BRITISH STANDARD

BS EN 1870-14:2007 +A2:2012

Safety of woodworking machines — Circular sawing machines —

Part 14: Vertical panel sawing machines

ICS 79.120.10

BSI British Standards

National foreword

This British Standard is the UK implementation of EN 1870-14:2007+A2:2012. It supersedes BS EN 1870-14:2007+A1:2009 which is withdrawn.

The start and finish of text introduced or altered by amendment is indicated in the text by tags. Tags indicating changes to CEN text carry the number of the CEN amendment. For example, text altered by CEN amendment A1 is indicated by [A1〉 〈A1].

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

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

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

Compliance with a British Standard cannot confer immunity from legal obligations.

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English Version

Safety of woodworking machines - Circular sawing machines - Part 14: Vertical panel sawing machines

Sécurité des machines pour le travail du bois - Machines à scie circulaire - Partie 14: Scies à panneaux verticales

Sicherheit von Holzbearbeitungsmaschinen - Kreissägemaschinen - Teil 14: Vertikalplattenkreissägemaschinen

This European Standard was approved by CEN on 22 November 2007 and includes Amendment 1 approved by CEN on 20 August 2009 and Amendment 2 approved by CEN on 30 January 2012.

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-CENELEC 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-CENELEC Management Centre has the same status as the official versions.

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Foreword

This document (EN 1870-14:2007+A2:2012) has been prepared by Technical Committee CEN/TC 142 “Woodworking machines - Safety”, the secretariat of which is held by UNI.

This document shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by September 2012 and conflicting national standards shall be withdrawn at the latest by September 2012.

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

This document includes Amendment 1, approved by CEN on 2009-08-20, and Amendment 2, approved by CEN on 2012-01-30.

This document supersedes ⟦A2⟩ EN 1870-14:2007+A1:2009 ⟨A2⟧.

The start and finish of text introduced or altered by amendment is indicated in the text by tags ⟦A1⟩ ⟨A1⟧ and ⟦A2⟩ ⟨A2⟧.

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 ⟦A2⟩ Machinery Directive ⟨A2⟧.

⟦A2⟩ For relationship with EU Directive(s), see informative Annex ZA, which is an integral part of this document. ⟨A2⟧

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 ⟦A2⟩ EN ISO 12100:2010 ⟨A2⟧ 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*;

⟦A1⟩ *deleted text* ⟨A1⟧

— *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 saw benches/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)*;

〈A2〉

— *Part 18: Dimension saws*;

— *Part 19: Circular saw benches (with and without sliding table) and building site saws*. 〈A2〉

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, Croatia, 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, Turkey and the United Kingdom.

Introduction

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

This document is a type C standard as defined in [A2] EN ISO 12100:2010 [A2].

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

When provisions of this type C standard are different from those which are stated in type A or B standards, the provisions of this 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 vertical 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 [A2] EN 847-1:2005+A1:2007 [A2].

1 Scope

This document [A1] specifies all [A1] significant hazards, hazardous situations and events as listed in Clause 4 which are relevant to manually loaded and unloaded vertical panel sawing (with or without integrated feed) machines fitted with:

— the facility for scoring;

— an angle cutting device;

— a middle support device;

— a programmable stop for parallel vertical cuts;

— the facility for grooving with a width of at most 20 mm in one pass by using a milling tools,

hereinafter referred to as "machines" when they are used as intended and under the conditions foreseen by the manufacturer [A2] including reasonably foreseeable misuse [A2].

The machines are designed for cutting panels of the following materials:

a) wood based materials such as chipboard, fibreboard, plywood and also these materials where they are covered with plastic / light alloy laminates;

b) solid wood;

c) hardened rubber and hardened plastic material;

d) non ferrous materials e.g. light alloy;

e) compound materials with core consisting of polyurethane or mineral material laminated with light alloy.

This document does not apply to vertical panel saws with pressure beam and saw unit mounted behind the workpiece support.

This document does not deal with hazards relating to the combination of a single machine being used with any other machine (as part of a line).

This document is not applicable to vertical panel saws which are manufactured before the date of its publication as EN.

NOTE Machines covered by this standard are listed under [A2] 1.4 [A2] 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.

[A1] *deleted text* [A1]

[A2] EN 847-1:2005+A1:2007 [A2], *Tools for woodworking — Safety requirements — Part 1: Milling tools, circular saw blades*

[A2] EN 894-1:1997+A1:2008 [A2] *Safety of machinery — Ergonomics requirements for the design of display and control actuators — Part 1: General principles for human interactions with displays and control actuators*

[A2] EN 894-2:1997+A1:2008 [A2], *Safety of machinery — Ergonomics requirements for the design of displays and control actuators — Part 2: Displays*

[A2] EN 894-3:2000+A1:2008 [A2], *Safety of machinery — Ergonomics requirements for the design of display and control actuators — Part 3: Control actuators*

[A2] *deleted text* [A2]

[A2] EN 1005-1:2001+A1:2008 [A2], *Safety of machinery — Human physical performance — Part 1: Terms and definitions*

[A2] EN 1005-2:2003+A1:2008, *Safety of machinery — Human physical performance — Part 2: Manual handling of machinery and component parts of machinery* [A2]

