

European standard

French standard

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February 2008

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Safety of woodworking machines

Circular sawing machines

Part 13: Horizontal beam panel sawing machines

F : Sécurité des machines pour le travail du bois — Machines à scier circulaires —
Partie 13 : Scies à panneaux horizontales à presseur
D : Sicherheit von Holzbearbeitungsmaschinen — Kreissägemaschinen —
Teil 13: Horizontale Plattenkreissäge maschinen mit Druckbalken

French standard approved

by decision of the Director General of AFNOR on January 2, 2008 taking effect on February 2, 2008.

With standard NF EN 1870-14, replaces the approved standard NF EN 1870-2, dated August 1999 which will remain in effect until June 2009.

Correspondence The European standard EN 1870-13:2007 has the status of French standard.

Analysis

This document was prepared in order to give the means to comply with the requirements of the "Machinery" Directive 98/37/EC modified by the Directive 98/79/EC. It determines the safety requirements of horizontal beam panel sawing machines.

Descriptors

Technical International Thesaurus: safety of machines, woodworking machinery, sawing machines (tools), circular saws, definitions, safety requirements, safety measures, protection against mechanical hazards, noise reduction, human factors engineering, information, use, marking.

Modifications

With respect to the replaced document:

- exclusion of vertical beam panel sawing machines, covered in NF EN 1870-14;
- addition of definitions and requirements relating to electrical control systems associated with safety (SRECS and SRP(CS));
- addition of an impact test method for the protectors.

Corrections

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National foreword*References to French standards*

The correspondence between the standards figuring in the clause "Normative references" and the identical French standards is as follows:

EN 294	: NF EN 294 (classification index: E 09-010)
EN 614-1	: NF EN 614-1 (classification index: X 35-004-1)
EN 847-1	: NF EN 847-1 (classification index: E 73-521-1)
EN 894-1	: NF EN 894-1 (classification index: X 35-101-1)
EN 894-2	: NF EN 894-2 (classification index: X 35-101-2)
EN 894-3	: NF EN 894-3 (classification index: X 35-101-3)
EN 983	: NF EN 983 (classification index: E 49-202)
EN 1005-1	: NF EN 1005-1 (classification index: X 35-106-1)
EN 1005-2	: NF EN 1005-2 (classification index: X 35-106-2)
EN 1005-3	: NF EN 1005-3 (classification index: X 35-106-3)
EN 1005-4	: NF EN 1005-4 (classification index: X 35-106-4)
EN 1037	: NF EN 1037 (classification index: E 09-053-2)
EN 1088	: NF EN 1088 (classification index: E 09-051)
EN 1760-3	: NF EN 1760-3 (classification index: E 09-042)
EN 50178	: NF EN 50178 (classification index: C 53-200)
EN 50370-1	: NF EN 50370-1 (classification index: C 91-370-1)
EN 50370-2	: NF EN 50370-2 (classification index: C 91-370-2)
EN 60204-1	: NF EN 60204-1 (classification index: C 79-130)
EN 60439-1	: NF EN 60439-1 (classification index: C 63-421)
EN 60529	: NF EN 60529 (classification index: C 20-010)
EN 60825-1	: NF EN 60825-1 (classification index: C 43-805)
EN 61310-1	: NF EN 61310-1 (classification index: C 79-141)
EN 61496-1	: NF EN 61496-1 (classification index: C 79-151)
CLC/TS 61496-2	: NF EN 61496-2 (classification index: C 79-152)
EN 61508-3	: NF EN 61508-3 (classification index: C 46-063)
EN 62061	: NF EN 62061 (classification index: C 79-170)
EN ISO 3743-1	: NF EN ISO 3743-1 (classification index: S 31-024-1)
EN ISO 3743-2	: NF EN ISO 3743-2 (classification index: S 31-024-2)
EN ISO 3744	: NF EN ISO 3744 (classification index: S 31-025)
EN ISO 3745	: NF EN ISO 3745 (classification index: S 31-026)
EN ISO 3746	: NF EN ISO 3746 (classification index: S 31-027)
EN ISO 4871	: NF EN ISO 4871 (classification index: S 31-075)
EN ISO 9614-1	: NF EN ISO 9614-1 (classification index: S 31-100-1)
EN ISO 11202	: NF EN ISO 11202 (classification index: S 31-502)
EN ISO 11204	: NF EN ISO 11204 (classification index: S 31-504)



<i>EN ISO 11688-1</i>	<i>: NF EN ISO 11688-1 (classification index: S 31-510-1)</i>
<i>EN ISO 12100-1</i>	<i>: NF EN ISO 12100-1 (classification index: E 09-001-1)</i>
<i>EN ISO 12100-2</i>	<i>: NF EN ISO 12100-2 (classification index: E 09-001-2)</i>
<i>EN ISO 13849-1</i>	<i>: NF EN ISO 13849-1 (classification index: E 09-025-1)</i>
<i>EN ISO 13849-2</i>	<i>: NF EN ISO 13849-2 (classification index: E 09-025-2)</i>
<i>EN ISO 13850</i>	<i>: NF EN ISO 13850 (classification index: E 09-053)</i>
<i>ISO 7960</i>	<i>: NF ISO 7960 (classification index: E 64-201)</i>

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Within the framework of this standard, CEN has established a transitional period allowing the adaptation of products to this new standard, during which period CEN members are authorized to maintain the national standards in effect.

Consequently, NF EN 1870-2 dated August 1999 will remain in effect until June 2009.





English Version

Safety of woodworking machines - Circular sawing machines - Part 13: Horizontal beam panel sawing machines

Sécurité des machines pour le travail du bois - Machines à
scier circulaires - Partie 13: Scies à panneaux horizontales
à presseur

Sicherheit von Holzbearbeitungsmaschinen -
Kreissägemaschinen - Teil 13: Horizontale
Plattenkreissägemaschinen mit Druckbalken

This European Standard was approved by CEN on 21 October 2007.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN Management Centre or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the CEN Management Centre has the same status as the official versions.

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Foreword

This document (EN 1870-13:2007) 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 June 2008, and conflicting national standards shall be withdrawn at the latest by June 2009.

This document together with prEN 1870-14:2007 supersedes EN 1870-2:1999.

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 the Machinery Directive.

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

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

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 12100-1:2003 for a description of A, B and C standards).

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 2: Horizontal beam panel saws and vertical panel 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: Multiblade 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 (manual radial arm saws)

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and 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 12100-1:2003.

The machinery concerned and the extent to which hazards, hazardous situations and events are 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 type C 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 horizontal beam panel sawing machines. This document is also useful for designers and importers.

This document also includes provision and examples of information to be provided by the manufacturer to the user.

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



1 Scope

This document deals with the significant hazards, hazardous situations and events as listed in Clause 4 which are relevant to horizontal beam panel sawing machines where the saw unit is mounted below the workpiece support and which are manually or mechanically loaded and / or unloaded, fitted with:

- a side pressure device and / or
- the facility for scoring and / or
- the facility for post-formed / soft-formed edge pre-cutting and / or
- a panel turning device and / or
- a pushing out device and / or
- pneumatic clamping of the saw blade and / or
- a powered panel loading device and / or
- a grooving device and / or
- additional cutting line(s) inside the machine for longitudinal and / or head cut (before transversal cutting line) and / or
- workpiece vacuum clamping as part of a panel turning device or of a panel loading device,

hereinafter referred to as "machines" when they are used as intended and under the conditions foreseen by the manufacturer.

The machines are designed for cutting panels consisting of:

- a) wood based materials such as chipboard, fibreboard, plywood and also these materials where they are covered with plastic/light alloy laminates which can be cut easily;
- b) solid wood;
- c) hardened rubber and hardened plastic material;
- d) non ferrous materials e.g. light alloy;
- e) gypsum boards, gypsum bounded fibreboards;
- f) composite boards made from the materials listed above.

This document does not deal with specific hazards related to:

- i) specific features which differ from the list above;
- ii) the machining of panels with grooving tools;
- iii) mechanical unloading of panels;
- iv) the combination of a single machine being used with any other machine (as part of a line).



This document is not applicable to horizontal beam panel sawing machines which are manufactured before the date of its publication as EN.

NOTE Machines covered by this standard if manually loaded and / or unloaded are listed under A.1.4 of Annex IV of the Machinery Directive.

2 Normative references

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

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

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

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

EN 894-1:1997, *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, *Safety of machinery — Ergonomics requirements for the design of displays and control actuators — Part 2: Displays*

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

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

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

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

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

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

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

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

EN 1760-3:2004, *Safety of machinery — Pressure sensitive protective devices — Part 3: General principles for the design and testing of pressure sensitive bumpers, plates, wires and similar devices*

EN 50178:1997, *Electronic equipment for use in power installations*

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

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

EN 60825-1:1994, *Safety of laser products — Part 1: Equipment classification, requirements and user's guide (IEC 60825-1:1993)*

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

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

CLC/TS 61496-2:2006, *Safety of machinery — Electro-sensitive protective equipment — Part 2: Particular requirements for equipment using active opto-electronic protective devices (AOPDs) (IEC 61496-2:2006)*

EN 61508-3:2001, *Functional safety of electrical/electronic/programmable electronic safety-related systems — Part 3: Software requirements (IEC 61508-3:1998 + Corrigendum:1999)*

EN 62061:2005, *Safety of machinery — Functional safety of safety-related electrical, electronic and programmable electronic control systems (IEC 62061:2005)*

EN ISO 3743-1:1995, *Acoustics — Determination of sound power levels of noise sources — Engineering methods for small movable sources in reverberant fields — Part 1: Comparison method for hard-walled test rooms (ISO 3743-1:1994)*

EN ISO 3743-2:1996, *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 reverberant test rooms (ISO 3743-2:1994)*

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

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

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

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

EN ISO 9614-1:1995, *Acoustics — Determination of sound power levels of noise sources using sound intensity — Part 1: Measurements at discrete points (ISO 9614-1:1993)*

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

EN ISO 11204:1995, *Acoustics — Noise emitted by machinery and equipment — Measurement of emission sound pressure levels at the work station and at other specified positions — Method requiring environmental corrections (ISO 11204:1995)*



EN ISO 11688-1:1998, *Acoustics — Recommended practice for the design of low-noise machinery and equipment — Part 1: Planning* (ISO/TR 11688-1:1995)

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

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

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

EN ISO 13849-2:2003, *Safety of machinery — Safety-related parts of control systems — Part 2: Validation* (ISO 13849-2:2003)

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

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

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN ISO 12100-1:2003 and the following apply.

3.1

horizontal beam panel sawing machines

machine fitted with one travelling saw unit per cutting line incorporating one or more circular saw blades which is designed for cutting panels. The workpiece is supported in the horizontal plane and mechanically positioned by a panel pusher for the cuts and held during cutting in position by a pressure beam. The cutting stroke is power driven. Before the cutting stroke commences, the saw blade is automatically raised/lowered and is retracted or out of operation for the return stroke. The cut takes place only in a single straight line (examples see Figures 1 a), 1 b) and 1 c)). The workpiece is loaded manually and / or by means of a powered panel loading device and manually or mechanically unloaded. The machine may have any of the following main features:

- a) a side pressure device;
- b) the facility for scoring;
- c) the facility for cutting post-formed / soft-formed edge pre-cutting;
- d) a panel turning device;
- e) a pushing out device;
- f) pneumatic clamping of the saw blade;
- g) a powered panel loading device;
- h) additional cutting line(s) (before front cutting line) located inside the machine e.g. for longitudinal and / or head cut (see Figure 2 and 3.18, 3.19);
- i) workpiece vacuum clamping as part of a panel turning device or a panel loading device.



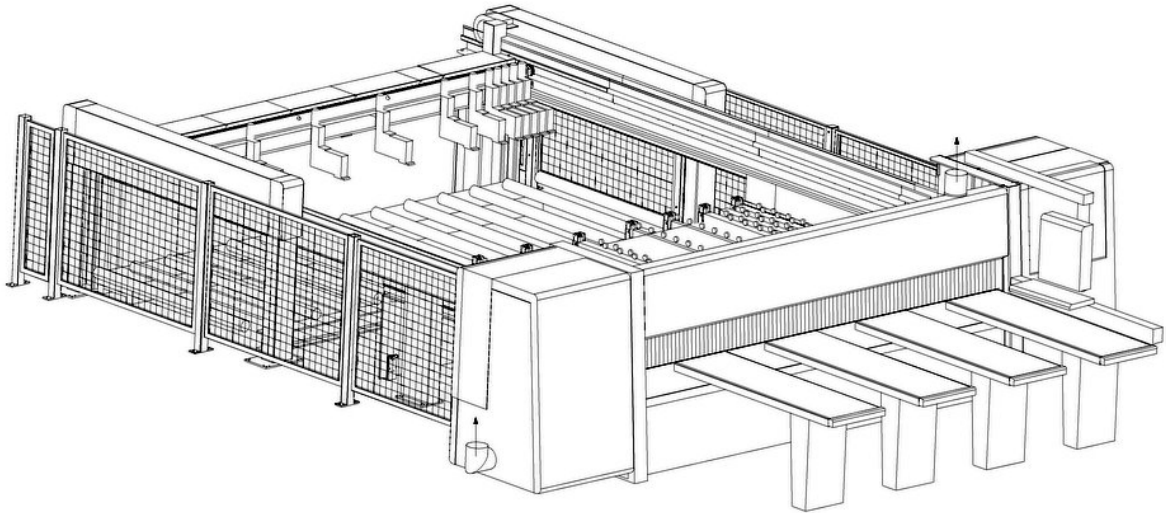


Figure 1 a) — Example of a horizontal beam panel saw with panel loading from the rear side by a powered loading device and with fixed distance guarding and light barrier

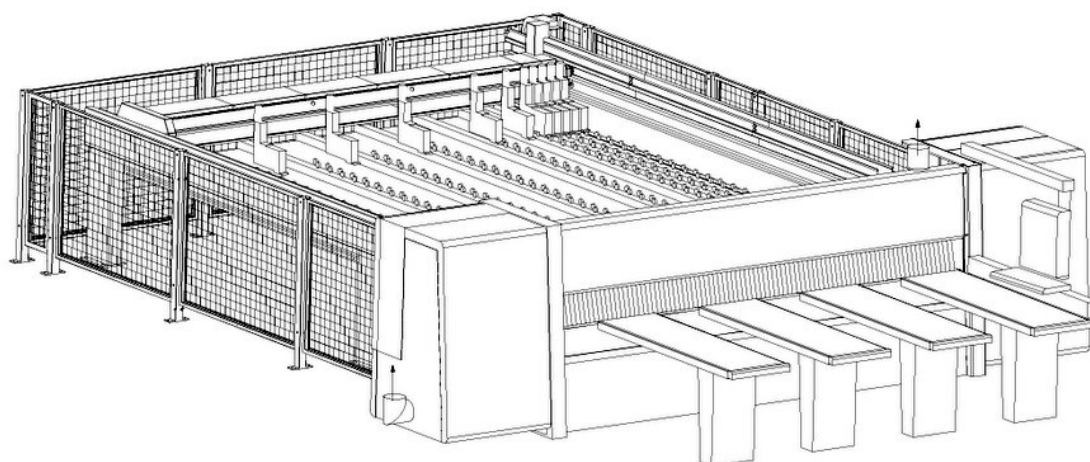


Figure 1 b) — Example of a horizontal beam panel saw with panel loading from the front side and with fixed distance guarding

