruction handbook (see 6.4 y)).

The degree of protection for all electrical components shall be IP 5X minimum in accordance with EN 60529:1991 and EN 60529:1991/A1:2000.

In accordance with EN 60204-1:2006, 18.2 the test 1 for the continuity of the protective bonding circuit and with EN 60204-1:2006, 18.6 functional tests apply.

~~Verification~~: By checking the relevant drawings, circuit diagrams, inspection of the machine and relevant tests for continuity of the protective bonding circuit and functional tests specified in EN 60204-1:2006, 18.2, test 1 and 18.6.

NOTE For electrical components characteristics the information from the electrical component supplier can be useful.

5.4.5 Ergonomics and handling

The requirements of EN 614-1:2006+A1:2009 shall apply and in addition:

The height of the work-piece support above floor level shall be between 800 mm and 900 mm.

For the position of controls see 5.2.2 and 5.2.5 (see also EN 894-3:2000+A1:2008).

If the machine is equipped with a display the requirements of EN 894-2:1997+A1:2008 shall apply.

The machine and its controls shall be designed according to ergonomic principles in accordance with EN 1005-4:2005+A1:2008 for work posture which is not fatiguing.

The positioning, marking and illumination (if necessary) of control devices, and facilities for materials and tool set handling shall be in accordance with ergonomic principles in accordance with EN 894-1:1997+A1:2008, EN 894-2:1997+A1:2008, EN 894-3:2000+A1:2008, EN 1005-1:2001+A1:2008, EN 1005-2:2003+A1:2008 and EN 1005-3:2002+A1:2008.

Tanks containing compressed air drainers and oilers shall be placed or oriented in such a way that the filler and drain pipes can be easily reached.

Machine components with a mass exceeding 25 kg shall include necessary attachments to accommodate the fitting of a lifting device e.g. lugs positioned such as to avoid their overturn or fall or move in an uncontrolled way during transport, assembly, dismantling, disabling and scrapping.

If the machine is fitted with a movable control panel, this panel shall be fitted with a facility to move it in the desired position.

If graphical symbols related to the operation of actuators are used, they shall be in accordance with EN 61310-1:2008, Table A.1.

Further guidance is given in EN 60204-1:2006, EN 614-1:2006+A1:2009 and EN 614-2:2000+A1:2008.

~~Verification~~: By checking the relevant drawings, measurement and inspection of the machine.

5.4.6 Lighting

Where lighting is required as determined by reference to EN 1837:1999+A1:2009, it shall be provided in accordance with EN 60204-1:2006, 15.2.

See 6.4.

~~Verification~~: By checking the relevant drawings and/or circuit diagrams and inspection of the machine.

5.4.7 Pneumatic

If the machine is fitted with pneumatic system the requirements of EN ISO 4414:2010 shall apply. See also 5.2.1, 5.2.3, 5.2.5, 5.2.8, 5.4.13, 5.4.14, 6.2 of this document and EN ISO 12100:2010, 6.2.10.

~~Verification:~~ By checking the relevant drawings and/or circuit diagrams and inspection on the machine.

5.4.8 Hydraulic

If the machine is fitted with hydraulic system the requirements of EN ISO 4413:2010 shall apply. See also 5.2.1, 5.2.3, 5.2.5, 5.2.8, 5.4.13, 5.4.14 of this document and EN ISO 12100:2010, 6.2.10.

~~Verification:~~ By checking the relevant drawings and/or circuit diagrams and inspection on the machine.

5.4.9 Electromagnetic compatibility

The machine shall have sufficient immunity to electromagnetic disturbances to enable it to operate correctly in accordance with EN 60439-1:1999 and EN 60439-1:1999/A1:2004, EN 50370-1:2005 and EN 50370-2:2003.

NOTE Machines which incorporate CE-marked electrical equipment and where such equipment and cabling is installed in accordance with their respective manufacturers instructions, are generally considered to be protected against external electromagnetic interference.

~~Verification~~: By checking the relevant drawings and/or circuit diagrams and inspection of the machine.

5.4.10 Laser

If the machine is fitted with a laser to indicate the cutting line, the laser shall be of Category 2, 2M or a lower category in accordance with the requirements of EN 60825-1:2007.

The laser shall be fitted to the machine so that warnings on the laser itself remain visible.

Direct eye contact with the nominal ocular hazard area shall be prevented, e.g. by use of an extension piece to maintain a safe distance.

All provisions from the laser manufacturer associated to the installation and the use of the laser shall be fulfilled. The instruction for use of the laser shall be repeated in the instruction manual. Warning label and advice on use of eye protection if any shall be provided on the machine near the operator's position.

~~*Verification*~~: By checking the relevant drawings and inspection.