[A2] EN 1005-3:2002+A1:2008 [A2], *Safety of machinery — Human physical performance — Part 3: Recommended force limits for machinery operation*

[A2] EN 1005-4:2005+A1:2008, *Safety of machinery — Human physical performance — Part 4: Evaluation of working postures and movements in relation to machinery* [A2]

[A2] EN 1037:1995+A1:2008 [A2], *Safety of machinery — Prevention of unexpected start-up*

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

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)*

[A2] EN 60439-1:1999[1)], [A2] *Low-voltage switchgear and controlgear assemblies — Part 1: Type-tested and partially type-tested assemblies (IEC 60439-1:1999)*

[A2] EN 60529:1991[2)], [A2] *Degrees of protection provided by enclosures (IP Code) (IEC 60529:1989)*

[A1] EN 61310-1:2008, *Safety of machinery — Indication, marking and actuation — Part 1: Requirements for visual, acoustic and tactile signals (IEC 61310-1:2007)* [A1]

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

[A2] *deleted text* [A2]

[A2] EN 61800-5-2:2007, *Adjustable speed electrical power drive systems — Part 5-2: Safety requirements — Functional (IEC 61800-5-2:2007)* [A2]

[A2] 1) EN 60439-1:1999 is impacted by EN 60439-1:1999/A1:2004. [A2]

[A2] 2)EN 60529:1991 is impacted by EN 60529:1991/A1:2000. [A2]

[A2] EN ISO 3743-1:2010, *Acoustics — Determination of sound power levels and sound energy levels of noise sources using sound pressure — Engineering methods for small movable sources in reverberant fields — Part 1: Comparison method for a hard-walled test room (ISO 3743-1:2010)* [A2]

[A2] EN ISO 3743-2:2009 [A2], *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)*

[A2] EN ISO 3744:2010, *Acoustics — Determination of sound power levels and sound energy levels of noise sources using sound pressure — Engineering methods for an essentially free field over a reflecting plane (ISO 3744:2010)* [A2]

[A2] EN ISO 3745:2009 [A2], *Acoustics — Determination of sound power levels of noise sources using sound pressure — Precision methods for anechoïc and semi-anechoïc rooms (ISO 3745:2003)*

[A2] EN ISO 3746:2010, *Acoustics — Determination of sound power levels and sound energy levels of noise sources using sound pressure — Survey method using an enveloping measurement surface over a reflecting plane (ISO 3746:2010)* [A2]

[A2] EN ISO 4414:2010, *Pneumatic fluid power — General rules and safety requirements for systems and their components (ISO 4414:2010)* [A2]

[A2] EN ISO 4871:2009 [A2], *Acoustics — Declaration and verification of noise emission values of machinery and equipment (ISO 4871:1996)*

[A2] EN ISO 9614-1:2009 [A2], *Acoustics — Determination of sound power levels of noise sources using sound intensity — Part 1: Measurement at discreet points (ISO 9614-1:1993)*

[A2] EN ISO 11202:2010, *Acoustics - Noise emitted by machinery and equipment - Determination of emission sound pressure levels at a work station and at other specified positions applying approximate environmental corrections (ISO 11202:2010)* [A2]

[A2] EN ISO 11204:2010, *Acoustics — Noise emitted by machinery and equipment — Determination of emission sound pressure levels at a work station and at other specified positions applying accurate environmental corrections (ISO 11204:2010)* [A2]

[A2] EN ISO 11688-1:2009 [A2], *Acoustics — Recommended practice for the design of low-noise machinery and equipment — Part 1: Planning (ISO/TR 11688-1:1995)*

[A2] EN ISO 12100:2010, *Safety of machinery — General principles for design — Risk assessment and risk reduction (ISO 12100:2010)* [A2]

[A1] EN ISO 13849-1:2008 [A1], *Safety of machinery — Safety-related parts of control systems — Part 1: General principles for design (ISO 13849-1:2006)*

[A1] EN ISO 13849-2:2008 [A1], *Safety of machinery — Safety-related parts of control systems — Part 2: Validation (ISO 13849-2:2003)*

[A2] EN ISO 13850:2008, *Safety of machinery — Emergency stop — Principles for design (ISO 13850:2006)* [A2]

[A1] EN ISO 13857:2008, *Safety of machinery — Safety distances to prevent hazard zones being reached by upper and lower limbs (ISO 13857:2008)* [A1]

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

3 Terms and definitions

A2

3.1 General A2

For the purposes of this document, the terms and definitions given in A2 EN ISO 12100:2010 A2 and the following apply.

A2

3.2 Definitions A2

A2 3.2.1 A2
vertical panel sawing machine
A2 machine designed for cutting panels where the work piece is supported in a near vertical plane during cutting where the saw unit is mounted in front of the workpiece support (example, see Figure 1)

NOTE The cut takes place either in a single straight vertical line by moving the saw unit along the moving beam or in a single horizontal line by moving the moving beam along the work piece support. The work piece is manually loaded and unloaded. The machine may have any of the following main features:

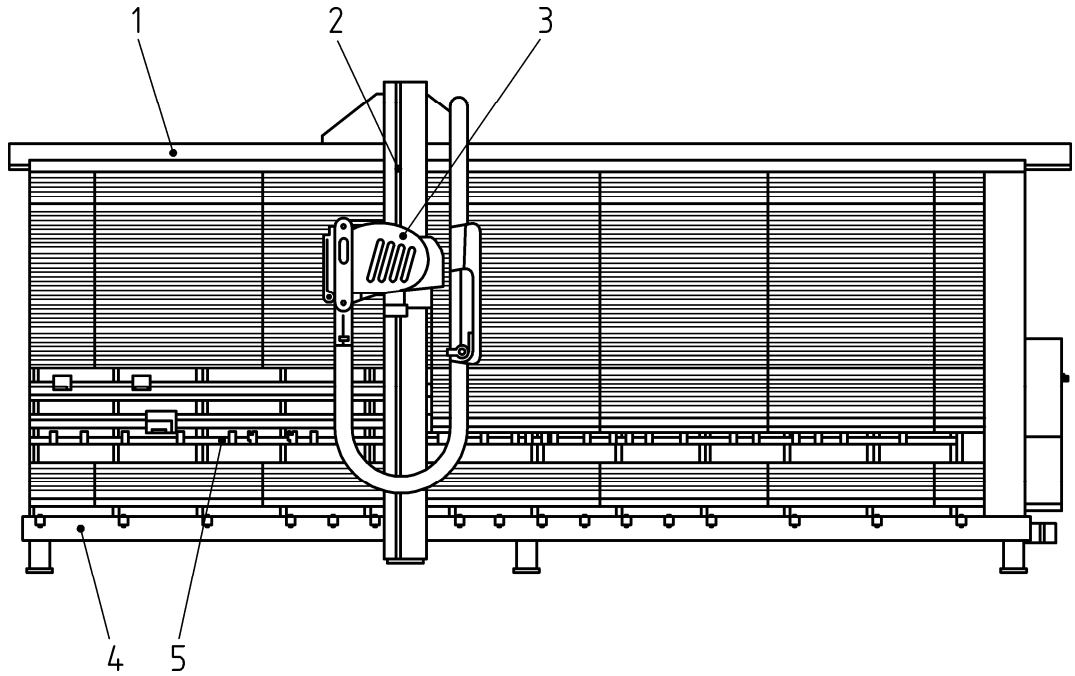
a) the facility for scoring;

b) an angle cutting device;

c) a middle support device;

d) a programmable stop for parallel vertical cuts;

e) the facility for using grooving tools. A2



Key

1 frame
2 moving beam
3 saw unit
4 base of workpiece support
5 middle support device

Figure 1 — Example of a vertical panel sawing machine

3.2.2
vertical panel sawing machine with hand feed
machine where the saw unit incorporating the saw blade is manually guided along the moving beam for vertical cuts or manually guided together with the moving beam along the workpiece support for horizontal cuts

3.2.3
vertical panel sawing machine with integrated feed
machine where the saw unit incorporating the saw blade has integrated feed for its vertical movement along the moving beam and / or for its horizontal movement by moving the moving beam along the work piece support

NOTE The saw blade is automatically projected through the work piece during the cutting stroke and then retracted together with the saw unit from the work piece to its rest position followed by the return stroke of the saw unit to its rest position.

3.2.4
manual loading
where the operator puts the work piece on the workpiece support i.e. there is no intermediate loading device to receive and transfer the work piece from the operator to the cutting position

3.2.5
manual unloading
where the operator removes the work piece from the workpiece support i.e. there is no intermediate unloading device to transfer the work piece from the cutting position to the operator

3.2.6
saw unit
supporting unit of the tool(s) e.g. saw blade(s), milling tool, which performs the cutting stroke

3.2.7
main saw blade
circular saw blade which is used for separating the work piece

3.2.8
scoring
the making of a shallow cut in the surface of a work piece, 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

3.2.9
scoring saw blade
saw blade mounted in front of the main saw blade which is designed for scoring

3.2.10
saw blade/saw unit rest position
position to which the saw unit returns at the end of each cut either power driven on integrated fed machines or manually on machines with hand feed

3.2.11
cutting cycle on integrated feed machines
movements of the saw unit incorporating the tool during the machining operation

NOTE The cutting cycle comprises:

a) movement of the saw unit with the tool from its rest position to the cutting position;