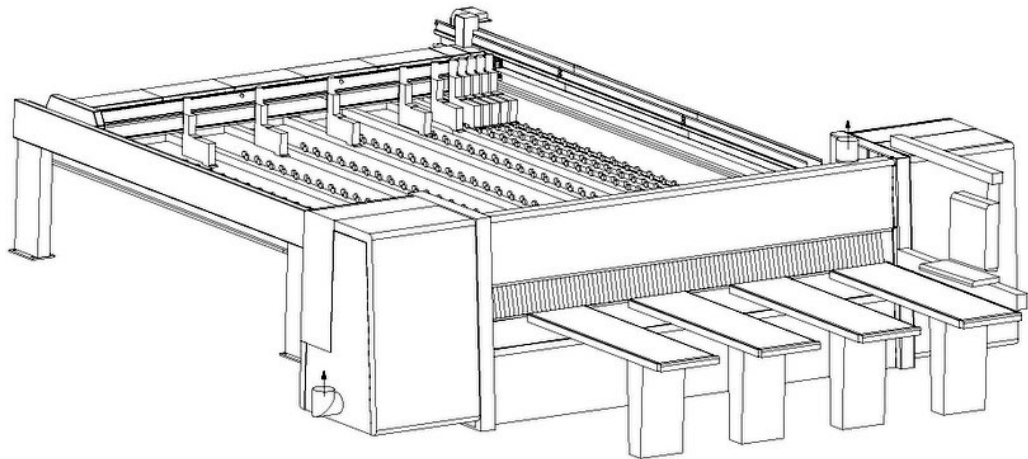
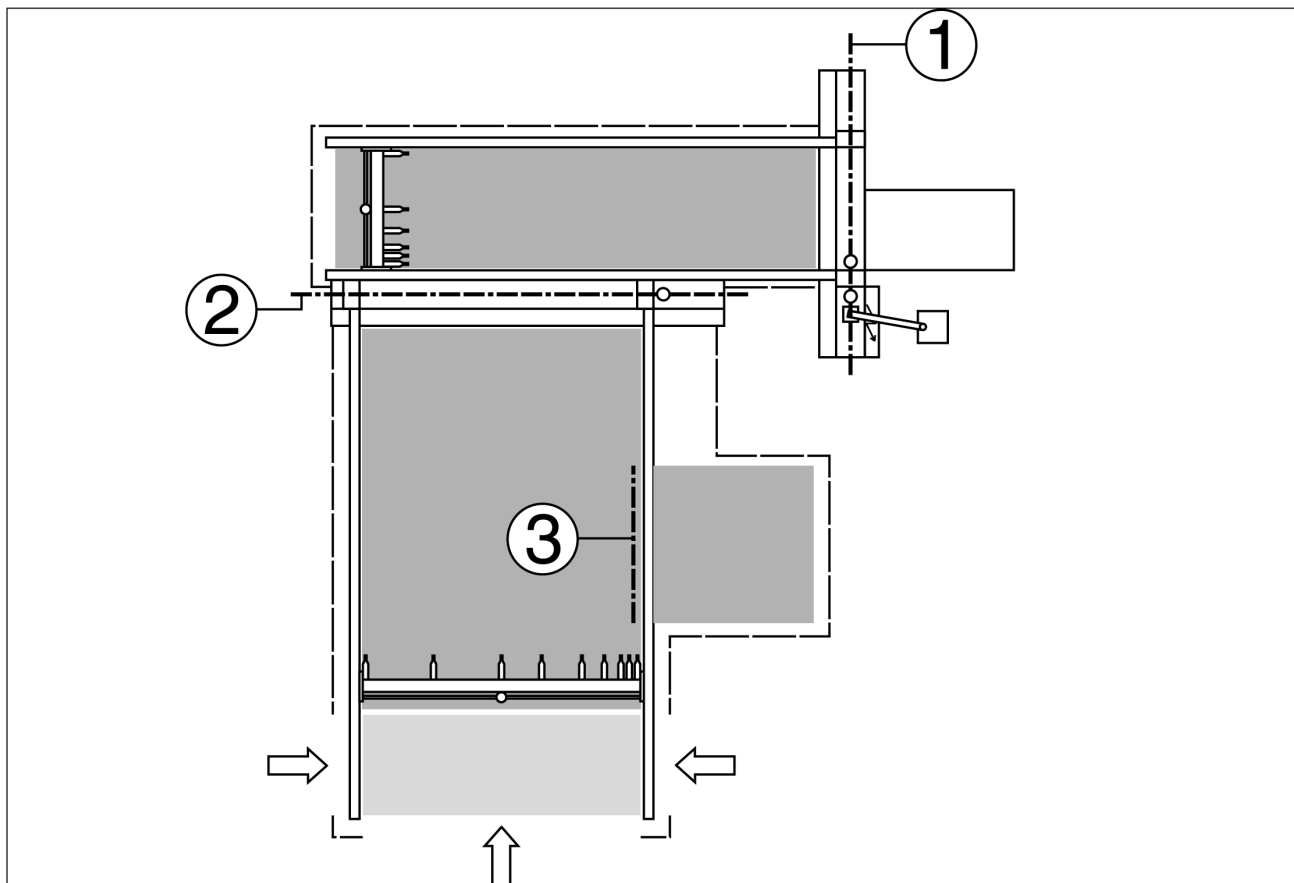


Figure 1 c) — Example of a horizontal beam panel saw with panel loading from the front and with individual safeguarding of hazardous points

Figure 1 — Examples of horizontal beam panel saws



Key

- 1 front cutting line
- 2 longitudinal cutting line
- 3 head cutting line

Figure 2 — Horizontal beam panel saw cutting lines

3.2

integrated feed

feed mechanism for the workpiece and the saw unit(s) incorporating the saw blade(s) which are integrated with the machine and where the workpiece and the saw unit(s) are held and controlled mechanically during the machining operation

3.3

manual loading

where the operator puts the workpiece on the workpiece support from the front side of the machine i.e. there is no intermediate loading device to transfer the workpiece from the operator to the machine front cutting line

3.4

manual unloading

where the operator removes the workpiece from the workpiece support i.e. there is no intermediate unloading device to transfer the workpiece from the cutting position to the operator within 1 500 mm

3.5

powered loading

where the workpiece(s) is / are put on the workpiece support by e.g. a lifting unit or a loading device, normally a lifting platform

3.6

powered unloading

where the workpiece is taken by an unloading device from the extension workpiece support and the distance between the front cutting line and the operator's position exceeds 1 500 mm

3.7

saw unit

supporting unit of the saw blade(s), which performs the cutting stroke

3.8

main saw blade

circular saw blade which is used for separating the workpiece

3.9

scoring

making of a shallow cut in the surface of a workpiece, deep enough to pass through any veneer or plastic facing on the workpiece so as to prevent surface damage when the main saw blade makes its cut

3.10

scoring saw blade

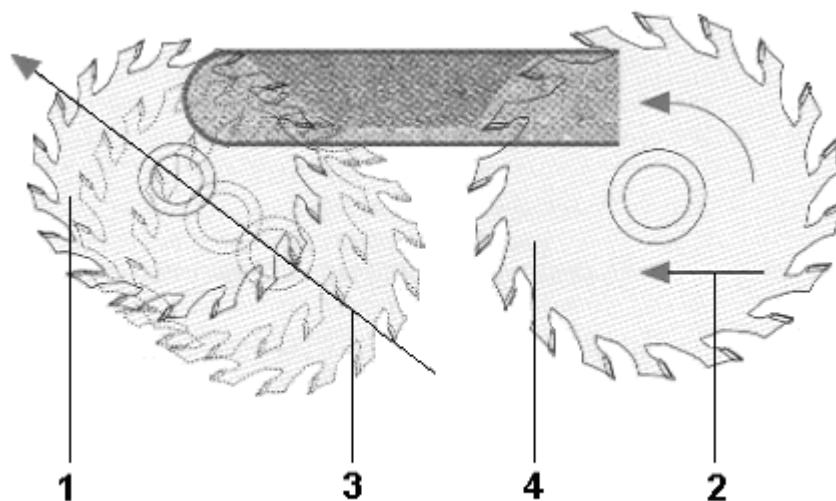
saw blade mounted in front of the main saw blade which is used for scoring

3.11

post-formed / soft-formed edge pre-cutting

cut made by a separate saw blade in the front profiled edge of the workpiece deep enough to prevent surface damage when the main saw blade makes its cut (see Figure 3)





Key

- 1 post-formed / soft-formed edge pre-cutting saw blade
- 2 feed direction of the saw unit
- 3 movement of post-formed / soft-formed edge pre-cutting saw blade
- 4 main saw blade

Figure 3 — Post-formed / soft-formed edge pre-cutting

3.12

post-formed / soft-formed edge pre-cutting saw blade

saw blade used for post-formed edge pre-cutting. This may be the scoring saw blade or a separate saw blade specifically for this purpose

3.13

saw blade rest position

position to which the saw blade(s) return(s) at the end of the cut outside the cutting area i.e. into a position below the workpiece support or together with the saw unit into a position outside the cutting area also with protruding saw blade(s)

3.14

saw unit rest position

position to which the saw unit returns at the end of each cutting cycle

3.15

pressure beam rest position

position to which the pressure beam returns after the saw blade(s) has/have reached its/their rest position

3.16

cutting cycle

movements of the saw unit incorporating the saw blade during the machining operation comprising:

- movement of the saw blade from its rest position to the cutting position;
- movement of the saw unit from its cutting position through the cutting stroke;

- return movement of the saw blade to its rest position;
- return movement of the saw unit to the chosen rest position

3.17**front cutting line**

cutting line closest to the operator's position (see Figure 2)

3.18**longitudinal cutting line**

additional cutting line(s) inside the machine (see Figure 2)

3.19**head cutting line**

first cutting line to divide a panel before further cuts (see Figure 2)

3.20**pressure beam**

workpiece clamping device which extends across the full working width of the machine. Its function is to hold the workpiece down to the workpiece support during cutting. It is also part of the safeguarding of the saw blade(s) in the cutting area

3.21**panel pusher**

movable workpiece guiding device which is used to position the workpiece over the line of cut. The positioning of the panel pusher may be under NC control. The panel pusher is fitted with holding devices e.g. collets for holding the workpiece in position

3.22**side pressure device**

power operated movable workpiece guiding device positioned inside the sectional safety curtain used to push the workpiece against the fence for right-angled cuts

3.23**panel turning device**

device integrated into the rear or front workpiece support which, after moving out of the workpiece support turns the panel e.g. after the first cut for 90° to machine at right-angled cut

3.24**pushing out device**

device which after moving or tilting from a rest position down to the workpiece support moves last part / small parts of a panel in front of the pressure beam for easy take off by the operator

3.25**powered panel loading device**

device where the panel stack is put e.g. by a fork-lift truck or by a lifting unit either direct to a lifting platform or to a powered roller table(s) which feed(s) the stack to the lifting table. The lifting platform moves the uppermost panel or the required number of panels into a position which enables the panel pusher to bring the panel(s) into the cutting position. The lifting platform itself can be fitted with an own panel pusher. The control circuits of the loading device are connected to the control circuits of the machine

3.26**machine actuator**

power mechanism used to effect motion of the machine

3.27**run-down time**

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



3.28

information from the supplier

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

3.29

safety related electrical control system (SRECS)

electrical part of a control system whose failure can result in a hazard (3.2.4 of EN 62061:2005)

3.30

safety related part of a control system (SRP(CS))

part or subpart(s) of a control system that responds to input signals and generates safety-related output signals.

The combined safety-related parts of a control system start at the point where the safety-related signals are initiated (including e.g. the actuating cam and the roller of the position switch) and end at the output of the power control elements (including e.g. the main contacts of the contactor). This also includes monitoring systems (3.1 of EN ISO 13849-1:2006)

3.31

embedded software

software that is part of the system supplied by the manufacturer and is not accessible for modification by the end user

NOTE 1 Embedded software is also referred to as firmware or system software (see 3.2.47 of EN 62061:2005).

NOTE 2 Manufacturer means manufacturer of the system.

NOTE 3 For example the operating system of a speed monitoring device.

3.32

application software

sequences, limits and expressions that control the appropriate outputs, decisions necessary to meet SRECS functional requirements (see 3.2.46 of EN 62061:2005)

NOTE For example the SRECS program to run a machine.

4 List of significant hazards

This clause contains the significant hazards, hazardous situations and events (see EN 1050:1996) as far as they are dealt with in this document, 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 in accordance with Annex A of EN 1050:1996.



Table 1 — List of significant hazards

No	Hazards, hazardous situations and hazardous events	EN ISO 12100		Relevant clause of this document
		Part 1:2003	Part 2:2003	
1	Mechanical hazards related to: - machine parts or workpieces due to:			
	a) shape;	4.2	4.2.1, 4.2.2, 5	5.2.2, 5.3.3, 5.3.5, 5.3.6, 6.2, 6.3, Annex C
	b) relative location;			5.2.2, 5.2.3, 5.2.6, 5.3.6, 6.2
	c) mass and stability (potential energy of elements which may move under the effect of gravity);			5.2.6, 5.2.8
	d) mass and velocity (kinetic energy of elements in controlled or uncontrolled motion);			5.2.3, 5.2.6, 5.3.5, 5.3.6
	e) mechanical strength;			5.3.2, Annex B, Annex D
	- accumulation of energy inside the machinery by:			
	f) gases under pressure;	4.2	4.10, 5.5.4	5.4.6
1.1	Crushing hazard	4.2.1		5.2.3, 5.2.4, 5.2.6, 5.3.4, 5.3.5, 5.3.6, 5.3.7, 5.4.11, 5.4.12
1.2	Shearing hazard			5.2.3, 5.2.4, 5.3.4, 5.3.5, 5.3.6, 5.3.7, 5.4.11, 5.4.12
1.3	Cutting or severing hazard			5.2.3, 5.2.4, 5.2.5, 5.2.6, 5.3.4, 5.3.6, 5.3.7, 5.4.11, 5.4.12
1.4	Entanglement hazard			5.2.4, 5.2.5, 5.3.6, 5.3.7, 5.4.11, 5.4.12
1.5	Drawing-in or trapping hazard			5.2.3, 5.2.4, 5.2.5, 5.3.4, 5.3.6, 5.3.7, 5.4, 11, 5.4.12
1.6	Impact hazard			5.2.3, 5.3.5, 5.4.11
1.9	High pressure fluid injection or ejection hazard			5.2.4, 5.3.5, 5.4.7, 5.4.11



Table 1 — List of significant hazards (continued)

2	Electrical hazards due to:			
2.1	Contact of persons with live parts (direct contact)	4.3	4.9, 5.5.4	5.4.4, 5.4.11
2.2	Contact of persons with parts which have become live under faulty conditions (indirect contact)	4.3	4.9	5.4.4, 5.4.11
2.4	Electrostatic phenomena	4.3	4.9	5.4.8
4	Hazards generated by noise , resulting in:			
4.1	Hearing loss (deafness), other physiological disorders (loss of balance, loss of awareness)	4.5	4.2.2, 5	5.4.2
4.2	Interference with speech communication, acoustic signals			6.3
6	Hazards generated by radiation			
6.5	Laser	4.7		5.4.10
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	4.8	4.3b, 4.4	5.4.3, 6.3
7.2	Fire	4.8	4.4	5.4.1
8	Hazards generated by neglecting ergonomic principles in machinery design:			
8.1	Unhealthy postures or excessive effort	4.9	4.7, 4.8.2, 4.11.12, 5.5.5, 5.5.6	5.2.2, 5.4.5
8.2	Hand-arm or foot-leg anatomy	4.9	4.8.3	5.4.5
8.4	Local lighting		4.8.6	6.3
8.5	Mental overload and underload, stress	4.9	4.8.5	6.3
8.6	Human error, human behaviour	4.9	4.8, 4.11.8, 4.11.10, 5.5.2, 6	6.3
8.7	Design, location or identification of manual controls		4.8.7, 4.11.8	5.2.2
8.8	Design or location of visual display units		4.8.8, 6.2	5.2.2
9	Combination of hazards	4.11		5.2.3, 5.2.5, 5.2.6, 5.2.7, 5.2.9, 5.3.6, 5.4.11, 5.4.12
10	Unexpected start-up, unexpected overrun/overspeed (or any similar malfunction) from:			
10.1	Failure / disorder of the control system		4.11, 5.5.4	5.2.1, 5.2.9, 5.4.11
10.2	Restoration of energy supply after an interruption		4.11.4	5.2.8, 5.4.6
10.3	External influences on electrical equipment		4.11.11	5.4.7, Annex F
10.4	Other external influences (gravity)			5.3.5
10.5	Errors in the software		4.11.7	Annex F
10.6	Errors made by the operator (due to mismatch of machinery with human characteristics and abilities, see 8.6)	4.9	4.8, 4.11.8, 4.11.10, 5.5.2, 6	6.3
(to be continued)				

Table 1 — List of significant hazards (*concluded*)

No	Hazards, hazardous situations and hazardous events	EN ISO 12100		Relevant clause of this document
		Part 1: 2003	Part 2: 2003	
11	Impossibility of stopping the machine in the best possible conditions		4.11.1, 4.11.3, 5.5.2	5.2.4, 5.2.5, 5.4.11
12	Variations in the rotational speed of tools		4.2.2, 4.3	5.2.7
13	Failure of the power supply		4.11.1, 4.11.4	5.2.8
14	Failure of the control circuit		4.11, 5.5.4	5.2.9
15	Errors of fitting	4.9	4.7, 6.5	5.4.9
16	Break-up during operation	4.2.2	4.3	5.3.2
17	Falling or ejected objects or fluids	4.2.2	4.3, 4.10	5.2.6, 6.3
18	Loss of stability / overturning of machinery	4.2.2	5.2.6	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 Clauses 5 and 6.