NOTE For the laser characteristics a confirmation from the manufacturer of the laser can be useful.

5.4.11 Static electricity

If the machine is fitted with flexible hoses for chip and dust extraction the hoses shall be able to lead charge to earth potential.

~~*Verification*~~: By checking the relevant drawings and inspection of the machine.

5.4.12 Errors of fitting

It shall not be possible to fit a saw-blade of greater diameter than the largest saw-blade for which the machine is designed.

See also 5.3.3.4, 6.3 and 6.4.

~~*Verification*~~: By checking the relevant drawings and inspection of the machine.

5.4.13 Isolation

The requirements of EN 1037:1995+A1:2008, Clause 5 apply and in addition:

The electrical isolator shall be in accordance with EN 60204-1:2006, 5.3.

The electrical power supply to the machine shall be controlled by a supply disconnecting device in accordance with EN 60204-1:2006, 5.3.2, a), b) or c).

When fitted with a plug to connect the machine to a 3-phase electrical supply, this plug may incorporate a phase inverter.

If the machine is fitted with a Direct Current (DC) injection braking system the electrical isolator shall be either:

a) not be located on the same side of the machine or on the same side of the panel as the start and stop controls; or

b) equipped with a blocking device. It shall only be possible to switch-off the mains after manually actuating a de-blocking device. In this case the supply disconnection device shall not be equipped as emergency stopping device.

Where the machine has a pneumatic system, it shall be capable of being isolated by a device e.g. a valve. This device shall include means permitting it to be locked in the off position (e.g. by a padlock).

Where hydraulic energy is used, a hydraulic isolator shall be provided which is in accordance with EN ISO 4413:2010, 5.2.8.

Where residual energy is stored, e.g. in a reservoir or pipe, means for dumping residual pressure shall be provided, for example using a valve. Dumping pressure shall not be by disconnection of a pipe.

See also 6.2.

~~Verification~~: By checking the relevant drawings and/or circuit diagrams, inspection and relevant functional testing of the machine.

5.4.14 Maintenance

The basic principles of EN ISO 12100:2010, 6.2.15 shall be observed and in addition:

Where lubrication points are provided they shall be located outside of danger zones and accessible by the operator when standing on the floor.

The machine shall be so designed that maintenance and cleaning can be, if possible undertaken after disconnection of the machine from all energy sources (see also 6.4).

See 6.4, 5.3.7.4 and 5.4.13.

~~Verification~~: By checking the instruction handbook and inspection on the machine.

6 Information for use

6.1 General

The basic principles of EN ISO 12100:2010, 6.4 shall be observed and - if fitted with saw blades - the requirements of EN 847-1:2005+A1:2007, Clause 8 apply and the following subclauses:

6.2 Warnings and warning devices

The machine shall be permanently marked with the following warnings:

a) instruction on e.g. a label or pictogram that the top pressure device shall be correctly adjusted for the work-piece thickness;

b) if the machine is equipped with a pneumatic/hydraulic supply and isolation of the pneumatic/hydraulic energy is not achieved by the electrical isolation a permanent warning label shall be placed in proximity to the electrical supply disconnection device, warning that the pneumatic/hydraulic supply is not isolated by isolation of the electrical supply.

Where an electrical brake with a complex electronic control system is fitted the machine shall be equipped with a warning device e.g. a red warning lamp, indicating a negative test result of braking system (see Annex E).

Permanently marked means for example engraving, etching, embossing or stamping or using a sticker.

The warnings shall either be in the language of the country in which the machine is to be used or wherever possible by using pictograms.

~~Verification~~: By checking the relevant drawings and inspection on the machine.

6.3 Marking

The basic principles of EN ISO 12100:2010, 6.4.4 shall be observed and in addition:

The following information shall be marked legibly and indelibly throughout the expected life of the machine either directly on the machine e.g. by engraving, etching or by using labels or stickers or a plate permanently affixed to the machine e.g. by riveting:

a) business name and address of the machine manufacturer and, where applicable, of his authorised representative;

b) year of construction, that is the year in which the manufacturing process is completed;

c) designation of the machinery and designation of series or type;

d) machine identification or serial number (if any);

e) maximum and minimum diameter of the saw-blades for which the machine is designed;

f) the bore diameter of the saw-blade;

g) nominal pressure for pneumatic/hydraulic circuits (if provided);

h) a pictogram showing the direction of rotation of the saw-blade at each saw unit;

i) rating information (mandatory for electro-technical products: voltage, frequency, nominal current).

The labels or pictograms for marking the nominal pressure and the isolators shall be fitted in a position in close proximity to the installed location of the isolators on the machine.

The markings shall either be in the language of the country in which the machine is to be used or wherever possible by using pictograms.