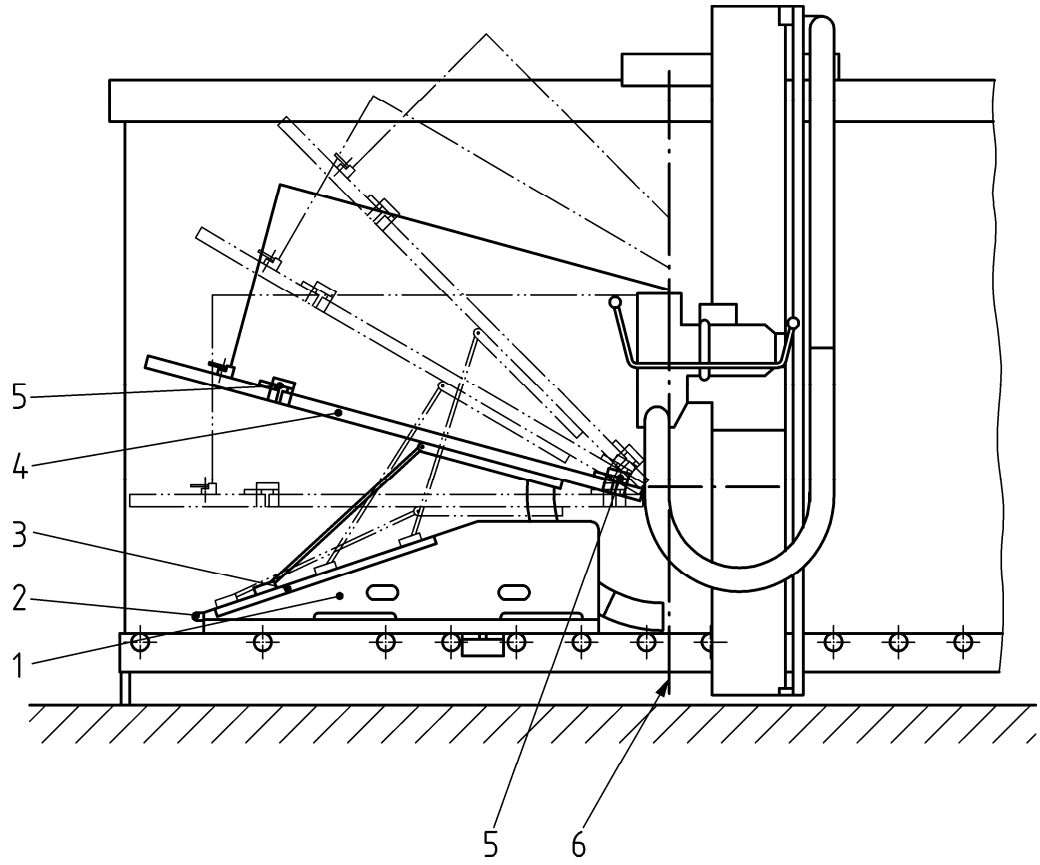
b) movement of the saw unit from its cutting position either along the moving beam (vertical cutting) or together with the moving beam through the cutting stroke (horizontal cutting);

c) returning of the saw unit to its rest position.

A further movement of the saw unit along the moving beam or of the moving beam with saw unit back to their starting positions may follow.

3.2.12
middle support device
device for supporting a work piece with small dimensions fitted to the work piece support

3.2.13
angle cutting device
device fitted to the work piece support of the machine (example see Figure 2)



Key

1 support system
2 lockable device for adjusting the cutting angle
3 scale for indicating the adjusted cutting angle
4 work piece support
5 work piece clamping
6 cutting line

Figure 2 — Example of an angle cutting device

3.2.14
programmable stop for vertical cuts
device fitted to the work piece support of the machine designed for vertical cuts at predetermined dimensions

3.2.15
machine actuator
power mechanism used to effect motion on the machine

3.2.16
run-down time
time elapsed from the actuation of the stop control device up to spindle standstill

3.2.17
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

deleted text

3.2.18
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

NOTE 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 (EN ISO 13849-1:2008, 3.1) .

3.2.19
embedded software (SRESW)
software that is part of the system supplied by the control manufacturer and which is not accessible for modification by the user of the machinery

NOTE 1 Firmware or system software are examples of embedded software (EN ISO 13849-1:2008, 3.1.37).

NOTE 2 Manufacturer means manufacturer of the system.

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

3.2.20
application software (SRASW)
software specific to the application, implemented by the machine manufacturer, and generally containing logic sequences, limits and expressions that control the appropriate inputs, outputs, calculations and decisions necessary to meet the SRP/CS requirements

[EN ISO 13849-1:2008, 3.1.36]

3.2.21
performance level PL
discrete level used to specify the ability of safety-related parts of control systems to perform a safety function under foreseeable conditions

[EN ISO 13849-1:2008, 3.1.23]

4 List of significant hazards

This clause contains all significant hazards, hazardous situations and events (see EN ISO 12100:2010) *deleted text*, 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.

〈A2〉 Table 1 — List of significant hazards

No	Hazards, hazardous situations and hazardous events	EN ISO 12100:2010	Relevant clause of this document
1	**Mechanical hazards** related to: - machine parts or workpieces due to:		
	a) shape;	6.2.2.1, 6.2.2.2, 6.3	5.3.3, 5.3.5, 5.3.6, 5.3.7, 5.4.3, 6.2, 6.3, Annex B
	b) relative location;		5.2.2, 5.3.7, 6.2
	c) mass and stability (potential energy of elements which may move under the effect of gravity);		5.2.6, 5.3.6
	d) mass and velocity (kinetic energy of elements in controlled or uncontrolled motion);		5.3.6
	e) mechanical strength.		5.3.2, 5.3.6, 5.3.7, Annex A, Annex C, Annex D, Annex E
	- accumulation of energy inside the machinery by:		
	f) elastic elements (springs);	6.2.10, 6.3.5.4	5.4.5
	g) gases under pressure.		5.4.6, 5.4.10, 6.3
1.1	Crushing hazard		5.3.6, 5.3.7, 5.3.8
1.2	Shearing hazard		5.3.7, 5.3.8
1.3	Cutting or severing hazard		5.2.6, 5.3.7, 6.1
1.4	Entanglement hazard		5.3.7, 5.3.8
1.5	Drawing-in or trapping hazard		5.3.7, 5.3.8
1.6	Impact hazard		5.2.6, 5.3.6, 5.3.7
1.9	High pressure fluid injection or ejection hazard	6.2.10	5.3.2, 5.3.5, 6.3
2	**Electrical hazards** due to:		
2.1	Contact of persons with live parts (direct contact)	6.2.9, 6.3.5.4	5.4.4, 5.4.10
2.2	Contact of persons with parts which have become live under faulty conditions (indirect contact)	6.2.9	5.4.4, 5.4.10
2.4	Electrostatic phenomena	6.2.9	5.4.8
4	**Hazards generated by noise**, resulting in:		
4.1	Hearing loss (deafness), other physiological disorders (loss of balance, loss of awareness)	6.2.2.2, 6.3	5.4.2
4.2	Interference with speech communication, acoustic signals	6.2.2.2, 6.3	6.3