NOTE 1 In addition, the machine should be designed according to the principles of EN ISO 12100-1:2003 and EN ISO 12100-2:2003 for hazards relevant but not significant, which are not dealt with by this document (e.g. sharp edges of the machine frame).

NOTE 2 For guidance in connection with risk reduction by design see Clause 4 of EN ISO 12100-2:2003 and for safeguarding measures see Clause 5 of EN ISO 12100-2:2003.

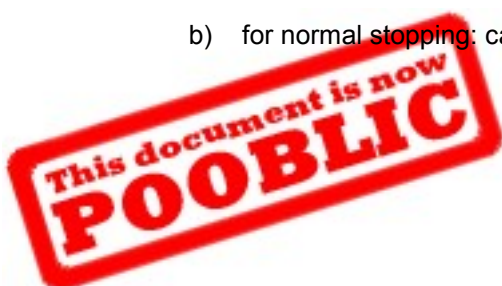
5.2 Controls

5.2.1 Safety and reliability of control systems

5.2.1.1 General

For the purpose of this document safety related part of a 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. Safety related parts of the control system of this machine comprise parts concerning the following functions and they shall fulfil the requirements of the categories given below according to EN ISO 13849-1:2006:

- a) for starting and restarting and for prevention of unexpected start-up after failure of power supply: category 1 or 3 (see 5.2.3, 5.2.8);
- b) for normal stopping: category 1 or 3 (see 5.2.4);



- c) for emergency stop: category 1 or 3 (see 5.2.5);
- d) for interlocking of guards: category 1 or 3 (see 5.3.6, 5.3.7);
- e) interlocking with guard locking: category 1 or 3 (see 5.3.6, 5.3.7);
- f) for interlocking of functions: category B, 1 or 3 (see 5.2.3, 5.2.4, 5.2.6, 5.3.6.3, 5.3.6.6, 5.3.6.7)
- g) for spindle speed indication of the selected speed (if spindle speed changing is provided): category B (see 5.2.7);
- h) for interlocking the pressure beam movement with safety curtain guarding position: category 1 or 3 (see 5.2.6);
- i) for trip devices: category 1, 2 or 3 (see 5.3.6.3, 5.3.6.4, 5.3.6.8);
- j) for pressure beam control: category 1 or 3 (see 5.2.6);
- k) for the control system for controlling reduced speed of panel pusher movement towards the operator: category 2 (see 5.3.5, 5.3.6.4);
- l) for reset functions: category 1 or 3 (see 5.3.6.4, 5.3.6.8);
- m) for monitoring of the clamping position and / or pressure of the pressure beam: category B (see 5.2.6);
- n) for braking: category B, 1 or 2 (see 5.3.4).

NOTE 1 Where more than one category is given further information about the necessary type is specified in the quoted clauses.

Where category B is required all categories fulfil the requirements and where category 1 is required categories 3 and 4 also fulfil the requirement. Where category 2 is required categories 3 and 4 also fulfil the requirement, where category 3 is required category 4 also fulfils the requirement.

NOTE 2 6.3 of EN ISO 13849-1:2006 gives useful information on combination of safety-related parts to the same or different categories.

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

5.2.1.2 Use of well tried components

Where for safety related parts of control circuits category 1 according to EN ISO 13849-1:2006 is required, at least well tried components shall be used.

Components are considered well tried if they comply with 6.2.4 of EN ISO 13849-1:2006 (see also informative Annex A).

NOTE 1 The list of well tried electrical components is given in Table D.4 of EN ISO 13849-2:2003.

NOTE 2 EN 13849-2:2003 gives useful information on assessment of well-tried components, possible exclusion of faults etc.

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

5.2.1.3 Use of electronic components

If electronic components are used the requirements given in Annex F shall be met.



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

5.2.2 Position of controls

The following electrical controls of the machine shall be positioned together on the main control panel, located at the front side of the machine such that the working area is visible from this position by the operator:

- for starting and stopping the cutting cycle;
- for normal stopping;
- for the movement of the panel pusher
- for saw spindle speed changing (if fitted),
- for the side pressure (where fitted);
- the pushing out device (where fitted).

Emergency stop control devices shall be provided at the following positions:

- a) on the main control panel and any auxiliary control panels;
- b) at each side of any loading/unloading openings, unless a main control panel or auxiliary control panel is situated at this position.

All hand-operated electrical controls shall be positioned between 600 mm and 1 800 mm above the floor level.

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

5.2.3 Starting

5.2.3.1 General

Giving power to the actuator starting any movement of the machine shall only be possible if all interlocked guards and / or interlocked guards with guard locking are in place and functional. This is achieved by the interlocking arrangements described in 5.3.6 and 5.3.7. Start or restart shall only be possible by actuation of the start control device provided for that purpose.

For electrically operated machines the requirements of 9.2.5.2 of EN 60204-1:2006 apply but the exceptions described in 9.2.5.2 of EN 60204-1:2006 are not relevant, and "operation" means rotation of the tool spindle(s) and / or integrated feed movements;

The category of the control circuits (also see 5.2.1) for starting except cutting cycle start shall be in accordance with the requirements of EN ISO 13849-1:2006 and at least:

- a) category 1 if the control circuits are hardwired;
- b) category 3 if the control circuits include electronic components.

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



5.2.3.2 Cutting sequence

The following requirements apply only for the front cutting line for machines manually loaded / unloaded.

The cutting cycle for each cut shall only be possible if the panel pusher(s) used for positioning the panel being cut is / are not capable of forward movement towards the pressure beam during the cutting stroke.

The initiation of a cutting cycle shall only be possible if the following conditions in sequence are met:

- a) the support of the sectional safety curtain shall have reached its guarding position (see 5.3.6.2);
- b) the saw blade(s) shall have reached its / their cutting position and be running at the intended speed before the feed movement of the saw unit(s) starts (see 5.3.6.5);
- c) before the saw blade(s) come(s) in contact with the workpiece(s) it shall be insured that the following sequence of conditions are met, e.g. by means of a time delay device:
 - 1) The side pressure device (if fitted and in use in the cycle) shall move to its pressing position against the fence;
 - 2) the pressure beam shall move to its clamping position (see also 5.2.6);
 - 3) the workpiece guiding part of the side pressure device (if fitted to the saw unit and in use during the cycle) shall not be in contact with the workpiece.

The initiation of the return stroke of the saw unit(s) if any, the release of the clamping pressure of the pressure beam and the opening of the safety curtain shall only be possible when the saw blade(s) have been retracted in their rest position.

Saw blade(s) shall remain in its/their rest position along the cutting line during return stroke.

The category of the control circuits (also see 5.2.1) for the interlocking arrangements for the cutting cycle shall be in accordance with the requirements of EN ISO 13849-1:2006 and at least:

- i) category 1 if the control circuits are hardwired;
- ii) category 3 if the control circuits include electronic components.

The category of the control circuits for panel pusher(s) movement(s) shall be in accordance with the requirements of EN ISO 13849-1:2006 and at least category B.

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

5.2.4 Normal stopping

The machine shall be fitted with a stop control which, when actuated shall disconnect power from all the machine actuators except to clamping device (if provided) and actuate the brake(s) (if provided – see 5.3.4).

The normal stop control shall be a category 1 stop in accordance with the requirements of 9.2.2 of EN 60204-1:2006.

The category 1 stopping sequence shall be applied in the following order whereby the stopping of a), b) and e) may be initiated simultaneously:

- a) stop any saw unit traversing movement and retract the saw blade(s) to its/their rest position;

- b) cut power to the saw blade(s) spindle drive motor(s), actuate the brake(s) (if provided – see 5.3.4), release clamping pressure of the pressure beam(s);
- c) return pressure beam(s) to its/their rest position;
- d) cut power to the brake(s) (if electrical and if provided) after the saw blade(s) has come to rest e.g. by a time delay of fail safe technique e.g. of capacity type or conforming to the requirements of category 3 according to EN ISO 13849-1:2006;
- e) cut power to the other machine actuators except to clamping device (if fitted).

The design of the control circuits shall be such as to satisfy the normal stopping sequence. If a time delay device is used the time delay shall be at least the maximum braked run-down time. Either the time delay shall be fixed or the time delay adjustment device shall be sealed.

The category of the control circuits (also see 5.2.1) for normal stopping shall be in accordance with the requirements of EN ISO 13849-1:2006 and at least:

- i) category 1 if the control circuits are hardwired;
- ii) category 3 if the control circuits include electronic components.

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

5.2.5 Emergency stop

The requirements of EN ISO 13850:2006 apply and in addition:

The machine shall be fitted with emergency stop control devices positioned in accordance with the requirements of 5.2.2 which, when actuated shall disconnect power from all the machine actuators except clamping devices (if fitted) and actuate the brake(s) (if provided).

The emergency stop control shall be a category 1 stop in accordance with the requirements in 4.1.4 of EN ISO 13850:2006 and in accordance with the requirements in 10.7 of EN 60204-1:2006. The emergency stop control device shall be at any time of self latching type.

The emergency stop control circuit shall conform to category 1 in accordance with the requirements of 9.2.5.4.2 of EN 60204-1:2006. The stopping sequence shall be applied in the following order whereby the stopping of a), b) and e) may be initiated simultaneously:

- a) stop any saw unit(s) feed traversing movement and retract the saw blade(s) to its / their rest position;
- b) cut power to the saw blade spindle drive motor(s), actuate the brake(s) (if provided – see 5.3.4), release clamping pressure of the pressure beam(s);
- c) return the pressure beam(s) to its / their rest position;
- d) cut power to the brake(s) (if electrical and if provided) after the saw blade(s) has come to rest e.g. by a time delay of fail safe technique e.g. of capacity type or conforming to the requirements of category 3 according to EN ISO 13849-1:2006;
- e) cut power to the other machine actuators except to clamping device (if fitted).

The design of the control circuits shall be such as to satisfy the emergency stopping sequence. If a time delay device is used the time delay shall be at least the maximum braked run-down time. Either the time delay shall be fixed or the time delay adjustment device shall be sealed.



The category of the control circuits (also see 5.2.1) for the emergency stops shall be in accordance with the requirements of EN ISO 13849-1:2006 and at least:

- i) category 1 if the control circuits are hardwired;
- ii) category 3 if the control circuits include electronic components.

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

5.2.6 Pressure beam control

Any pressure beam shall be in accordance with the following requirements:

- a) pressure beam position and / or the clamping pressure shall be monitored;
- b) the backward movement to its rest position shall not start before the saw blade(s) have reached its(their) rest position;
- c) it shall remain in its rest position even when power is lost to its actuators. On pneumatic systems, where non-return valves are used to achieve this requirement, these valves shall be fitted at the actuating cylinders (see also 5.2.8).

The category of the control circuits (also see 5.2.1) for the interlocking arrangements shall be in accordance with the requirements of EN ISO 13849-1:2006 and at least:

- i) category 1 if the control circuits are hardwired;
- ii) category 3 if the control circuits include electronic components.

As an exception the category of the control circuits for the interlocking arrangements related to pressure beams for cutting lines other than front cutting line on machines manually loaded and / or unloaded may be at least category B in accordance with the requirements of EN ISO 13849-1:2006.

The category of the control circuit for monitoring the clamping position and / or pressure of pressure beam (see 5.2.1) shall be at least category B in accordance with the requirements of EN ISO 13849-1:2006.

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

5.2.7 Speed changing

Where a machine is designed to operate at more than one main saw spindle speed the selected speed shall be indicated at the operator's position at least during speed setting.

The category of the control circuits (also see 5.2.1) for the indication of the selected speed shall be at least category B in accordance with the requirements of EN ISO 13849-1:2006.

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

5.2.8 Failure of the power supply

The restoration of the energy supply after a supply interruption shall not result in a restart of any machine actuator in accordance with EN 1037:1995. For electrically driven machines this is achieved e.g. by providing an under voltage protection at a predetermined under voltage level in accordance with the requirements in 7.5, paragraphs 1 and 3 of EN 60204-1:2006.

If the clamping pressure of the pressure beam is applied by pneumatic pressure, provision shall be made to maintain position in the event of pneumatic power failure. Where non-return valves are used to meet this requirement, they shall be fitted to the actuating cylinders in accordance with EN 983:1996.

The category of the control circuits (also see 5.2.1) for prevention of unexpected start-up after failure of power supply shall be in accordance with the requirements of EN ISO 13849-1:2006 and at least:

- a) category 1 if the control circuits are hardwired;
- b) category 3 if the control circuits include electronic components.

The category of the control circuit (also see 5.2.1) for maintaining clamping pressure of the pressure beam shall be at least category B in accordance with the requirements of EN ISO 13849-1:2006.

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

5.2.9 Failure of the control circuits

The requirements of Clause 6 of EN 1037:1995 apply and in addition:

The control circuits shall be designed so that a line rupture in any circuit (e.g. broken wire, pipe or hose) will in accordance with EN 60204-1:2006 and EN 983:1996 not result in the loss of a safety function e.g. involuntary start of dangerous movements e.g. saw blade rotation, saw unit movement, panel pusher movement or loss of pressure beam clamping.

For requirements for the control circuits see 5.2.1.

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

5.3 Protection against mechanical hazards

5.3.1 Stability

The machine shall be fitted with facilities for fixing it to a suitable stable structure e.g. floor. Facilities for fixing are e.g. fixing holes or the necessary fixing devices in the machine frame (also see 6.3).