If the machine is equipped with scales the requirements of EN 894-2:1997+A1:2008 shall apply.

~~*Verification*~~ : By checking the relevant drawings and inspection on the machine.

6.4 Instruction handbook

The principles of EN ISO 12100:2010, 6.4.5 shall be observed and in addition the instruction handbook shall include at least:

a) a repetition of the markings, pictograms and other instructions on the machine (see 6.2 and 6.3) and, if necessary, information about their meaning;

b) intended use of the machine including reasonably foreseeable misuse;

c) a warning regarding residual risks;

d) instructions for the safe use (see also 6.4.5.1 d) of EN ISO 12100:2010);

e) if necessary on stationary machines instruction about the need to fix the machine to the floor and how this is to be done;

f) on displaceable machines information how transportation shall be handled and how to make the machine stable during cutting;

g) the position of the separate control console (where provided);

h) that only correctly sharpened saw-blades manufactured in accordance with the requirements of EN 847-1:2005+A1:2007 shall be used;

i) that no saw-blade shall be used whose maximum speed marked on them is lower than the rotational speed of the saw spindles;

j) the maximum length, width and thickness of the work-piece;

k) the need to ensure that the location of the machine is such that no additional crushing and shearing risk is created between the moving parts of the machine or work-piece and other fixed adjacent machines, part of the building or stocks of material, etc.;

l) information on adequate training of operators in the use, adjustment and operation of the machine including methods for adjustment and cleaning;

These shall also include instructions on how the following points can be satisfied:

1) information about safe cleaning including chip and dust to be collected by using a vacuum cleaner;

2) to adopt safe procedures for cleaning e.g. with the machine disconnected from all energy sources, maintenance and remove chips and dust regularly to avoid the risk of fire;

3) information that off-cuts shall be diverted away from the cutting area into a suitable receptacle and empty this when necessary;

4) that off-cuts or other parts of the work-piece shall not be removed from the cutting area whilst the machine is running;

m) instruction that adequate general or localised lighting shall be provided;

n) if fitted with a laser, a statement that no exchange with a different type of laser is permitted, that no additional optical equipment shall be used and that repair shall only be carried out by the laser manufacturer or authorised persons;

o) information regarding the chip and dust equipment fitted to the machine as follows:

1) necessary airflow in $m^3 h^{-1}$;

2) pressure drop at each dust extraction connection outlet;

3) recommended conveying air velocity in the duct in $m s^{-1}$;

4) cross section dimensions and details of each connection outlet;

p) information that during use the machine shall be connected to an external chip and dust extraction system;

External chip and dust extraction equipment with fixed installations are dealt with in EN 12779:2004+A1:2009.

q) instruction that dust extraction equipment to be switched on before starting machining;

r) information on safe procedure for maintenance (including frequency), and servicing , that whenever possible maintenance shall be only done if the machine is isolated from all energy sources and involuntary restart is prevented; in cases where machine cannot be isolated from all energy sources information about necessary safety measures;

s) if fitted with a hydraulic and/or pneumatic system the method for the safe dissipation of residual energy (see 5.4.14);

t) those safety devices which shall be tested, how frequently the tests shall be carried out and the test method. This shall include at least the following:

1) emergency stop(s) - by functional test;

2) interlocked guards - by opening each guard in turn to stop the machine and by proving the inability to start the machine with each guard in the open position;

3) interlocked guards with guard locking - by proving the inability to open the guard until the saw spindles are stationary and by proving the inability to start up machine with any guard in the open position;

4) the brake(s) - by functional testing to check that the machine is braked within the specified time;

u) a declaration concerning airborne noise emissions by the machinery, either the actual value or a value established on the basis of measurements made on identical machinery, measured in accordance with the methods given in 5.4.2.2, i.e.:

1) A-weighted emission sound pressure levels at workstations;

2) A-weighted sound power levels emitted by the machinery.

The declaration shall be accompanied by a statement of the measuring method used and the operating conditions applied during the test and values for associated uncertainty *K* using the dual-number form of declaration in accordance with EN ISO 4871:2009 as follows:

4 dB when using EN ISO 3746:2010 and EN ISO 11202:2010;
2 dB when using EN ISO 3743-1:2010 or EN ISO 3743-2:2009 or EN ISO 3744:2010;
1 dB when using EN ISO 3745:2009

for example, for a sound power level : L

Associated uncertainty K = 4 dB

L_{WA} = xx dB (measured value)

Measurement made in accordance with EN ISO 3746:2010.

If the accuracy of the declared emission values is to be checked, measurements shall be made using the same method and the same operating conditions as those declared.