(to be continued)

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

7	**Hazards generated by materials and substances (and their constituent elements) processed or used by the machinery**		
7.1	Hazards from contact with or inhalation of harmful fluids and dusts	6.2.3b, 6.2.4	5.4.3, 6.3
7.2	Fire	6.2.4	5.4.1
8	**Hazards generated by neglecting ergonomic principles in machinery design**:		
8.1	Unhealthy postures or excessive effort	6.2.7, 6.2.8.2, 6.2.11.12, 6.3.5.5, 6.3.5.6	5.2.2, 5.4.5
8.2	Hand-arm or foot-leg anatomy	6.2.8.3	5.4.5
8.4	Local lighting	6.2.8.6	6.3
8.5	Mental overload and underload, stress	6.2.8.5	6.3
8.6	Human error, human behaviour	6.2.8, 6.2.11.8, 6.2.11.10, 6.3.5.2, 6.4	5.4.9, 6.3
8.7	Design, location or identification of manual controls	6.2.8.7, 6.2.11.8	5.2.2
8.8	Design or location of visual display units	6.2.8.8, 6.4.2	5.2.2
9	**Combination of hazards**	6.3.2.1	5.2.3, 5.2.5, 5.2.6, 5.2.9, 5.3.5, 5.4.10, 5.4.11
10	**Unexpected start-up, unexpected overrun / overspeed (or any similar malfunction)** from:		
10.1	Failure/disorder of the control system	6.2.11, 6.3.5.4	5.2.1, 5.2.9, 5.4.11, 6.1
10.2	Restoration of energy supply after an interruption	6.2.11.4	5.2.8, 5.4.6
10.3	External influences on electrical equipment	6.2.11.11	5.2.1, 5.4.7
10.4	Other external influences (gravity)	6.2.12.1	5.3.3, 5.3.5
10.5	Errors in the software	6.2.11.7	5.2.1
10.6	Errors made by the operator (due to mismatch of machinery with human characteristics and abilities, see 8.6)	6.2.8, 6.2.11.8, 6.2.11.10, 6.3.5.2, 6	5.2.2, 5.4.5, 6.3
11	**Impossibility of stopping the machine in the best possible conditions**	6.2.11.1, 6.2.11.3, 6.3.5.2	5.2.4, 5.2.5, 5.4.10
12	**Variations in the rotational speed of tools**	6.2.2.2, 6.3.3	5.2.7
13	**Failure of the power supply**	6.2.11.1, 6.2.11.4	5.2.8
14	**Failure of the control circuit**	6.2.11, 6.3.5.4	5.2.9
15	**Errors of fitting**	6.2.7, 6.4.5	5.4.9
16	**Break-up during operation**	6.2.3	5.3.2
17	**Falling or ejected objects or fluids**	6.2.3, 6.2.10	5.3.5
18	**Loss of stability / overturning of machinery**	6.3.2.6	5.3.1

〈A2

5 Safety requirements and / or measures

5.1 General

The machine shall comply with the safety requirements and / or protective measures of Clause 5.

NOTE 1 In addition, the machine should be designed according to the principles of [A2] EN ISO 12100:2010 [A2] 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 [A2] EN ISO 12100:2010, 6.2 [A2] and for safeguarding measures see [A2] EN ISO 12100:2010, 6.3 [A2].

5.2 Controls

5.2.1 Safety and reliability of control systems

[A2] *deleted text* [A2]

[A2] For the purpose of this document, safety related part of a control system means the system from the initial actuator or position detector or sensor up to and including the power control element of the final machine final actuator 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 at least the requirements of the PL given below in accordance with the requirements of EN ISO 13849-1:2008: [A2]

a) for starting and restarting: [A2] PL = c [A2] (see 5.2.3, 5.2.6);

b) for prevention of unexpected start up: [A2] PL = c [A2] (see 5.2.9);

c) for normal stopping: [A2] PL = c [A2] (see 5.2.4);

d) for emergency stop: [A2] PL = c [A2] (see 5.2.5);

e) for enabling devices: [A2] PL = c [A2] (see 5.3.6.4 and 5.3.7.3);

f) for hold-to-run control devices: [A2] PL = c [A2] ([A2] PL = b [A2] is allowed if the hold-to-run control device is combined with an enabling device [A2] PL = c [A2]) (see 5.3.6.4 and 5.3.7.3);

g) for interlocking of guards: [A2] PL = c [A2] (see 5.3.7, 5.3.8);

h) for interlocking of functions: [A2] PL = c [A2] (see 5.2.3.1, 5.2.6, 5.2.7, 5.3.4, 5.3.7.3);

i) for speed changing and indication of the selected speed: [A2] PL = b [A2] (see 5.2.7);

j) for powered movement of the saw blade, saw unit and moving beam: [A2] PL = c [A2] (see 5.2.3, 5.2.4, 5.2.5, 5.2.6, 5.3.7);

k) for monitoring the operating maximum speed of the stroke of the saw unit and of the moving beam on machines with integrated feed: [A2] PL = c [A2] (see 5.2.6);

l) for powered movement of the programmable stop: [A2] PL = c [A2] (see 5.3.6.4);

m) for braking: [A2] PL = b or PL = c [A2] (see 5.3.4).