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

5.3.2 Hazard resulting from break-up during operation

To avoid hazards of break-up during operation the guards for the saw blade(s) shall be manufactured from materials with at least the following properties:

- a) steel with an ultimate breaking strength of at least 350 N mm^{-2} and a wall thickness of at least 1,5 mm;
- b) light alloy with characteristics in accordance with Table 2;



Table 2 — Characteristics of light alloy blades guards

Ultimate tensile strength N mm ⁻²	Minimum thickness mm
60	7
120	6
180	5
240	4
300	3

- c) polycarbonate with a wall thickness of at least 3 mm or other plastic material (e.g. polyethylene, polyester, polyvinylchloride, polymethylmetacrylate) having an impact resistance equal to or better than that of polycarbonate of 3 mm thickness;
- d) cast iron with an ultimate tensile strength of at least 200 N mm⁻² and a wall thickness of at least 5 mm.

Verification: By checking the relevant drawings, performing the test described in Annex B for plastic materials not conforming to c), measurement 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 Geometrical performance

Saw spindles shall be manufactured in accordance with the tolerances given in Annex C.

If the machine is fitted with saw blade(s) they shall be in accordance with the requirements of EN 847-1:2005.

Verification: By checking the relevant drawings and by measurement.

5.3.3.2 Spindle locking

When it is necessary to hold the spindle stationary for tool changing, a spindle holding/blocking device shall be provided e.g. a double spanner arrangement or an integral locking bar inserted through the spindle. When a blocking device is used it shall prevent tool spindle rotation and shall not be deformed after starting the spindle drive motor, with the blocking device in place.

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

5.3.3.3 Saw blade fixing device

For the fixing of the saw blade(s) saw flanges 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 3 mm in width and recessed to the centre.

Precautions shall be taken to ensure that the tool does not come loose during start up, running, during rundown or during braking, e.g. by using a positive connection between the spindle and the tool, or by using a positive connection between the front saw flange and the saw spindle.

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

5.3.4 Braking

An automatic brake shall be provided for the saw spindle(s) where the un-braked run-down time exceeds 90 s. The braked run-down time shall be less than 90 s.

NOTE In the case of failure of power supply this run-down time may be exceeded.

The braking torque shall not be applied directly to the tool itself or the saw blade flanges.

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

Where a spring operated mechanical brake is fitted the last paragraph of 9.3.4 of EN 60204-1:2006 does not apply and the following requirements shall be met:

- a) If release of the brake is fitted it shall not be possible to release the brake until the saw spindle(s) has/have come to a complete stop (e.g. by a time delay of fail safe technique e.g. of capacity type or conforming to the requirements of category 3 according to EN ISO 13849-1:2006 between control actuation and brake release);
- b) the category of the control circuits (also see 5.2.1) for the interlocking function shall be category 1 in accordance with the requirements of EN ISO 13849-1:2006.

Where an electrical braking system is used and contains electronic components the control system for braking shall be at least in accordance with the requirements of category 2 of EN ISO 13849-1:2006. The control system shall be tested periodically e.g. by monitoring the braked run down time or by monitoring the braking current circuit during starting (short braking). The test shall:

- i) be independent from the basic control system for braking;
- ii) be independent from the intention of the operator;
- iii) be performed at least once within every 8 h of machine running.

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.

As an exception to the above requirements and 5.2.1 a simple electronic brake may be designed in category B in accordance with EN ISO 13849-1:2006 if the probability of a failure in high demand is less than $3 \times 10^{-6} \text{ h}^{-1}$. In this case the brake control system shall not be controlled by a PLC.

For calculating the probability of a dangerous failure in high demand for a simple electronic brake component with no fault tolerance and no testing capability (category B) the procedure described in Annex D of EN ISO 13849-1:2006 shall be used.

Verification: By checking the relevant drawings and / or circuit diagrams and inspection of the machine. For the determination of un-braked run-down time and braked run-down time, if relevant, see the appropriate tests described in Annex E.

5.3.5 Workpiece supports and guides

A workpiece support shall be provided at the front of the machine which shall have a width of at least 200 mm, measured at right angle to the front cutting saw line.

Any workpiece supporting structure which is capable of being contacted by the saw blade shall be made from a material which is easily cut by the saw blade in the event of contact between the saw blade and the workpiece support, e.g. light alloy, plastic.



At the front side of the machine an extension table or tables shall be fitted to provide support for workpieces which can be cut by the machine.

This is achieved by:

- a) one fixed extension table fitted over the whole length of the cutting line; or
- b) one fixed extension table fitted adjacent to the fence; and one or more fixed or moveable extension tables.

The length of each extension table (dimension perpendicular to the front cutting saw line) shall be at least 1,35 m and the width shall be at least 0,5 m.

Moveable extension tables shall be so constructed as to allow them to be moved along the cutting length of the machine.

The speed of movement of the panel pushers and of the movement of the pushing out device shall not exceed 25 m min^{-1} in the direction of the operator. This limitation doesn't apply when there is no interference between components parts of the panel pusher and maximum stack height.

In addition the following measures against change or falsification of data shall be taken:

- i) measures against loss of the data for the selected speed stored in the machine control if stored data result in an automatic selection of the intended panel pusher or pushing out device's speed:
 - the safety related data for the panel pusher and / or pushing out device shall be stored either in 2 independent memory chips or stored two times in one single chip (one time inverse);
 - after input of the safety related data for the panel pusher and / or pushing out device the data shall be confirmed;
 - the two data shall be compared at each switching on of the isolator and at each fetch of the data. If the two data are not identical it shall be impossible to start the panel pusher and / or pushing out device movements or if running the movement(s) shall be stopped and a warning shall be given;
 - for monitoring of failures the processor comparing the data shall have an external watch dog function;
- ii) measures against falsification in data transfer between manual control, data stored in the machine control, display for the data and control of the inverter e.g.:
 - the selected panel pusher and / or pushing out device speed shall be stored in the control system for the speed change;
 - the selected panel pusher and / or pushing out device speed transmitted to the control of the inverter shall be read back and monitored on the display for checking by the operator. In case where the speed signals differ the start-up of the movement shall be prevented.

NOTE For movement of the side pressure (if fitted) toward the fence see 5.3.6.5.

If the control system for monitoring the reduced speed of the panel pusher movement towards the operator and of the pushing out device movement (if fitted) includes electronic components this control system shall be category 2 or 3 in accordance with the requirements of EN ISO 13849-1:2006. If category 2 is used the control system shall be tested at least at each initial start or at each 8 h of run of the machine. 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.

See also 6.3 d).

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

5.3.6 Prevention of access to moving parts

5.3.6.1 Safeguarding of the saw blade(s) outside the cutting area

Access to the saw blade(s) outside the cutting area i.e. when the saw unit(s) is / are in the rest position or in the saw blade(s) changing position shall be prevented by fixed guards. Any gaps in these guards shall be designed in accordance with safety distances in 4.5.1 of EN 294:1992.

Where access to the saw blade(s) is required for maintenance and servicing e.g. for saw blade changing, then the fixed guard shall incorporate either:

- a) on machines where the run-down time of the saw blade(s) does not exceed 10 s a moveable interlocked guard; or
- b) on machines where the run-down time of the saw blade(s) exceeds 10 s a moveable interlocked guard with spring applied/power released guard locking device in accordance with Annex M of EN 1088:1995.

Any powered movement required for saw blade changing shall only be possible with the relevant moveable guards closed with the exception that this movement can start simultaneously with the opening of the moveable guard if:

- i) no crushing and shearing hazards caused by the movement exist and
- ii) the maximum time for the movement is less than 1 s. The control circuit for monitoring the maximum time shall be at least category B in accordance with the requirements of EN ISO 13849-1:2006.

A supply interruption shall not lead to any dangerous movement e.g. returning of the saw blade to its rest position when the moveable guard is open.

The category of the control circuits (also see 5.2.1) for the interlocking and interlocking with guard locking shall be in accordance with the requirements of EN ISO 13849-1:2006 and at least:

- category 1 if the control circuits are hardwired;
- category 3 if the control circuits include electronic components.

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

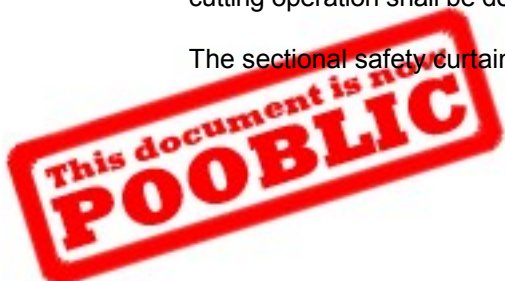
5.3.6.2 Safeguarding of the saw blade(s) in the cutting area

For front cutting line access to the saw blade(s) in the cutting area from the operator side of the machine shall be prevented by a deterring impeding device in the form of a sectional safety curtain consisting of individual stripes. On machines where access is possible to the cutting area from the rear side of the pressure beam, a second sectional safety curtain shall also be fitted at the rear side of the pressure beam.

NOTE Access to the saw blade(s) from above the sectional safety curtain(s) is prevented by the pressure beam.

Any gaps in the guarding and the slot in the machine table through which the saw blade(s) projects during the cutting operation shall be designed in accordance with the safety distances in 4.5.1 of EN 294:1992.

The sectional safety curtain shall meet the following requirements:



- a) It shall be fitted next to the pressure beam;
- b) it shall cover the full cutting width of the machine;
- c) the maximum effective width of each stripe shall not exceed 50 mm;
- d) it shall have reached its guarding position before the downward movement of the pressure beam starts;
- e) in its closed position the lower edge of the individual stripes shall be able to lie on the workpiece or on the workpiece support where no workpiece is present irrespective of the position of the pressure beam (see Figure 4);

Dimensions in millimetres

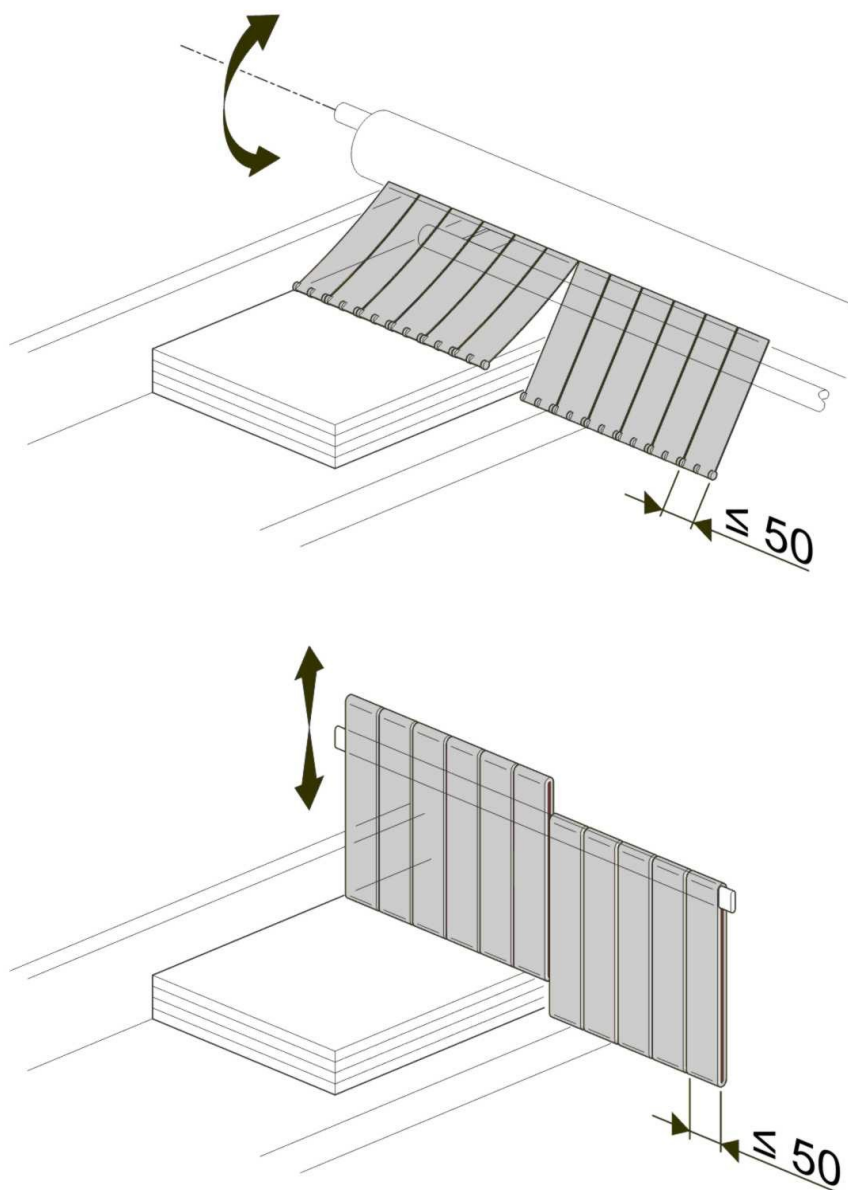


Figure 4 — Safety curtain

- f) the stripes shall fulfil the rigidity test requirement described in Annex D.

The category of the control circuits (also see 5.2.1) for interlocking the closure movement of the safety curtain with the pressure beam movement shall be in accordance with the requirements of EN ISO 13849-1:2006 and at least:

- i) category 1 if the control circuits are hardwired;
- ii) category 3 if the control circuits include electronic components.

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

5.3.6.3 Safeguarding of the pressure beam

Access to the crushing and trapping zone between the downward moving pressure beam and the workpiece support and / or the workpiece shall be avoided by providing a mechanically actuated trip device (trip bar) on the operator side of the machine. Possible positions of the trip bar sensor are shown in Figure 5. On machines where access from the rear side of the machine to the pressure beam is not prevented by the safeguarding of the rear side of the machine (see 5.3.6.4), a second mechanically actuated trip device (trip bar) shall also be fitted at the rear side of the pressure beam.

The mechanically actuated trip device (trip bar) shall be in accordance with the following requirements:

- a) it shall extend at least over the full length of the pressure beam;
- b) when its sensor is activated the downward movement of the pressure beam shall reverse before the distance between the lower part of the pressure beam and the workpiece support (see Figure 5) is less than 12 mm.

Verification: Depending on the chosen position of the trip bar sensor a distance block with the height of

- 26 mm if the sensor position 1 a) (see Figure 5) is chosen; or
- 30 mm if the sensor position 1 b) is chosen; or
- 36 mm if the sensor position 1 c) is chosen

shall be positioned so that it activates the trip bar sensor in the middle of its length. The downward movement of the pressure beam with its maximum speed is initiated and the distance measured after the trip bar has reached its rest position with a measuring equipment with an accuracy of at least $\pm 0,5$ mm. The test shall be repeated with the distance block at the left and at the right end of the sensor. In not any of the 3 tests the measured distance shall be less than 12 mm.

- c) its dimensions shall be in accordance with Figure 5;
- d) when operated, it shall cause first the saw unit to retract beneath the workpiece support and second the return of the pressure beam to the rest position;
- e) the force to actuate the trip bar(s) shall not exceed 50 N wherever applied over the full length of it;

The category of the control circuits (also see 5.2.1) for trip bar action shall be in accordance with the requirements of EN ISO 13849-1:2006 and at least:

- i) category 1 if the control circuits are hardwired;



- ii) category 3 if the control circuits include electronic components.