The noise declaration shall be accompanied by the following statement:

"The figures quoted are emission levels and are not necessarily safe working levels. Whilst there is a correlation between the emission and exposure levels, this cannot be used reliably to determine whether or not further precautions are required. Factors that influence the actual level of exposure of the workforce include the characteristics of the work room and the other sources of noise, etc., i.e. the number of machines and other adjacent processes. Also the permissible exposure level can vary from country to country. This information, however, will enable the user of the machine to make a better evaluation of the hazard and risk."

Information on noise emission shall also be provided in the sales literature when performance data are provided.

v) information on conditions necessary to ensure that throughout the foreseeable lifetime the machine including its components cannot overturn or fall or move in an uncontrolled way during transport, assembly, dismantling, disabling and scrapping;

w) the operating method to be followed in the event of accident or breakdown; if a blockage is likely to occur, the operating method to be followed so as to enable the equipment to be safely unblocked;

x) the identification data of the spare parts to be changed by the user, when these affect the health and safety of operators (parts to be changed only by the manufacturer or personal charged by the manufacturer are excluded);

y) information on how to provide protection of people against electrical shock due to indirect contact in the machine by a device for automatic disconnection of the power supply to be installed by the user in the line powering the machine;

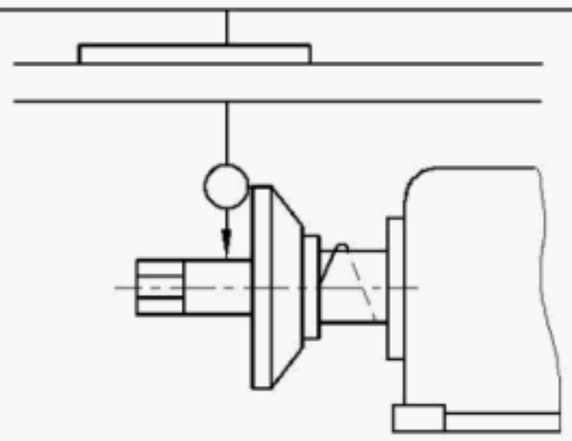
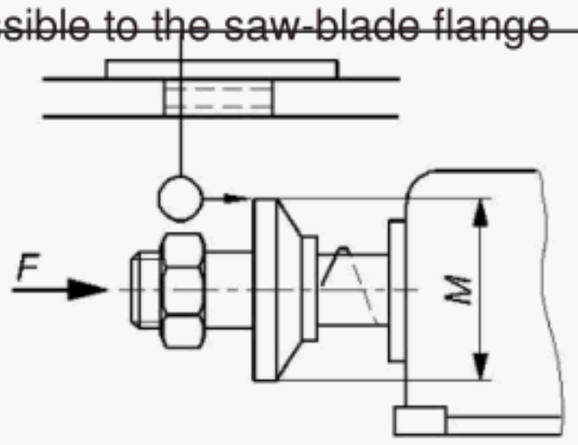
z) description of fixed guards which have to be removed by the user for maintenance and cleaning purposes. (guards to be dismounted only by the manufacturer or personal charged by the manufacturer are excluded).

~~*Verification*~~: By checking the instruction handbook and relevant drawings.

Annex A

(normative)

Saw spindle dimensional tolerances

Diagram	Object	Permissible deviation	Measuring instrument
 Measurement mode as close as possible to the saw-blade flange	Measuring run-out of saw spindle	mm 0,03	Dial gauge
 Apply axial pressure *F* as recommended by manufacturer	Measuring camming of the saw flange	0,03 for $M \leq 100$ 0,04 for $M > 100$	Dial gauge

Annex B

(normative)

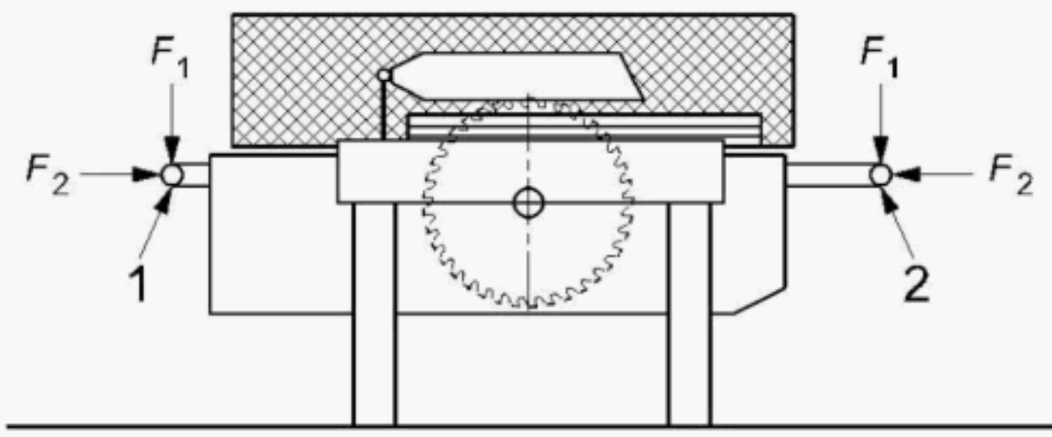
Stability test for the deterring/impeding device required in 5.3.7.1.2

The centres of the in feed and out feed bars are subject to a vertical force F_1 of 1 000 N and a horizontal force F_2 of 300 N as shown on the Figure B.1.