[A2] Where magnetic / proximity switches are used they shall be in accordance with the requirements of 6.2 of EN 1088:1995+A2:2008 and the related control system shall conform to at least PL = c in accordance with the requirements of EN ISO 13849-1:2008. [A2]

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

[A2] *deleted text* [A2]

5.2.2 Position of controls

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

The electrical hand-operated controls of the machine i.e. for starting, normal stopping, cutting stroke / return stroke (machines with integrated feed), for the programmable stop (if fitted) and for tool spindle speed changing (if fitted) shall be positioned on the front side of the main control panel fixed at the moving beam.

The hand-operated controls for the power driven saw unit infeed / outfeed movement shall be positioned either on the saw unit or on the front side of the main control panel fixed at the moving beam.

An emergency stop control device shall be provided on the front side of the main control panel together with the normal start and stop controls.

For machines with integrated feed additional emergency stop control devices shall be provided at each end of the machine frame and on any auxiliary control panel.

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

5.2.3 Starting

Before starting or restarting of the machine all interlocked guards shall be in place and functional. This is achieved by the interlocking arrangements described in 5.3.7.

For electrically operated machines the requirements of 9.2.5.2 of EN 60204-1:2006 apply but the exceptions referred to and described in 9.2.4 of EN 60204-1:2006 are not relevant.

Start or restart shall only be possible by actuation of the start control device provided for that purpose.

▌A2⟩ The safety related part of the control systems (see also 5.2.1) for:

a) starting or restarting the tool spindle;

b) pivoting movement of the saw unit;

c) infeed / outfeed movement of the saw unit on machines with hand feed;

d) starting the cutting cycle or for initiation of the start of the cutting cycle on machines with integrated feed

shall be at least PL = c in accordance with the requirements of EN ISO 13849-1:2008.

The safety related part of the control system for the cutting cycle movements on machines with integrated feed shall be at least PL = b in accordance with the requirements of EN ISO 13849-1:2008. ⟨A2▌

Only one powered integrated feed movement shall be possible at any one time.

At the end of the integrated feed / pivoting movement power is cut to the corresponding machine actuators. A time delay device of fail safe technique may be used for cutting power with time delay corresponding to the maximum time for the integrated feed movement ▌A2⟩ , e.g. of capacity type conforming to PL = c in accordance with the requirements of EN ISO 13849-1:2008 ⟨A2▌. Either the time delay shall be fixed or the time delay adjustment device shall be sealed. A new initiation shall be necessary to perform an additional integrated feed movement.

Starting the saw unit pivoting movement shall only be possible when the saw unit is in its rest position.

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

5.2.4.1 General

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

[A2] NOTE For normal stopping of PDS(SR) (power drive system, safety related) see 4.2.2.2 "safe torque off (STO)" and 4.2.2.3 "safe stop 1 (SS1)" of EN 61800-5-2:2007. [A2]

The design of the control circuits shall be such as to satisfy the normal stopping sequences required in 5.2.4.3 and 5.2.4.4. If a time delay device is used the time delay shall be at least the maximum run-down time. Either the time delay shall be fixed or the time delay adjustment device shall be sealed.

[A2] The safety related part of the control system (see also 5.2.1) for normal stopping shall be at least PL = c in accordance with the requirements of EN ISO 13849-1:2008. [A2]

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

5.2.4.2 Additional stops

[A2] Additional stop controls in PL = b in accordance with the requirements of EN ISO 13849-1:2008 for control systems including electronic components shall only be possible for: [A2]

a) the saw blade infeed / outfeed movement;

b) the saw unit feed movement;

c) the saw unit pivoting movement.

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

5.2.4.3 Vertical panel sawing machines with hand feed

If the machine is fitted with a mechanical brake, the stop control required by 5.2.4.1 shall be a category 0 stop in accordance with the requirements of 9.2.2 of EN 60204-1:2006.

If the machine is fitted with an electrical brake, the stop control required by 5.2.4.1 shall be a category 1 stop in accordance with the requirements of 9.2.2 of EN 60204-1:2006 and the stopping sequence shall:

a) cut power to the tool spindle drive motor and apply the brake;

b) cut power to the brake actuator after the tool(s) has come to rest e.g. by a time delay of fail safe technique [A2], e.g. of capacity type conforming to PL = c in accordance with the requirements of EN ISO 13849-1:2008 [A2].