When the pressure beam is in its rest position access to the crushing and trapping zone between its rear bottom edge and the top front edge of the panel pusher or of the collets during forward movement of the panel pusher or of the collets shall be prevented either:

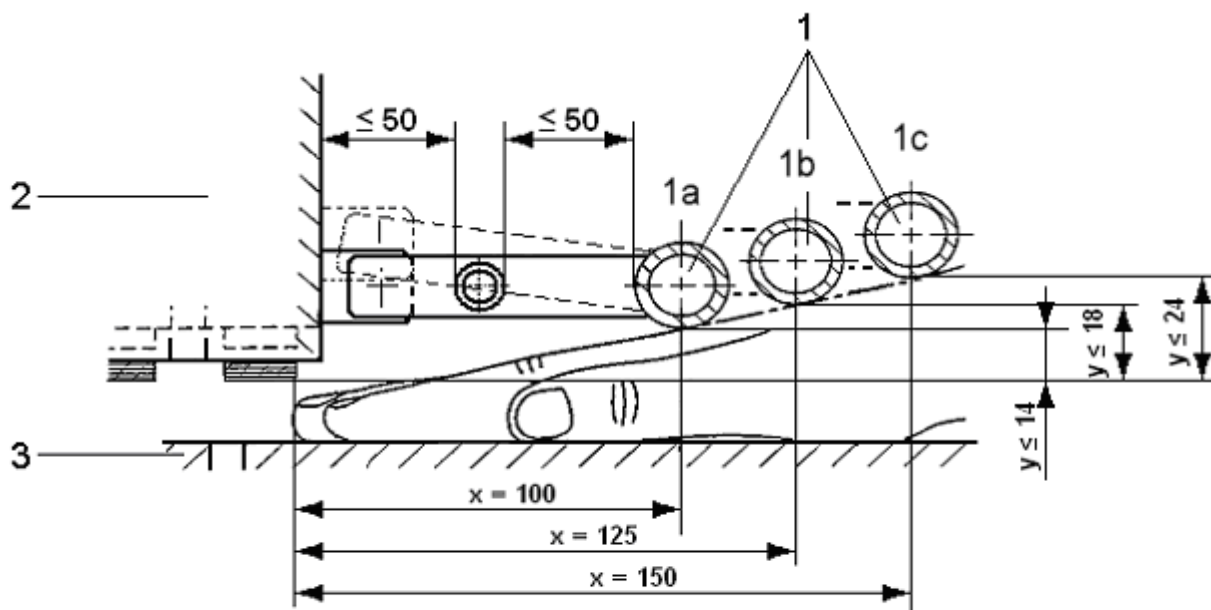
- by interlocking of the forward movement with the sectional safety curtain so that this movement is only possible when the sectional safety curtain is in its guarding position; or
- limiting the forward movement so that the edge of the panel pusher or of the collets cannot approach within 50 mm of the rear bottom edge of the pressure beam (see Figures 6 a) and 6 b)).

The category of the control circuits (also see 5.2.1) for the interlocking function shall be in accordance with the requirements of EN ISO 13849-1:2006 and at least:

- iii) category 1 if the control circuits are hardwired;
- iv) category 3 if the control circuits include electronic components.

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

Dimensions in millimetres



Key

- 1 possible positions of trip bar sensor
- 2 pressure beam
- 3 workpiece support

Figure 5 — Dimensions of trip bar

Dimensions in millimetres

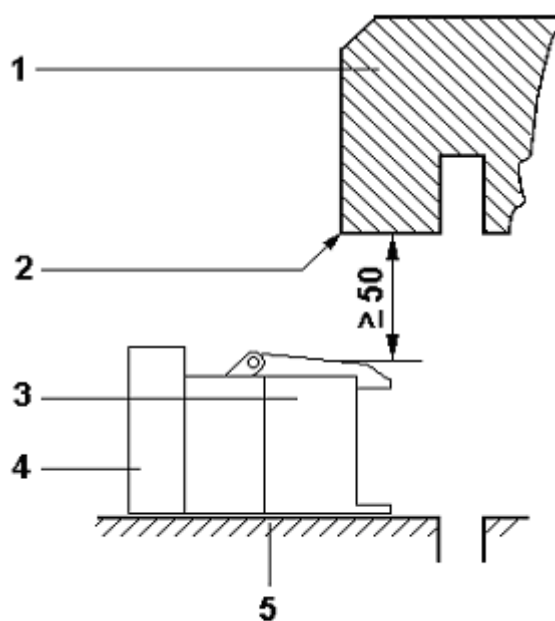


Figure 6 a) — End of panel pusher / collet movement below pressure beam

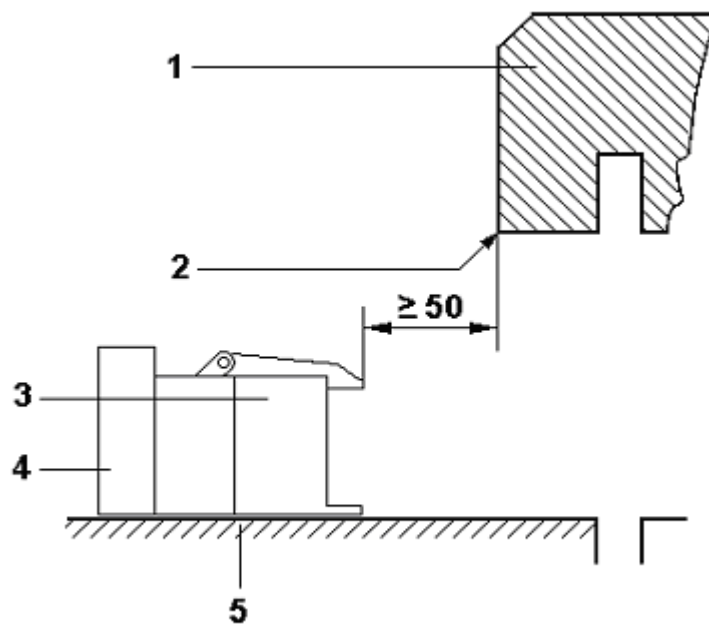


Figure 6 b) — Panel pusher / collet movement stops in front of pressure beam

Key

- 1 pressure beam
- 2 rear bottom edge of the pressure beam
- 3 collet in foremost position
- 4 panel pusher in foremost position
- 5 workpiece support

Figure 6 — Panel pusher position relative to pressure beam

5.3.6.4 Safeguarding the rear of the machine

With the exception of rear side workpiece loading zone(s) access to any dangerous point on the rear of the machine i.e. pressure beam, panel pusher, collets (if fitted), panel turning device (if fitted) and pushing out fence (if fitted) shall be prevented either by fixed distance guarding (example see Figure 1 a) and Figure 1 b)) or by individual safeguarding of each single dangerous point (example see Figure 1 c)).

NOTE 1 For safeguarding of rear side workpiece loading zone(s) see 5.3.6.8.

If a fixed distance guard is provided it shall be in accordance with the following requirements:

- a) it shall have a minimum height of 1 600 mm from the floor level and shall extend down to floor level or to within a maximum distance of 300 mm from the floor level unless distance guards are mounted on the machine frame and access from below the machine workpiece support to any moving part is prevented;
- b) an access door for frequent access i.e. more frequently than once per week shall be provided. The access door shall be interlocked with all dangerous movements e.g. panel pusher movement, saw blade rotation and loading device movements (if provided). A reset control device shall be provided next to the access door(s) and on the outside of the fixed distance guard in such a position that it is not possible to get access to the reset control device from inside the fixed distance guard when the access door is closed.

NOTE 2 For dangerous movements of the pressure beam see 5.3.6.2.

As an exception to b) an access door is not required, if access to the rear of the machine for maintenance and servicing purposes is possible via an opening provided for loading of the workpieces which is safeguarded by the measures described in 5.3.6.8.

The category of the control circuits (also see 5.2.1) for interlocking of the access door(s) and for the reset function shall be in accordance with the requirements of EN ISO 13849-1:2006 and at least:

- i) category 1 if the control circuits are hardwired;
- ii) category 3 if the control circuits include electronic components;

Other openings provided in the rear side distance guard shall fulfil the safety distances according to Table 4 of EN 294:1992.

If individual safeguarding of each single dangerous point is used the following requirements shall be met:

- the openings between the roller supports for the workpiece shall be totally filled in so that it is not possible to get access to dangerous points from below the rear side workpiece support (see also 6.2). Necessary opening in the filling in parts shall be so designed or positioned that the safety distances according to Table 4 of EN 294:1992 are met;
- the backward movement of the panel pusher shall be limited by mechanical end stops so that the movement ends at latest at the rear end of the closed workpiece support;
- access to dangerous points on the panel pusher, collets, panel turning device (if fitted) and pushing out fence (if fitted) shall be prevented by individual fixed guards and / or by their positioning so that the safety distances according to Table 4 of EN 294:1992 are met;
- where only impact hazards from moving parts exist i.e. if the movement speed exceeds 25 m min^{-1} a trip device e.g. pressure sensitive bumpers shall be provided. Mechanical trip devices e.g. bumpers shall conform to the requirements of EN 1760-3:2004 and shall be such that the movement is stopped before impact force of 400 N is reached. The impact force shall be measured using a fix probe of 80 mm diameter positioned square to the direction of motion. The active part of the pressure sensitive bumper shall be of flexible material e.g. rubber and its width greater than 80 mm. For pressure sensitive bumpers where the signal is not provided directly the associated safety related control systems shall be of category 3 in accordance with the requirements of EN ISO 13849-1:2006. For pressure sensitive bumpers where the signal is provided directly the associated safety related control systems may be of category 1 in accordance with the requirements of EN ISO 13849-1:2006. Pressure sensitive bumpers shall extend to the whole height of the machine moving component up to a minimum of 1 800 mm high and from the edge inward up to 700 mm from the machine side;
- where only an impact hazard is foreseeable and the maximum movement speed is below 25 m min^{-1} no additional protective device is required where moveable parts corners are rounded and no hazards exist from projecting parts e.g. screws. If the control system for monitoring the reduced speed of the moveable part includes electronic components this control system shall be category 2 or 3 in accordance with the requirements of EN ISO 13849-1:2006. If category 2 is used the control system shall be tested at least at each initial start or at each 8 h of run of the machine. 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.

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



5.3.6.5 Safeguarding of the side pressure device

If the machine is fitted with a power driven side pressure device access to crushing and shearing points between the side pressure device and the pressure beam and the workpiece and / or the workpiece support shall be prevented by locating the side pressure device between the pressure beam and the sectional safety curtain and / or behind the pressure beam. If the side pressure device is located before the sectional safety curtain or in front of the pressure beam any powered movement of the side pressure shall only be possible if the sectional safety curtain is in its lowest guarding position or the movement of the side pressure is controlled by a hold-to-run control device.

NOTE For the requirements for the cutting cycle sequence and the category of the control circuit for interlocking of the side pressure see 5.2.3.2.

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

5.3.6.6 Safeguarding of the panel turning device

If the machine is fitted with an external panel turning device access to any crushing and shearing points between this device and fixed parts shall be prevented by hold to run control located outside crushing and shearing zones (see also 5.3.6.4).

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

5.3.6.7 Safeguarding of the pushing out device

If the machine is fitted with a pushing out device the following requirements shall be met:

- a) access to crushing and shearing points between the pushing out device and fixed parts of the rear workpiece support shall be prevented by the means described in 5.3.6.4;
- b) when it is in the working position movement of the pushing out device shall only be possible if the pressure beam and the side pressure (if provided) are in their rest positions and the sectional safety curtain is in its open position when the safety sectional curtain movement is vertical;
- c) the forward movement of the pushing out device shall be limited so that shearing and / or crushing hazards between the pushing out device and the front edge of the machine are avoided;
- d) the movement of the pushing out device from its rest position to its working position close to the rear side of the workpiece support shall only be possible if the panel pusher is in a safe position i.e. if the safety distances of Table 3 of EN 294:1992 are met and there are no shearing and / or crushing hazardous points and the safety curtain is in the guarding position or the movement is controlled by means of a hold-to-run control device.

The category of the control circuits (also see 5.2.1) for the interlocking functions shall be in accordance with the requirements of EN ISO 13849-1:2006 and at least:

- i) category 1 if the control circuits are hardwired;
- ii) category 3 if the control circuits include electronic components.

For the category of the control circuit for the speed monitoring of the pushing out device see 5.3.5.

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

5.3.6.8 Safeguarding of powered panel loading devices

5.3.6.8.1 Panel stack loading direct on the lifting platform

With the exception of the loading opening access to any dangerous points on the loading device e.g. at the lifting platform or the panel pusher shall be prevented by fixed distance guarding which shall meet the following requirements (see also Figure 7):

- a) it shall have a minimum height of 1 600 mm from the floor level and shall extend down to floor level or to within a maximum distance of 300 mm from the floor level;
- b) any gaps in it e.g. when using wire mesh shall be designed in accordance with safety distances in 4.5.1 of EN 294:1992.

The opening for loading the panel stack shall be safeguarded by a trip device using active opto-electronic protective device (light barrier – AOPD) in accordance with the requirements of EN 61496-1:2004 which shall be in accordance with the following requirements:

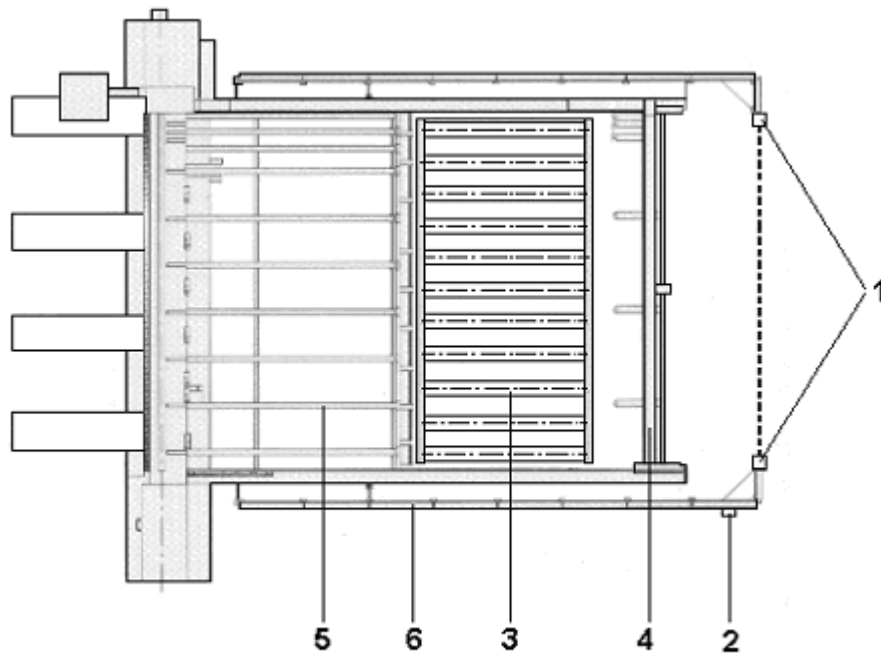
- i) it shall be category 2 as defined in CLC/TS 61496-2:2006;
- ii) it shall have at least two beams, one at 400 mm and the other at 900 mm from the floor level;
- iii) it shall be positioned at least 850 mm from any dangerous point so that it is not possible for a person standing outside the protected zone to reach any dangerous point inside of the protected zone without triggering the AOPD;
- iv) when the AOPD is triggered any dangerous movement at the rear side of the machine i.e. lifting platform, panel pusher, collets (if fitted), panel turning device (if fitted) and pushing out fence (if fitted) shall stop. An already commenced cutting cycle shall stop when it is finished and a new one shall not be possible unless the movement is safeguarded and the access to this movement is limited by an impeding/deterring device e.g. the machine table;
- v) a manually operated reset control device for reactivating the AOPD shall be provided next to the loading opening and on the outside of the fixed distance guard in such a position that it is not possible to get access to the reset control device from inside the protected zone (see also Figure 7).

The category of the control circuits (also see 5.2.1) associated with the AOPD shall be in accordance with the requirements of EN ISO 13849-1:2006 and at least:

- category 1 if the control circuits are hardwired;
- category 3 if the control circuits include electronic components.