The maximum deviation during the test shall not exceed the values given in Table B.1.

Table B.1 — Maximum deviations for the deterring/impeding device

Force	Deviation
F_1 = 1 000 N	≤ 70 mm
F_2 = 300 N	≤ 50 mm



Key

1 longitudinal centre of deterring/impeding device – In feed
2 longitudinal centre of deterring/impeding device – Out feed

Figure B.1 — Deterring/impeding device stability test

Annex C
(normative)

Operating conditions for noise emission measurement

The machine shall be tested in accordance with ISO 7960:1995 (Clauses 1 to 5). In addition the following shall be observed:

a) all internal auxiliary units e.g. power feed, pneumatic clamping, shall be in operation during testing;

b) all relevant guards, safety devices, internal sound enclosures, etc. shall be in position during testing;

c) extraction shall be 'on' during testing in the working condition, but the influence of the noise of the extraction plant shall be excluded as far as possible, e.g. by the use of baffles or taking into account e.g. background noise correction.

The following machine specific operating conditions shall be observed:

1) maximum of 4 saw units shall be fitted with the largest saw blades for which the machine is designed;

2) the distance between the saw-blades shall be 800 mm;

3) the saw-blades shall be in the highest cutting position;

4) the type of the saw-blades shall be either the saw-blades delivered with the machine or saw-blades according to the recommendation of the machine manufacturer;

5) the work-piece shall be softwood of medium grade e.g. pine, spruce with a moisture content of 8 % to 14 % with following dimensions:

   i) length: 3 000 mm;

   ii) width: 100 mm;

   iii) thickness: 20 mm;

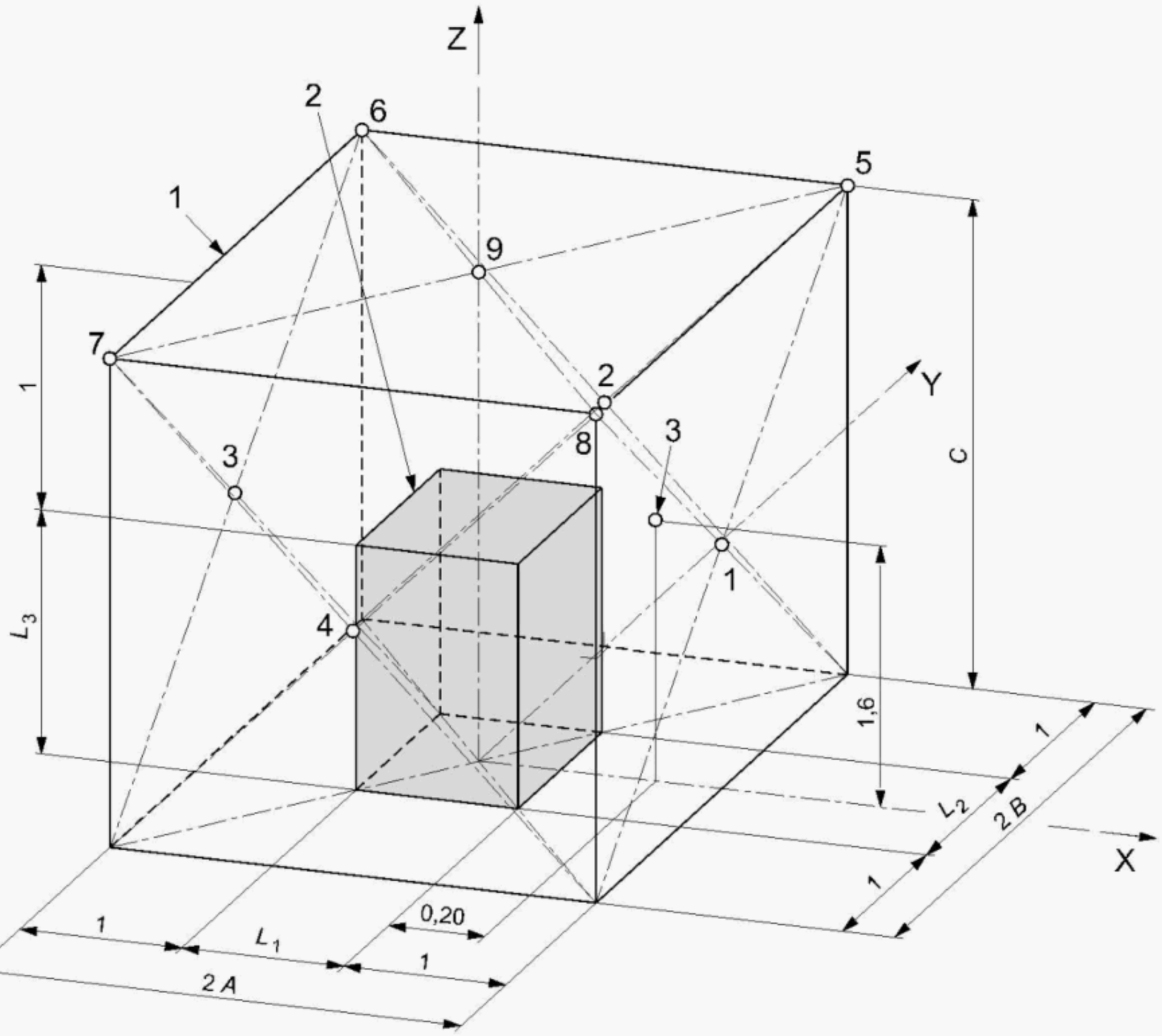
6) the feed rate shall be 10 m min^{-1} or the nearest possible.