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

5.2.4.4 Vertical panel sawing machines with integrated feed

The stop control required by 5.2.4.1 shall be a category 1 stop in accordance with the requirements of 9.2.2 of EN 60204-1:2006 and the stopping sequence shall be:

a) stop any saw unit traversing movement, retract the saw blade to its rest position and cut power to the tool spindle drive motor and actuate the brake (if provided); and afterwards

b) cut power to other machine actuators (e.g. programmable stop if fitted);

c) cut power to the brake actuator (if electrical) after the tool(s) has come to rest e.g. by a time delay of fail safe technique [A2] , e.g. of capacity type conforming to PL = c in accordance with the requirements of EN ISO 13849-1:2008 [A2].

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

5.2.5 Emergency stop

5.2.5.1 General

The requirements of [A2] EN ISO 13850:2008 [A2] apply and in addition:

[A2] NOTE For emergency stop of PDS(SR) (power drive system, safety related) see 4.2.2.2 "safe torque off (STO)" and 4.2.2.3 "safe stop 1 (SS1)" of EN 61800-5-2:2007. [A2]

The machine shall be fitted with emergency stop control(s) positioned in accordance with the requirements of 5.2.2 which, when actuated shall disconnect power from all the machine actuators and actuate the brake (if provided – see 5.3.4).

The stopping sequences required in 5.2.4.3 and 5.2.4.4 shall be satisfied at the level of the control circuits. If a time delay device is used the time delay shall be at least the maximum run-down time. Either the time delay shall be fixed or the time delay adjustment device shall be sealed.

[A2] The safety related part of the control circuits (see also 5.2.1) for the emergency stop shall be at least PL = c in accordance with the requirements of EN ISO 13849-1:2008. [A2]

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

5.2.5.2 Vertical panel sawing machines with hand feed

In addition to the requirements of 5.2.5.1 the following requirements apply:

If the machine is fitted with a [A2] spring operated mechanical brake [A2], the emergency stop control shall be a category 0 stop in accordance with the requirements in 4.1.4 of [A2] EN ISO 13850:2008 [A2] and in accordance with the requirements in 10.7 of EN 60204-1:2006. 10.7.4 of EN 60204-1:2006 does not apply. The emergency stop control device shall be at any time of self latching type.

The emergency stop control circuit shall conform to category 0 in accordance with the requirements in 9.2.5.4 of EN 60204-1:2006.

If the machine is fitted with [A2] any other type of brake e.g. an electrical brake [A2], the emergency stop control shall be a category 1 stop in accordance with the requirements in 4.1.4 of [A2] EN ISO 13850:2008 [A2] and in accordance with the requirements in 10.7 of EN 60204-1:2006. The emergency stop control circuit shall conform to category 1 in accordance with the requirements of 9.2.5.4 of EN 60204-1:2006.

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

5.2.5.3 Vertical panel sawing machines with integrated feed

In addition to the requirements of 5.2.5.1 the following requirements apply:

The emergency stop control shall be a category 1 stop in accordance with the requirements in 4.1.4 of ▌A2⟩ EN ISO 13850:2008 ⟨A2▌ 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 of EN 60204-1:2006.

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

5.2.6 Cutting cycle on vertical panel sawing machines with integrated feed

The cutting cycle on machines with integrated feed shall only be possible when the saw blade drive motor is running at full selected speed e.g. by using a time delay ▌A2⟩ , e.g. of capacity type conforming to PL = c in accordance with the requirements of EN ISO 13849-1:2008 ⟨A2▌.

The sequence of a cutting cycle which is composed of only one cut shall be as follows:

a) for a vertical cut the moving beam is locked in one of the vertical cutting positions; for a horizontal cut the saw unit is turned in horizontal cutting position and fixed e.g. clamped on the moving beam;

b) the saw unit moves from its rest position to its cutting position;

c) the saw unit (for vertical cuts) or the moving beam (for horizontal cuts) moves for cutting;

d) the saw unit or the moving beam stops the integrated feed either at the end of the workpiece support or at the end of the workpiece e.g. by detecting the position of the self closing saw blade moveable guard (pressure shoe);

e) the tool shall move back to its rest position;

f) after the tool has reached its rest position the return stroke either starts immediately by the machine itself or by the operator. A selecting control device shall be provided to choose one of the two possibilities.

The maximum speed of the stroke of the saw unit and of the moving beam on which it is mounted shall not exceed 25 m min^{-1}.

See also 5.3.7.3.

▌A2⟩ The safety related part of the control system for the selecting control device shall be at least PL = b in accordance with the requirements of EN ISO 13849-1:2008.

The safety related part of the control system (see also 5.2.1) for the interlocking arrangements and stroke maximum speed shall be at least PL = c in accordance with the requirements of EN ISO 13849-1:2008. ⟨A2▌

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

▌A2⟩ The safety related part of the control system (see also 5.2.1) for the indication of the selected speed shall be at least PL = b in accordance with the requirements of EN ISO 13849-1:2008. ⟨A2▌

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 ⟦A2⟩ EN 1037:1995+A1:2008 ⟨A2⟧. For electrically driven machine actuators 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.

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 ⟦A2⟩ EN 1037:1995+A1:2008 ⟨A2⟧ 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 ⟦A2⟩ EN ISO 4414:2010 ⟨A2⟧ not result in the loss of a safety function e.g. involuntary start of dangerous movement e.g. saw blade rotation, saw unit movement or moving beam movement.