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





Key

- 1 active opto-electronic protective device (AOPD)
- 2 reset control device for AOPD
- 3 lifting platform
- 4 panel pusher
- 5 workpiece support of the machine
- 6 fixed distance guarding (machine rear workpiece support and loading device)

Figure 7 — Example of safeguarding of a loading device with panel stack loading direct on the lifting platform

5.3.6.8.2 Panel stack loading on powered roller conveyor

With the exception of the loading opening access to any dangerous points on the loading device e.g. at the lifting platform, the panel pusher or the powered roller conveyor and to impact hazardous points caused by panel stack movement shall be prevented by fixed distance guarding which shall meet the following requirements (see also Figure 8):

- a) it shall have a minimum height of 1 600 mm from the floor level and shall extend down to floor level or to within a maximum distance of 300 mm from the floor level;
- b) any gaps in it e.g. when using wire mesh shall be designed in accordance with safety distances in 4.5.1 of EN 294:1992;

The opening for loading the panel stack on the roller conveyor and the opening necessary for moving the panel stack from the roller conveyor to the lifting platform shall be safeguarded. This can be achieved by trip devices using active opto-electronic protective devices (AOPD 1 and AOPD 2 – see Figure 8) in accordance with the requirements of EN 61496-1:2004 which shall be in accordance with the following requirements:

- i) they shall be category 2 as defined in CLC/TS 61496-2:2006;
- ii) they shall have at least two beams, one at 400 mm and the other at 900 mm from the floor level;
- iii) they shall be positioned at a distance of at least 1 000 mm from the danger zone so that it is not possible for a person standing outside the protected zone to reach any dangerous point inside of the protected zone without triggering the AOPD provided for safeguarding the relevant zone (see Figure 8), i.e. AOPD 1 for preventing access to dangerous movements of the roller conveyor (e.g. powered driven rollers or panel stack movement) and AOPD 2 for preventing access to dangerous movements at the rear side of the machine i.e. lifting platform, panel pusher, collets (if fitted), panel turning device (if fitted) and pushing out device (if fitted);
- iv) when AOPD 1 is triggered e.g. during loading a panel stack to the roller conveyor any dangerous movement in the corresponding zone 1 (e.g. powered driven rollers or panel stack movement) shall stop and AOPD 2 shall prevent access to the corresponding zone 2 with lifting platform etc.;
- v) a manually operated reset control device for reactivating the AOPD 1 shall be provided next to the loading opening and on the outside of the fixed distance guard in such a position that it is not possible to get access to the reset control device from inside the protected zone 1 (see also Figure 8);
- vi) it shall only be possible to start the drive motor of the roller conveyor for moving the panel stack to the lifting platform if the AOPD 1 is reactivated. Activation of AOPD 2 by the panel stack needs not to lead to a stop of any dangerous movement. After the panel stack has left the AOPD 2 an automatic reset to reactivate of AOPD 2 shall be initiated;
- vii) if AOPD 1 and AOPD 2 are both triggered an emergency stop of the whole machine shall be initiated. Means shall be provided e.g. a hold-to-run control device positioned next to the manually operated reset control device for reactivating the AOPD 1 for moving a panel stack standing between the roller conveyor and the lifting platform either to the lifting platform and / or back to the roller conveyor.

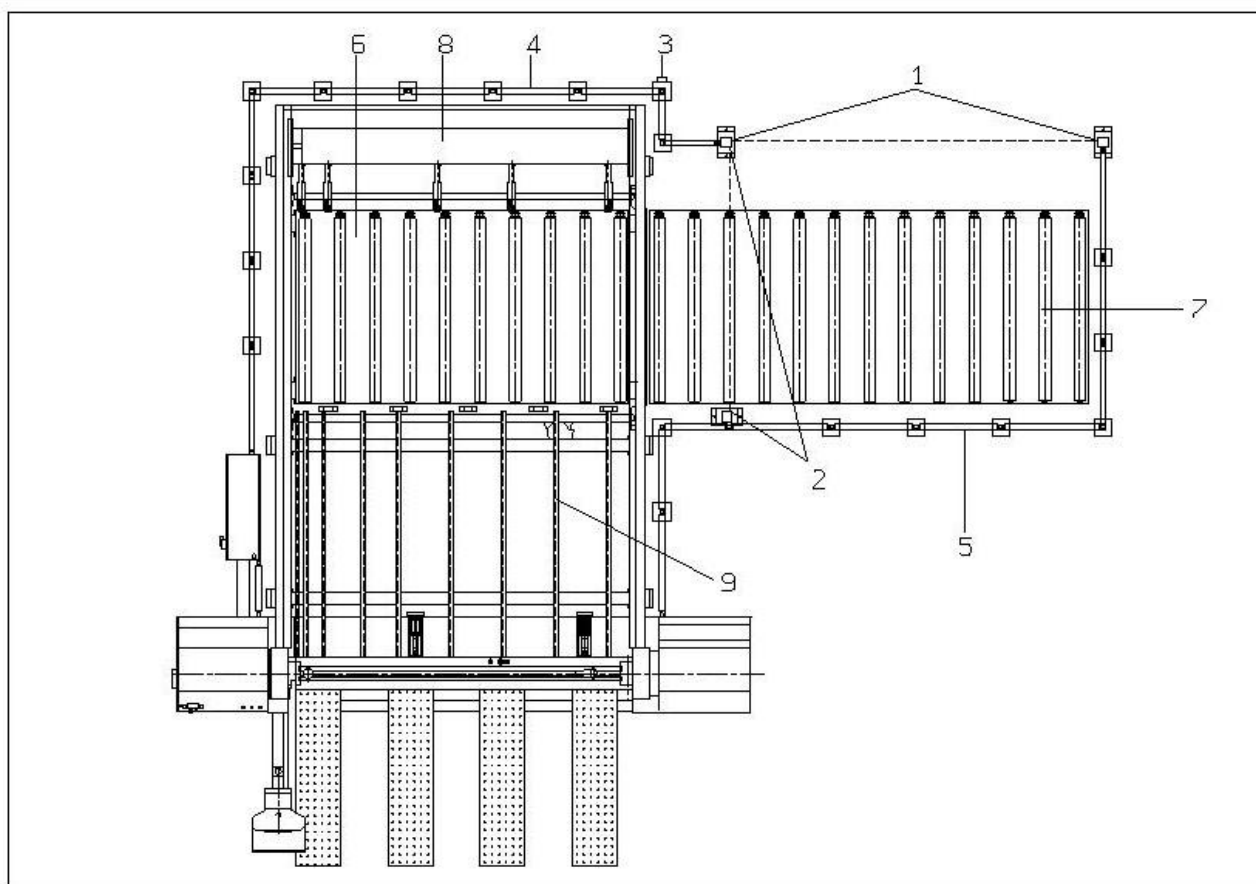
If only AOPD 1 is fitted any movement in the rear zone of the machine shall stop when AOPD triggers (see 5.3.6.8.1).

The category of the control circuits (also see 5.2.1) associated with the AOPD shall be in accordance with the requirements of EN ISO 13849-1:2006 and at least:

- category 1 if the control circuits are hardwired;
- category 3 if the control circuits include electronic components.

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





Key

- 1 active opto-electronic protective device (AOPD 1) for loading opening
- 2 active opto-electronic protective device (AOPD 2) for opening between roller conveyor and lifting platform
- 3 reset control device for AOPD 1
- 4 fixed distance guarding zone 1 (machine rear workpiece support and loading device)
- 5 fixed distance guarding zone 2 (powered roller conveyor)
- 6 lifting platform
- 7 powered roller conveyor
- 8 panel pusher
- 9 workpiece support of the machine

Figure 8 — Example of safeguarding of a loading device with panel stack loading on powered roller conveyor

5.3.7 Guarding of drives

Access to the drive mechanism (to saw spindle, panel pusher etc.) shall be prevented either by a fixed guard or a movable guard interlocked with the relevant drive actuator.

Where frequent access to the drives is provided for maintenance or adjustment purposes i.e. more than once per day, access shall be via an interlocked movable guard.

If it is possible to gain access to the saw blade(s) with the guard open it shall be a moveable interlocked guard with guard locking with manually operated delay device in accordance with Annex N of EN 1088:1995.

The category of the control circuits (also see 5.2.1) for interlocking or interlocking with guard locking function shall be in accordance with the requirements of EN ISO 13849-1:2006 and at least:

- a) category 1 if the control circuits are hardwired;
- b) category 3 if the control circuits include electronic components.

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

5.4 Protection against non-mechanical hazards

5.4.1 Fire

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

Sparks as a result of contact between the tool and fixed machine parts shall be avoided in accordance with the requirements of 5.3.5.

Verification: By checking the relevant drawings and inspection of 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 control noise at source given in EN ISO 11688-1:1998 shall be taken into account. Also the information given in EN ISO 11688-2:2001 may be taken into account. The most relevant noise source is the rotating saw blade(s).

5.4.2.2 Noise emission measurement

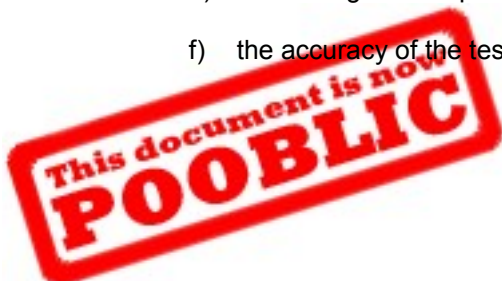
The operating conditions for noise measurement shall comply with Annex P of ISO 7960:1995.

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.

For machines where Annex P of ISO 7960:1995 is not applicable, e.g. for different spindle speeds and saw blade diameters, the detailed operating conditions used shall be given in the test report.

Emission sound power levels shall be measured in accordance with the enveloping surface measuring method given in EN ISO 3746:1995 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 in accordance with 8.2 of EN ISO 3746:1995 shall apply up to a difference of 10 dB;
- c) only the parallelepiped measurement surface shall be used at 1,0 m from the reference surface;
- d) where the distance from the machine to an auxiliary unit is less than 2,0 m the auxiliary unit shall be included in the reference surface;
- e) measuring time requirement in 7.5.3 of EN ISO 3746:1995 referring to 30 s shall be excluded;
- f) the accuracy of the test method shall be better than 3 dB;



g) the number of microphone positions shall be 9 in accordance with Annex P of ISO 7960:1995.

Alternatively, where the facilities exist and the measurement method applies to the machine emission sound power levels may also be measured in accordance with a method with higher precision i.e. EN ISO 3743-1:1995, EN ISO 3743-2:1996, EN ISO 3744:1995 and EN ISO 3745:2003 without the preceding modifications.

For determination of the emission sound power level by sound intensity method, use EN ISO 9614-1:1995 (subject to agreement between the supplier and the purchaser).

Emission sound pressure levels at the workstation shall be measured in accordance with EN ISO 11202:1995 with the following modifications:

- i) the environmental indicator K_{2A} and the local environmental correction K_{3A} shall be equal to or less than 4 dB;
- ii) the difference between the background emission sound pressure level and the workstation sound pressure level shall be equal to or greater than 6 dB;
- iii) the local environmental correction K_{3A} shall be calculated in accordance with A.2 of EN ISO 11204:1995 with the reference restricted to EN ISO 3746:1995 instead of the method given in of EN ISO 11202:1995, or in accordance with EN ISO 3743-1:1995, EN ISO 3743-2:1996, EN ISO 3744:1995 or EN ISO 3745:2003 where one of these standards has been used as the measuring method.

The declaration of noise emission shall be in accordance with 6.3 q).

5.4.3 Emission of chips and dust

The pressure beam shall include a capture device for collecting the chips and dust which is fitted with an extraction outlet to connect it to a separate chip and dust collection system.

The saw unit(s) shall include a capture device for collecting the chips and dust which is connected to an extraction channel in the machine frame. This extraction channel shall be provided with a further extraction outlet.

NOTE 1 By placing the capture device close to the emission source the dimension of the opening of the capture device and the air flow rate can be reduced at the same time as the capture efficiency can be improved.

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

The conveying of chips and dust between the capture device and the machine connection to the chips and dust extraction system, especially flexible connection of moving units, shall follow the requirement to minimise pressure drop and material built-up.

NOTE 2 The design of the capture device (e.g. geometry, choice of material) may be affected by other design criteria e.g. consideration of ergonomic principles, safety aspects, stability, and operation of the machine.

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

The information on extraction data shall be in accordance with 6.3 q).

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



5.4.4 Electricity

The requirements of EN 60204-1:2006 apply unless otherwise stated in this document.

In particular the following clause requirements of EN 60204-1:2006 shall be fulfilled:

- Clause 6 for prevention of electric shock;
- Clause 7 for protection of equipment;
- Clause 8 for equipotential bonding;
- Clause 12 for conductors and cables;
- Clause 13 for wiring practices;
- Clause 14 for electrical motors and associated equipment.

Electrical enclosures shall not be exposed to risk from the ejection of tools and workpieces. Live parts shall not be accessible in accordance with 6.2.2 of EN 60204-1:2006. Fire risk is not present where the requirements of 5.3.5 are fulfilled and where power circuit(s) is (are) protected against over current in accordance with 7.2.2 of EN 60204-1:2006.

The degree of protection of all electric components out of the enclosure(s) and the enclosure(s) for electrical components itself/themselves shall be at least IP 54 in accordance with the requirements of EN 60529:1991.

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

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

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 apply and in addition:

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

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

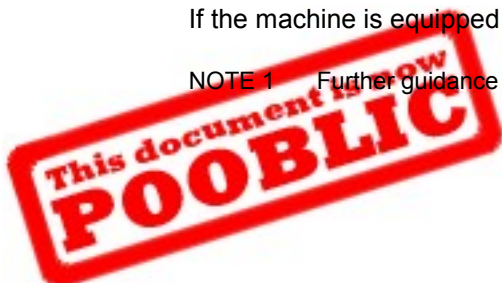
If the machine is fitted with a movable control panel, this panel shall be fitted with a facility to move it in the desired position e.g. a handle.

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.

If graphical symbols related to the operation of actuators are used, they shall be in accordance with Table 6 of EN 61310-1:1995.

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

NOTE 1 Further guidance is given in EN 60204-1:2006, EN 614-1:2006 and EN 614-2:2002.



NOTE 2 See also 5.2.2 for position of controls, 6.3, EN 894-3:2000 and EN 1005-3:2002.

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

5.4.6 Pneumatics

For machines fitted with pneumatic equipment the requirements of EN 983:1996 shall apply.

NOTE Also see 5.2.3.1, 5.2.6, 5.2.8, 5.4.11, 5.4.12, 6.2 and 6.3.

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

5.4.7 Electromagnetic compatibility

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

NOTE Machines which incorporate CE-marked electrical components 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.

For control systems with electronic components see Annex F.

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

5.4.8 Static electricity

Flexible hoses for chip and dust extraction fitted to the machine shall be able to lead charge to earth potential.

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

5.4.9 Errors of fitting

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

A pictogram positioned on the machine, close or adjacent to the saw blade changing position shall indicate the direction of rotation of each saw blade.

See also 6.3.

Verification: By checking the relevant drawings 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 risk category in accordance with the requirements of EN 60825-1:1994 (see also 6.3).

The laser shall be fitted to the machine so that warnings on the laser itself remain visible or by means of a sticker in close proximity of the laser.

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 / or circuit diagrams and inspection of the machine.

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

5.4.11 Supply disconnection (isolation)

The requirements of Clause 5 of EN 1037:1996 shall apply and in addition:

The electric power supply to the machine shall be controlled by a supply disconnecting device (isolator) which is in accordance with the requirements of 5.3 of EN 60204-1:2006 except that it shall not be of type (d) in 5.3.2 of EN 60204-1:2006.

If a machine is fitted with an electrical braking system the electrical isolator shall not be located on the same side of the machine or control panel as the start and stop controls.