The microphone positions shall be as shown in Figure C.1. The operator microphone position shall be 200 mm in front of the in feed edge of the machine in the middle of the 4 saw units and 1,6 m above the floor level.

As far as possible the data sheet shown in the annexes of ISO 7960:1995 shall be used for the test report.

If any condition of the test is impossible to achieve the deviation shall be recorded in the report.

Dimension in meters



Key

1 measurement surface
2 reference box
3 operator microphone position
L_1 length of the reference box L_2
width of the reference box L_3
height of the reference box
2A length of the measurement surface
2B width of the measurement surface
C height of the measurement surface

Figure C.1 — Measurement surface and microphone positions

Annex D
(normative)

Braking tests

D.1 Conditions for all tests

a) The test shall be performed with all spindle units;

b) the spindle unit shall be set in accordance with the manufacturer's instructions (e.g. belt tension);

c) when selecting the speed and the saw-blades for the tests, conditions shall be chosen which create the greatest kinetic energy for which the machine is designed;

d) before beginning the test warm up the spindle unit for at least 15 min by running at idle speed;

e) verify that the actual spindle speed is within 10 % of the intended speed;

f) the speed measuring equipment shall have an accuracy of at least ± 1 % of the full scale.

D.2 Tests

D.2.1 Un-braked run-down time

The un-braked run-down time shall be measured as follows:

a) start the spindle drive motor and run at the intended speed (no load) for 1 min;

b) cut the power to the saw spindle drive motor and measure the un-braked run-down time;

c) repeat steps a) and b) twice more.

The un-braked run-down time is the maximum of the three measurements taken.

D.2.2 Braked run-down time

The braked run-down time shall be measured as follows:

a) start the spindle drive motor and run at the intended speed (no load) for 1 min;

b) cut the power to the spindle drive motor and measure the braked run-down time;

c) allow the spindle to remain stationary for 1 min;

d) repeat steps a) to c) nine times.

The braked run-down time is the average of the ten measurements taken. The standard deviation of the 10 measurements shall not exceed 10 % of this average.

Annex E

(normative)

Impact test method for guards

E.1 General

This annex defines tests for guards used in order to minimise risks of ejection of parts of the saw blades or of work pieces out of the working zone.

This annex applies to guards as well as on samples of guards' materials.

E.2 Test method

E.2.1 Preliminary remarks

This test method reproduces the hazard of the ejection of the saw blades parts or of work pieces. The test allows to estimate the resistance/strength of guards and/or samples of guard materials against penetration and dislodgement from the machine by ejected parts from machine or work piece.

E.2.2 Testing equipment

The testing equipment comprises a propulsion device, a projectile, a support for the test object and a system that allows to measure or record the impact speed with an accuracy of ± 5 %.

E.2.3 Projectile for guards

The projectile shall be a ball of 8 mm diameter made from steel with the following properties:

$^{-2}$to 690 N mm^{-2};

a) tensile strength: *R*m = 560 N mm

b) yield strength: $R_{0,2} \geq 330$ N mm^{-2};

c) elongation at rupture: $A \geq 20$ %;

d) hardened to 56 ð^{4} HRC over depth of at least 0,5 mm.