Where pneumatic energy is used, a pneumatic isolator shall be provided in accordance with the requirements of the first indent in 5.1.6 of EN 983:1996 with a device for locking the isolator in the isolated condition.

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

5.4.12 Maintenance

The basic principles of 4.15 of EN ISO 12100-2:2003 shall be observed and in addition:

The machine shall be designed so that maintenance and cleaning can be wherever possible undertaken after disconnection of the machine from all energy sources (see also 6.3).

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

If dumping of residual pneumatic pressure allows movement of any machine component arising, then pressure shall be maintained in the system to prevent such movement and dumping of the residual pneumatic pressure shall be by voluntary action on a separate control.

Information on maintenance given in 6.5.1 e) of EN ISO 12100-2:2003 shall be provided.

Also see 6.3.

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

6 Information for use

6.1 Warning devices

The basic principles of 6.3 of EN ISO 12100-2:2003 shall be observed and in addition:

If the machine is equipped with an electrical brake with electronic control system the negative result of the periodical test required in 5.3.4.1 shall be indicated by a yellow warning light positioned in close proximity to the installed location of the stop control device for the corresponding saw spindle drive motor.

Where a machine is designed to operate at more than one main saw spindle speed the selected speed shall be displayed.

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



6.2 Marking

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 plates permanently fixed to the machine e.g. by riveting or stickers:

- a) name and address of the manufacturer;
- b) year of construction;
- c) designation of series or type;
- d) serial or identification number, if any;
- e) rating information (mandatory for electro technical products: voltage, frequency, power in accordance with 16.4 of EN 60204-1:2006);
- f) maximum and minimum diameter of the saw blade(s) for which the machine is designed;
- g) bore diameter of the saw blade(s);
- h) function, location and operational position of the electrical supply disconnecting device (isolator) and of the pneumatic isolator (if fitted) by a label or a pictogram fitted in a position in close proximity to the installed location of the corresponding isolator;
- i) nominal pressure for the pneumatic circuits on machines fitted with pneumatic systems;
- j) where the machine is fitted with a pneumatic isolator its function, location and operational position(s) e.g. by a label or a pictogram. The label or pictogram shall be placed on the machine in proximity to the isolator.

Where the machine is equipped with a pneumatic supply and isolation of the pneumatic energy supply 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 supply is not isolated by isolating of the electrical supply.

If the machine is fitted with a laser a warning label and advice on use of eye protection if any shall be provided on the machine near the operator's position.

On machines fitted with individual rear side safeguarding of each single dangerous point permanent warning labels shall be placed on each side of the machine indicating that standing on the rear workpiece support is not allowed.

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.

If graphical symbols related to the operation of actuators are used, they shall be in accordance with Table 6 of EN 61310-1:1995.

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

If the machine is fitted with saw blades the requirements for marking of the tools in Clause 7 of EN 847-1:2005 shall apply.

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



6.3 Instruction handbook

The basic principles of 6.5.3 of EN ISO 12100-2:2003 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 and, if necessary, information about their meaning as required in 6.1 and 6.2;
- b) the intended use of the machine in particular to ensure that panels with same total thickness are machined at any one time;
- c) a warning regarding residual risks in general (e.g. dust, noise, contact with the saw blade(s));
- d) when fitted with a laser a repetition of the laser manufacturer instruction for its use;
- e) the maximum dimensions of the panels which can be machined together with an installation drawing ensuring a clearance of the maximum length of the panel plus at least 500 mm measured from the cutting line at the front side of the machine to reduce body crushing with any fixed points (see Figure 9);



Dimensions in millimetres

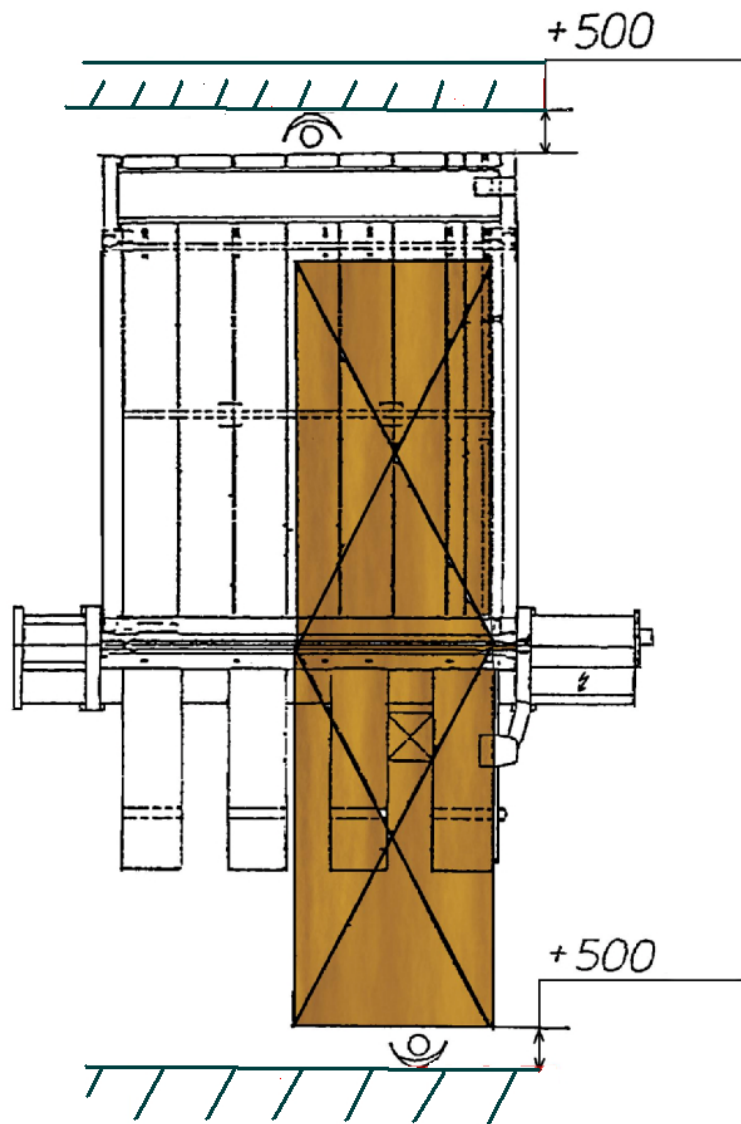


Figure 9 — Example of installation drawing

- f) the range of saw blade diameters and thickness for which the machine is designed;
- g) it is recommended that only correctly sharpened saw blades manufactured in accordance with the requirements of EN 847-1:2005 should be used;
- h) information that operators shall be adequately trained in the use, adjustment and operation of the machine including the correct use. This includes precautions during setting and machining as:
 - 1) stop the machine whilst unattended;
 - 2) ensure that the floor area around the machine is level, well maintained and free from loose material e.g. chips and off-cuts;
 - 3) report faults in the machine, including guards or tools as soon as they are discovered;

- 4) adopt safe procedures for cleaning, maintenance and remove chips and dust regularly to avoid the risk of fire;
 - 5) the principle of machine setting and operation;
 - 6) how to isolate the machine from all power sources;
 - 7) how to change the saw blade(s);
 - 8) instructions that the dust extraction equipment is to be switched on before commencing machining;
 - 9) the use of personal protective equipment e.g. for ear and eye protection according the local relevant legislation;
 - 10) recommended use of personal protective equipment with regard to wood dust.
- i) warning that the machine is producing a large amount of wood dust and therefore shall be connected to an external chip and dust extraction system;

NOTE 1 External chip and dust extraction equipment with fixed installations are dealt within EN 12779:2004.

- j) information regarding the chip and dust extraction equipment fitted to the machine as follows:
- i) necessary air flow in $\text{m}^3 \text{h}^{-1}$;
 - ii) the pressure drop at each connection outlet at the recommended conveying air velocity;
 - iii) the recommended conveying air velocity in the duct in m s^{-1} ;
 - iv) the cross section dimensions and details of each dust extraction outlet;
- k) information that adequate general or localised lighting shall be provided;
- l) instruction that whenever possible maintenance shall be only done if the machine is isolated from all energy sources and involuntary restart is prevented;
- m) information on maintenance given as examples in 6.5.1 e) of EN ISO 12100-2:2003;
- n) installation and maintenance requirements including a list of those devices which shall be inspected, how frequently the verification shall be carried out and by what method. This shall include at least the following:
- emergency stop - by functional testing;
 - 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;
 - interlocked guards with guard locking - by proving an inability to open the guard as long the saw blade is rotating;
 - the brake - by functional testing to check that the machine is braked within the specified time and if the machine is fitted with mechanical brake that the brake shall be tested after any intervention of the overload protection;
 - indication of the selected speed on machines designed to operate at more than one main tool spindle speed – by functional testing;
 - the sectional safety curtain – by functional testing;

- the mechanically actuated trip device - by functional testing;
- any AOPD - by functional testing;
- o) information about safe cleaning;
- p) if fitted with a pneumatic system the method for the safe dissipation of residual energy (see 5.4.10);
- q) a declaration concerning airborne noise emissions of the machine, either the actual value or a value established on the basis of measurements made on technically comparable machinery representative of the machinery to be produced, measured in accordance with the methods given in 5.4.2.2. 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 4871:1996 as follows:

4 dB when using EN ISO 3746:1995 and EN ISO 11202:1995;

2 dB when using EN ISO 3743-1:1995 or EN ISO 3743-2:1996 or EN ISO 3744:1995;

1 dB when using EN ISO 3745:2003;

for example, for a sound power level $L_{WA} = 93$ dB (measured value)

Associated uncertainty $K = 4$ dB

Measurement made in accordance with EN ISO 3746:1995

If the accuracy of the declared emission values is to be checked, the same method and the same operating conditions as those declared for measurements are to be used.

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 work-force include the characteristics of the work room, 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".

NOTE 2 Information on noise emission should be provided in the sales literature.

- r) the type of saw blade and recommended speed for panel materials the machine is designed for cutting.

Verification: By checking the information given in the instruction handbook and relevant drawings.

Annex A

(informative)

Use of well tried components

In particular the requirements of the following relevant standards should be applied when considering safety related parts to be well-tried in accordance with the requirements of 6.2.4 of EN ISO 13849-1:2006:

- a) for electrical components (see also Tables D.1 to D.17 of EN ISO 12100-2:2003):
 - 1) EN 60947-5-1:2004 for control switches with positive opening operation used as mechanically actuated position detectors for interlocking of guards and for relays used in auxiliary circuits;
 - 2) EN 60947-4-1:2001 for electromechanical contractors and motor starters used in mains circuits;
 - 3) HD 22.1 S4:2002 for rubber insulated cables;
 - 4) HD 21.1 S4:2002 for polyvinyl chloride cables if these cables are additionally protected against mechanical damage by positioning (e.g. inside frames).
- b) electrical control circuits if they also are in accordance with the first four measures listed in 9.4.2.1 of EN 60204-1:2006 (see also Tables D.1 and D.2 of EN ISO 13849-2:2003);
- c) mechanical components if, for example they operate in the positive mode in accordance with the description given in 4.5 of EN ISO 12100-2:2003;
- d) mechanically actuated position detectors for guards if they are actuated in the positive mode and their arrangement / fastening and the cam design / mounting complies with 5.2 and 5.3 of EN 1088:1995 (see also Tables A.1 to A.5 of EN ISO 13849-2:2003);
- e) pneumatic components and systems if they comply with EN 983:1996 (see also Tables B.1 to B.18 of EN ISO 13849-2:2003).

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

NOTE For the assessment of well-tried components, possible exclusion of faults etc. see EN ISO 13849-2:2003.



Annex B (normative)

Impact test method for guards

B.1 General

This annex defines tests for guards used on horizontal beam panel saws in order to minimise risks of ejection of parts of tools or of workpieces out of the working zone.

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

B.2 Test method

B.2.1 Preliminary remarks

This test method reproduces the hazard of the ejection of tools parts or of workpieces. The test allows estimating the resistance / strength of guards and / or samples of guard materials against penetration and dislodgement from the machine by ejected parts from tools.

B.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 $\pm 5\%$.

B.2.3 Projectile for guards

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

- a) tensile strength: $R_m = 560 \text{ N mm}^{-2}$ to 690 N mm^{-2} ;
- b) yield strength: $R_{0,2} \geq 330 \text{ N mm}^{-2}$;
- c) elongation at rupture: $A \geq 20\%$;
- d) hardened to 56^{+4}_0 HRC over depth of at least 0,5 mm.

B.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 $\times$ 450 mm. The frame shall be sufficiently rigid. The mounting of the sample shall be by non positive clamping.

B.2.5 Test procedure

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

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 material sample or on the guard.

B.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.

B.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) according to B.3.

B.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) machine manufacturer, type, maximum spindle speed;
- d) name of applicant;
- e) clamping or fixing of the test object;
- f) direction of shock, point of impact of the projectile;
- g) test result.

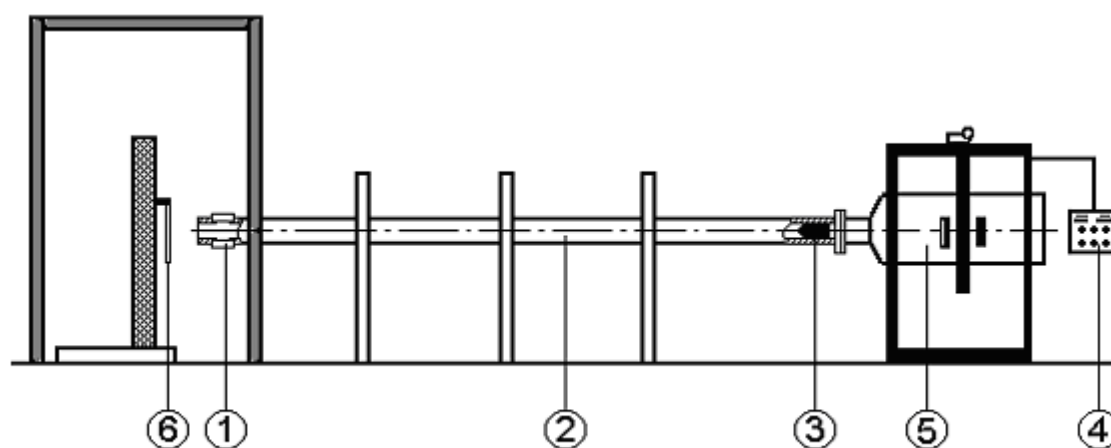
B.6 Test equipment for impact test

The propulsion device consists of a compressed air vessel with flanged gun barrel (see Figure B.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.





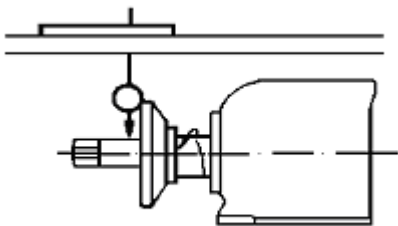
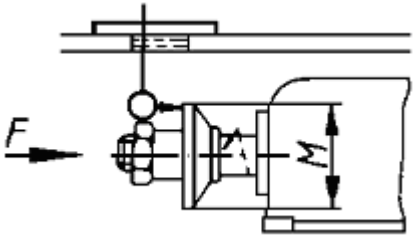
Key

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

Figure B.1 — Example of equipment for impact test

Annex C (normative)

Saw spindle dimensional tolerances

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

Annex D (normative)

Rigidity test for sectional safety curtain material

With the pressure beam in the highest working position and the sectional safety curtain in its lowest position, a horizontal force of 10 N shall be applied perpendicular to, and in the direction of the cutting plane. The force shall be applied to the centre of one section, 10 mm above the level of the workpiece support.