E.2.4 Sampling

The test is carried out with the guard and/or a sample of the guard material. The guard support shall be equivalent to the guard mounting on the machine. For testing guard materials samples may be used, fixed on a frame with an inner opening of 450 mm × 450 mm. The frame shall be sufficiently rigid. The mounting of the sample shall be by non positive clamping.

E.2.5 Test procedure

The impact test shall be executed with projectile indicated in E.2.3 and an impact speed of 70 m s^{-1} ± 5 %.

Impact shall be as square to the material sample surface or the guard surface as possible. The targets for the projectiles shall be the weakest and most unfavourable spot on the guard or on the centre of material sample.

E.3 Results

After the impact damages found on the guard or material shall be assessed as follows:

a) buckling/bulging (permanent deformation without crack);

b) incipient crack (visible only on one surface);

c) through crack (crack visible from one surface to the other);

d) penetration (projectile penetrating the test object);

e) guard window loosened from its fixing;

f) guard loosened from guard support.

E.4 Assessment

The test is passed if there is no through crack or penetration of the test object and if there are no damages e) and f) in accordance with the requirements of E.3.

E.5 Test report

The test report shall give the following minimum information:

a) date, place of the test and name of the testing institute;

b) projectile mass, dimensions, speed;

c) applicant identification;

d) design, material and dimensions of the test object;

e) clamping or fixing of the test object;

f) direction of shock, point of impact of the projectile;

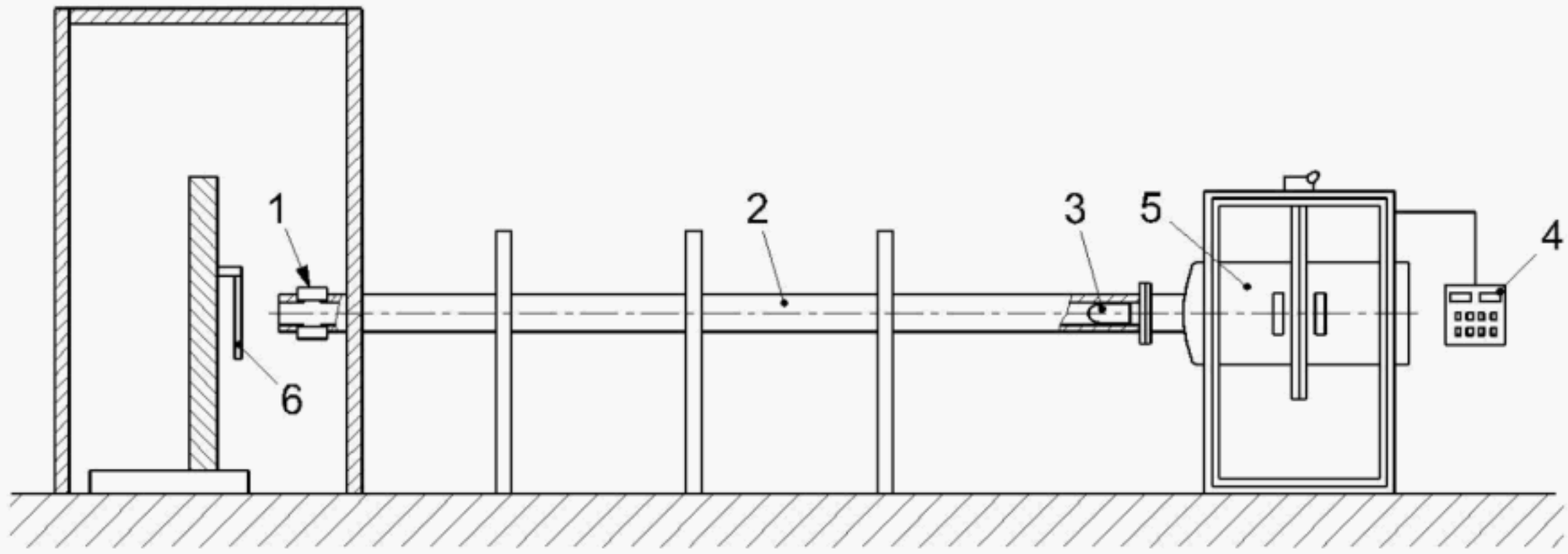
g) test result.

E.6 Test equipment for impact test

The propulsion device consists of a compressed air vessel with flanged gun barrel (see Figure E.1). The compressed air may be released by a valve to accelerate the projectile toward the test object.

The air gun is fed by an air compressor. The speed of the projectile may be controlled by the pressure of the air.

The projectile speed is measured near the nozzle of the gun barrel by a suitable speedometer e.g. by proximity sensor or photocell.



Key

1 speedometer
2 gun barrel
3 projectile
4 control panel
5 compressed-air vessel
6 test object

Figure E.1 — Example of equipment for impact test

Annex ZA

(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 Machinery Directive 2006/42/EC.