The maximum horizontal displacement at any point of this section shall not exceed 40 mm and the displacement shall not permit any point of the section to move to within 10 mm of the cutting plane.

Dimensions in millimetres

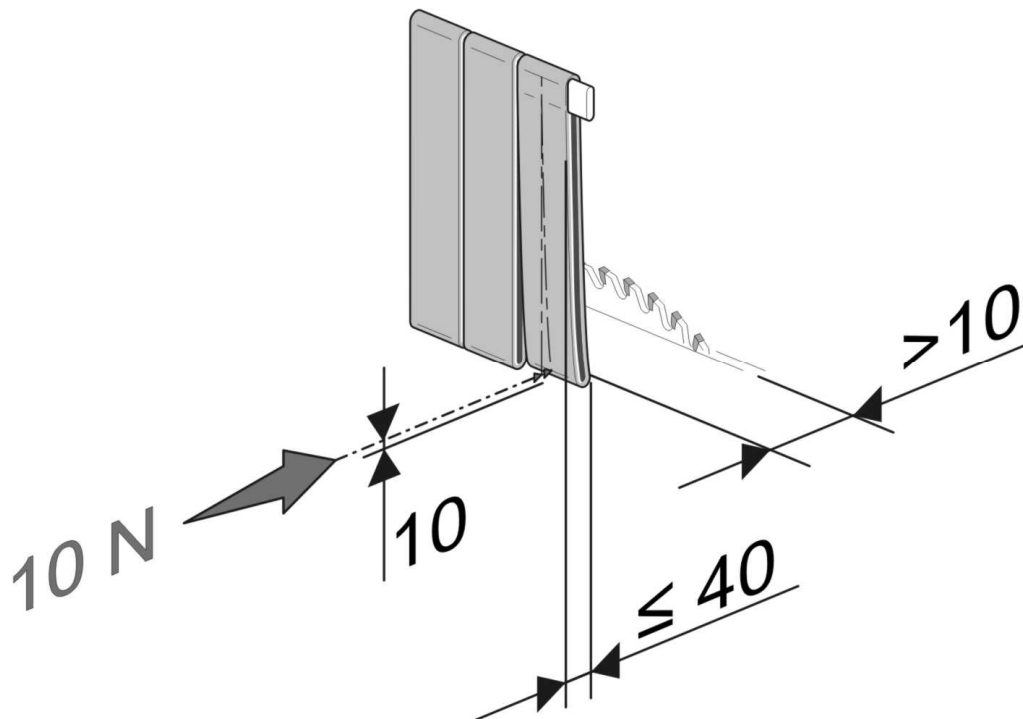


Figure D.1 a) — Curtain with vertical movement

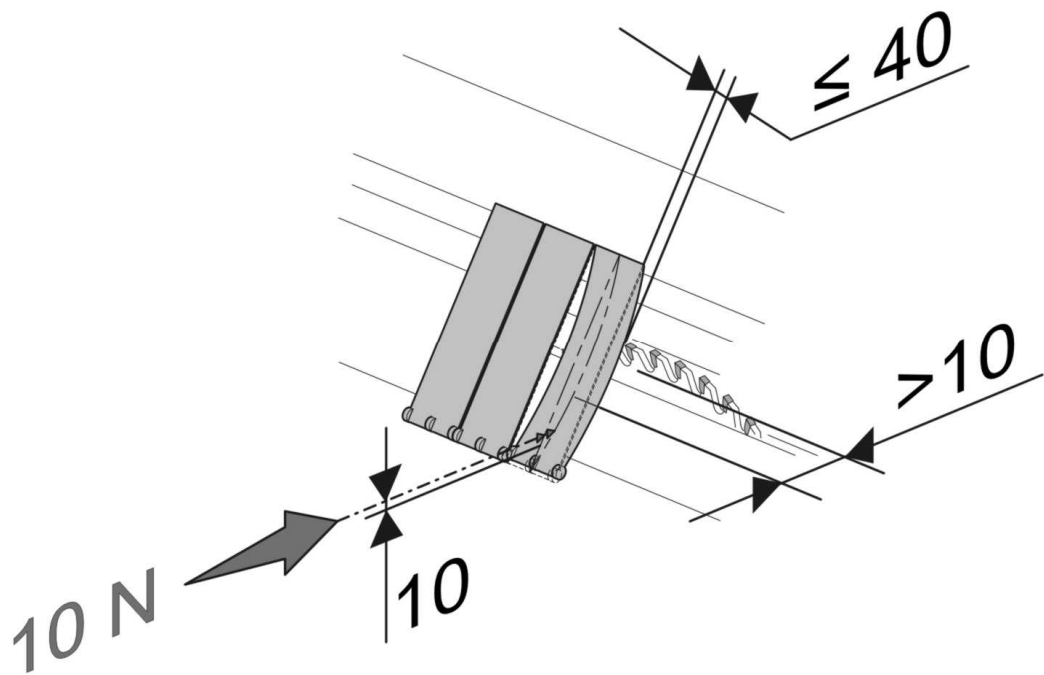


Figure D.1 b) — Curtain with pivoting movement

Figure D.1 — Sectional safety curtain test

Annex E (normative)

Braking tests

E.1 Conditions for all tests

- a) The spindle unit(s) shall be set in accordance with the intended use of the machine as stated in the manufacturer's instruction handbook especially belt tension (see 6.3);
- b) when selecting the speed and the saw blade(s), conditions shall be chosen which create the greatest kinetic energy for which the machine is designed (taking into account saw blade sizes, spindle speed etc.);
- c) before beginning the test the spindle unit(s) shall be running for at least 15 min at no load (idle speed);
- d) verify that the actual spindle speed is within 10 % of the intended speed.

E.2 Tests

E.2.1 Un-braked run-down time

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

- a) cut the power to the spindle drive motor and measure the un-braked run-down time;
- b) restart the spindle drive motor and allow it to reach the intended speed;
- c) repeat steps a) and b) twice more.

The un-braked run downtime is the maximum value of the three measurements taken.

E.2.2 Braked run-down time

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

- a) cut power to the spindle drive motor, apply the brake and measure the braked run-down time;
- b) allow the spindle to remain stationary for 1 min;
- c) restart the spindle drive motor and run under no load for 1 min;
- d) repeat steps a) to c) nine times.

The braked run-down time is the average of the ten measurements taken. All measured values shall be less than 90 s.



Annex F (normative)

Use of electronic components

F.1 General

For the implementation of any safety related function with electronic equipment the appropriate requirements of EN ISO 13849-1:2006 shall apply.

The design of the SRECS shall be such as to achieve the machine safety functions required in this document on base of the categories. Depending on the safety specifications the safety functions shall be achieved in category 2, 3 or 4 in accordance with the requirements of EN ISO 13849-1:2006.

NOTE 1 The categories for the machine safety functions are listed in 5.2.1.

SRECS shall be designed to be capable to fulfil the highest category in accordance with the requirements of EN ISO 13849-1:2006 required for the corresponding machine safety function.

Unless SRECS being part of a component for which a special standard exists they shall fulfil the environmental requirements in accordance with the requirements of 6.1 and 6.2 of EN 50178:1997.

Unless SRECS to category 2 being part of a component for which a special standard exists they shall fulfil the EMC requirements for type 2 in accordance with the requirements of EN 61496-1:2004. Unless SRECS to category 3 or 4 being part of a component for which a special standard exists they shall fulfil the EMC requirements for type 4 in accordance with the requirements of EN 61496-1:2004.

NOTE 2 See also 5.4.9 for the EMC requirements on the complete machine.

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

NOTE 3 For the components characteristics a confirmation from the components' manufacturers can be useful.

F.2 SRECS design

F.2.1 Components, hardware

SRECS hardware components (including sensors, actuators, PLCs, CNC systems, logic solvers etc.) shall be designed and constructed in accordance with the requirements of EN ISO 13849-1:2006.

SRECS hardware components (including sensors, actuators, PLCs, CNC systems, logic solvers etc.) shall be selected, assembled, combined and installed in accordance with the requirements of the technical instruction (including application and installation instructions) of the component's manufacturer.

A PLC fulfilling category 3 or 4 in accordance with the requirements of EN ISO 13849-1:2006 may be used in control systems for the implementation of the safety functions listed in 5.2.1.

NOTE 1 If a PLC is used, note that the overall response time could change in a defined range. The reaction time caused by the PLC depends mainly on the cycle time of the program. To consider the worst case the double cycle time should be assumed if no alarms or interrupts are used for faster switch off.



A PLC not fulfilling category 3 or 4 in accordance with the requirements of EN ISO 13849-1:2006 may only be a part of a SRECS up to category 3 e.g. as one channel of a dual channel system or as a testing device in category 2.

Where magnetic / proximity switches are used they shall be in accordance with the requirements of 6.2 of EN 1088:1995 and the related control system conforms to category 3 in accordance with the requirements of EN ISO 13849-1:2006.

A component failure shall not cause an unexpected movement (starting), a change of running conditions during operation (adjustment of the speed or of a powered movement) and a failure of a commanded stopping. Well known solutions such as monitoring, redundancy shall be used to achieve category 3 in accordance with the requirements of EN ISO 13849-1:2006.

Verification: Verification has to be carried out against the specification(s) by checking relevant drawings and / or circuit diagrams, calculation and inspection of the machine.

NOTE 2 For the components characteristics a confirmation from the components' manufacturers can be useful.

F.2.2 Safety related software

F.2.2.1 Embedded software

SRECS embedded software shall be in accordance with the requirements of Clause 6 and Clause 7 of EN 61508-3:2001.

Access to the embedded software of standard components shall not be possible.

Verification: Verification has to be carried out against the specification(s) by checking relevant drawings and / or circuit diagrams, calculation and inspection of the machine.

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

F.2.2.2 Application software

Programming of the SRECS shall fulfil the instructions (technical manual) of the component's manufacturer.

The safety related software shall be clearly separated from the functional software to avoid inadvertent alteration of the safety related software.

It shall only be possible for authorised persons to modify the software of the SRECS. Where access to programmable functions at the numerical control or SRECS is provided during production and / or setting mode (e.g. for workpiece support, speed setting), unauthorised access to programmed data or programmable functions shall be prevented. In particular it shall not be possible for the user to suspend the operation of safety functions (e.g. ESPE using AOPD) by means of sequences inserted in or called up by the application programme. This may be achieved in the form of a password.

Clause 6 and Clause 7 of EN 61508-3:2002 or as far as applicable 6.11.3 of EN 62061:2005 shall be taken into account for the application software development.

NOTE 1 These requirements for application software may be achieved by use of techniques such as defensive programming, structured programming, modularity (i.e. logic / function blocks, sequence diagrams etc.), re-use of software modules that satisfy the above requirements, depending of the programming tool available with the SRECS.

NOTE 2 It is recommended to apply pre-certified software modules (e.g. emergency stop) if available.

Verification: Verification has to be carried out against the specification(s) by checking relevant drawings and / or circuit diagrams, calculation and inspection of the machine.

NOTE 3 For the application software a confirmation from the machine manufacturers can be useful.

F.2.2.3 Validation

A SRECS shall be validated to ensure that the specified machine safety function performance is achieved. This validation shall show that all parts interact correctly to perform the safety function and that unintended functions do not occur.

Validation of the SRECS shall be in accordance with the requirements of EN ISO 13849-2:2003, e.g. by checking the relevant drawings and / or diagrams, flow charts, simulation of faults, inspection, measurement, confirmation from the component manufacturers and relevant functional testing on the machine.

NOTE Validation includes the use of testing and analysis techniques (e.g. static, dynamic or failure analysis). These analysis techniques may be used to reduce the number of test cases.



Annex ZA (informative)

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

This European Standard has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association to provide one means of conforming to Essential Requirements of the New Approach Directive Machinery 98/37/EC, amended by 98/79/EC.

Once this standard is cited in the Official Journal of the European Communities under that Directive and has been implemented as a national standard in at least one Member State, compliance with the clauses of this standard given in Table ZA.1 (except 6.3 h) 1) to 4) and Annex F) confers, within the limits of the scope of this standard, a presumption of conformity with the corresponding Essential Requirements of that Directive and associated EFTA regulations.

Table ZA.1 — Correspondence between this European Standard and Directive 98/37/EC

Clause(s) / subclause(s) of this EN	Essential Requirements (ERs) of Directive 98/37/EC
	1.1.2 Principle of safety integration
5.2.1, 5.2.2, 5.2.3, 5.2.4, 5.2.5, 5.2.6, 5.2.7, 5.2.8, 5.3.5, 5.3.6, 5.4.12, 6.3	a) fitted for its function
Clauses 5 and 6	b) eliminate the risks, give measures, inform
Clauses 5 and 6	c) use
5.4.5	d) ergonomics
5.4.5, 6.3	e) constraint in use
5.3.1, 5.4.8, 6.3	f) equipment
5.3.2, 5.3.5, 5.3.6, 5.4.3	1.1.3 Materials and products
6.3	1.1.4 Lighting
5.2.2, 5.3.6, 5.4.5	1.1.5 Design of machinery to facilitate its handling
5.2.1, 5.2.6, 5.2.7, 5.2.9, 5.4.11	1.2.1 Safety and reliability of control systems
5.2.2, 5.2.3, 5.2.4, 5.2.5, 5.2.6, 6.3	1.2.2 Control devices

5.2.2, 5.2.3, 5.2.6	1.2.3 Starting
5.2.2, 5.2.4, 5.2.5, 5.2.6	1.2.4 Stopping device (normal stopping – emergency stop – complex installations)
5.2.8, 5.4.6, 5.4.11, 5.4.12	1.2.6 Failure of power supply
5.2.1, 5.2.9, 5.4.11, 5.4.12	1.2.7 Failure of control circuit
Annex F	1.2.8 Software
5.2.3, 5.2.4, 5.2.5, 5.2.6, 5.2.7, 5.2.8, 5.3.1, 5.3.2, 5.3.3, 5.3.4, 5.3.5, 5.3.6, 5.3.7, 6.1, 6.2, 6.3	1.3 Protection against mechanical hazards
5.3.1	1.3.1 Stability
5.3.2, 6.3	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, 5.3.6	1.3.7 Prevention of risks related to moving parts
5.3.6	1.3.8 Choice of protection against risks related to moving parts (A moving transmission parts – B moving parts directly involved in the process)
5.2.1.1, 5.3.6	1.4.1 Required characteristics of guards and protective devices
5.3.2, 5.3.6	1.4.2 Special requirements for guards
5.2.1.1, 5.3.6	1.4.3 Special requirements for protection devices
5.2.9, 5.4.4, 5.4.11	1.5.1 Electricity supply
5.4.8	1.5.2 Static electricity
5.2.8, 5.4.6	1.5.3 Energy supply other than electricity
5.4.9	1.5.4 Errors of fitting
5.4.1	1.5.6 Fire
5.4.2	1.5.8 Noise
5.4.7, Annex F	1.5.11 External radiation
5.4.3	1.5.13 Emission of dust, gases etc.
5.4.12	1.6.1 Machinery maintenance

5.2.2, 5.3.6, 5.4.12	1.6.2 Access to operating position and servicing
5.4.11	1.6.3 Isolation of energy sources
5.2.2, 5.2.6, 5.2.7, 5.3.6, 5.4.5, 5.4.12, 6.3	1.6.4 Operator intervention
5.4.3, 6.3	1.6.5 Cleaning of internal parts
5.2.1, 5.3.3, 5.4.5, 6.3	1.7.0 Indicators
6.1	1.7.1 Warning devices
6.2	1.7.3 Marking
6.3	1.7.4 instructions
	2.3 Machinery for working wood and analogous materials
5.3.5	a) guiding
5.3.2	b) ejection
5.3.4	c) brake

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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