Once this standard is cited in the Official Journal of the European Union under that Directive, 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.

Table ZA.1 — Correspondence between this European Standard and Directive 2006/42/EC

Clause(s)/Subclause(s) of this EN	Essential Requirements (ERs) of Directive 2006/42/EC
	1.1.2 Principles of safety integration
5.2.1, 5.2.2, 5.2.3, 5.2.4, 5.2.5, 5.2.6, 5.2.7, 5.3.6, 5.3.7, 5.4.12, 5.4.14, 6.4	a) fitted for its function
Clause 5, 6	b) eliminate or reduce the risks, give measures, inform
Clause 5, 6	c) intended use and reasonably foreseeable misuse
5.4.5, 6.4	d) constraints in use
5.2, 5.3, 5.4	e) equipment
5.4.3	1.1.3 Materials and products
5.4.6, 6.4	1.1.4 Lighting
5.2.2, 5.3.7, 5.4.5	1.1.5 Design of machinery to facilitate its handling
5.4.5	1.1.6 Ergonomics
5.2.2, 5.2.3, 5.2.4, 5.2.5, 5.2.6, 5.2.7, 5.4.14, 6.4	1.1.7 Operating position
5.2.1, 5.2.6, 5.2.7, 5.2.8, 5.4.9, 5.4.13	1.2.1 Safety and reliability of control systems
5.2.2, 5.2.3, 5.2.4, 5.2.5, 5.2.6, 5.2.7, 6.4	1.2.2 Control devices
5.2.2, 5.2.3, 5.2.6, 5.2.7	1.2.3 Starting

Table ZA.1 *(continued)*

5.2.2, 5.2.4, 5.2.5	1.2.4 Stopping
5.2.4	1.2.4.1 Normal stop
5.2.5	1.2.4.3 Emergency stop
5.2.8, 5.4.4, 5.4.7, 5.4.8	1.2.6 Failure of the power supply
5.3.1, 6.4	1.3.1 Risk of loss of stability
5.3.2, 6.4	1.3.2 Risk of break-up during operation
5.3.2, 5.3.3, 5.3.5	1.3.3 Risks due to falling or ejected objects
5.1	1.3.4 Risk due to surfaces, edges or angles
5.2.6, 5.2.8	1.3.6 Risks relating to variations in the operating conditions
5.3.7	1.3.7 Risks related to moving parts
5.3.7	1.3.8 Choice of protection against risks related to moving parts
5.3.7.4	1.3.8.1 Moving transmission parts
5.3.7.1, 5.3.7.2, 5.3.7.3, 5.3.7.4	1.3.8.2 Moving parts involved in the process
5.2.6, 5.3.7	1.3.9 Risk of uncontrolled movements
5.3.2, 5.3.7	1.4.1 Required characteristics of guards and protective devices - General requirements
5.3.7.1, 5.3.7.2	1.4.2.1 Fixed guards
5.3.7.1, 5.3.7.2	1.4.2.2 Interlocking movable guards
5.3.7.1	1.4.2.3 Adjustable guards restricting access
5.2.8, 5.4.4	1.5.1 Electricity supply
5.4.11	1.5.2 Static electricity
5.2.8, 5.4.7, 5.4.8	1.5.3 Energy supply other than electricity
5.4.12	1.5.4 Errors of fitting
5.4.1	1.5.6 Fire
5.4.2	1.5.8 Noise
5.4.9	1.5.11 External radiation
5.4.10	1.5.12 Laser equipment

Table ZA.1 *(continued)*

5.4.3	1.5.13 Emission of hazardous materials and substances
5.3.7	1.5.14 Risk of being trapped
5.4.14	1.6.1 Machinery maintenance
5.2.2, 5.3.7, 5.4.14	1.6.2 Access to operating position and servicing points
5.4.13	1.6.3 Isolation of energy sources
5.2.2, 5.3.7, 5.4.5, 5.4.14, 6.4	1.6.4 Operator intervention
5.4.3, 5.4.14, 6.4	1.6.5 Cleaning of internal parts
5.2.1, 5.4.5, 6.1, 6.2	1.7.1 Information and warnings on the machinery
6.1, 6.2	1.7.2 Warning of residual risks
6.3	1.7.3 Marking of machinery
6.4	1.7.4 Instructions
	2.3 Machinery for working wood and analogous materials
5.3.6, 5.3.7	a) guiding
5.3.5	b) ejection
5.3.4	c) brake
5.3.5, 5.3.6, 5.3.7, 6.4	d) accidental tool contact

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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[1] EN 1093-9:1998+A1:2008, *Safety of machinery — Evaluation of the emission of airborne hazardous substances — Part 9: Pollutant concentration parameter, room method*

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