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 tool(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 tool guards

Ultimate tensile strength N mm^{-2}	Minimum thickness mm
60	7
120	6
180	5
240	4
300	3

[A2]

c) polycarbonate with a wall thickness of at least 3 mm or other plastic material passing the test given in Annex A; [A2]

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

[A2] *Verification:* By checking the relevant drawings, tensile strength, performing the test in Annex A, for plastic materials other than polycarbonate and inspection of the machine. [A2]

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 [A2] Annex B [A2].

If the machine is designed for using grooving tools the following requirements shall be met:

a) if the machine is fitted with tool(s) they shall be in accordance with the requirements of [A2] EN 847-1:2005+A1:2007 [A2] and shall be a tool for hand fed machines in accordance with 6.2.1 of [A2] EN 847-1:2005+A1:2007 [A2];

b) the maximum cutting width of the tool shall not exceed 20 mm;

c) a device to adjust the depth of the groove and to maintain it during machining shall be provided e.g. ball ring guides.

See also 5.3.7.2.

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

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 Tool 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 tool spindle where the un-braked run-down time exceeds 10 s. The braked run-down time shall be less than 10 s.

[A2] A PL_r of at least c for the braking function shall be achieved.

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

Where a spring operated mechanical brake or any other type of brake not using electronic components is fitted the last paragraph of 9.3.4 of EN 60204-1:2006 does not apply and the minimum life time of the friction coating and method of replacement shall be given (see 6.3). [A2]

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

[A2] *deleted text* [A2]

[A2] As an exception where an electrical braking system is used and contains electronic components the control system for braking shall be at least PL = b and designed at least in accordance with the requirements of category 2 of EN ISO 13849-1:2008 with the exception that the test rate requirement in 4.5.4 of EN ISO 13849-1:2008 is not applicable. The safety related part of the control system for braking shall be tested periodically, e.g. by monitoring braked run down time. The feedback shall come from either the encoder fitted to the spindle motor or from the measurement of the residual current in the wires powering the motor. The test shall:

1) be independent from the basic control system for braking or an internal watch dog shall be provided in the control system for breaking;

2) be independent from the intention of the operator;

3) be performed at each spindle stop. [A2]

A negative test shall be indicated. Where the test result is negative more than three times in sequence it shall not be possible to operate the machine (see also 6.1).

[A2] The diagnostic coverage (DC_{avg}) shall be ≥ 60%.

NOTE 1 See Annex E of EN ISO 13849-1:2008 for DC estimation. [A2]

[A2] As an exception to 5.2.1, a simple electronic brake (using simple electronic parts like rectifiers, transistors, triacs, diodes, resistors, thyristors) may be PL = b and designed in category 1 in accordance with the requirements of EN ISO 13849-1:2008 if the “mean time to a dangerous failure” (MTTFd) according to Table 5 of EN ISO 13849-1:2008 reaches a value of “high” (at least 30 years).

NOTE 2 Complex electronic components like e.g. microprocessors or PLCs cannot be considered as well tried under the scope of EN ISO 13849-1:2008 and do therefore not fulfil the requirements of category 1. [A2]

[A2] NOTE 3 For calculating the probability of occurrence of a dangerous failure for a simple electronic brake component with no fault detection (no DC) and no testing capability (category 1) the procedure described in Annex D of EN ISO 13849-1:2008 can be used. [A2]

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 if applicable the braked run-down time see the appropriate tests described in [A2] Annex E [A2].

5.3.5 Devices to minimise the possibility or the effect of ejection

Vertical panel saws shall be supplied with a riving knife.

The riving knife and its mounting arrangement shall be in accordance with the following requirements:

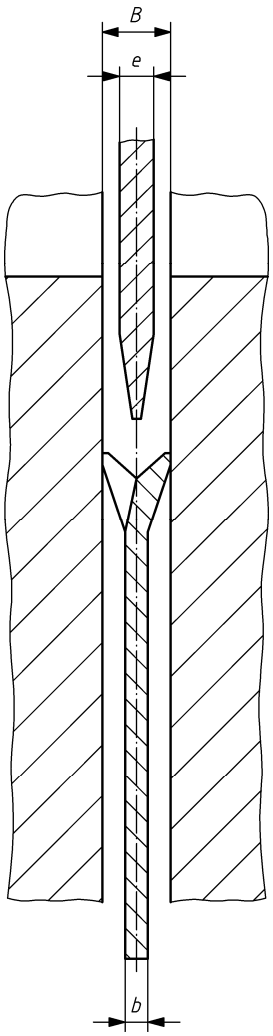
a) For cuts which start other than at the edge of the work piece the riving knife shall be capable of being retracted under manual control and automatically held in the retracted position. When the saw blade next returns to its rest position the riving knife shall automatically return to its normal operating position.

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

b) it shall be manufactured from steel with a minimum tensile strength of 580 N mm^{-2}, or of a comparable material, have flat sides (within 0,1 mm in 100 mm) and shall have a thickness less than the width of cut (kerf) and at least 0,2 mm greater than the saw blade plate (see Figure 3).

Verification: By checking the relevant drawings, measurement of kerf width, thickness, flatness.

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



Key

e riving knife thickness

B width of saw blade cut (kerf)

b saw blade thickness

Figure 3 — Riving knife thickness in relation to saw blade dimensions

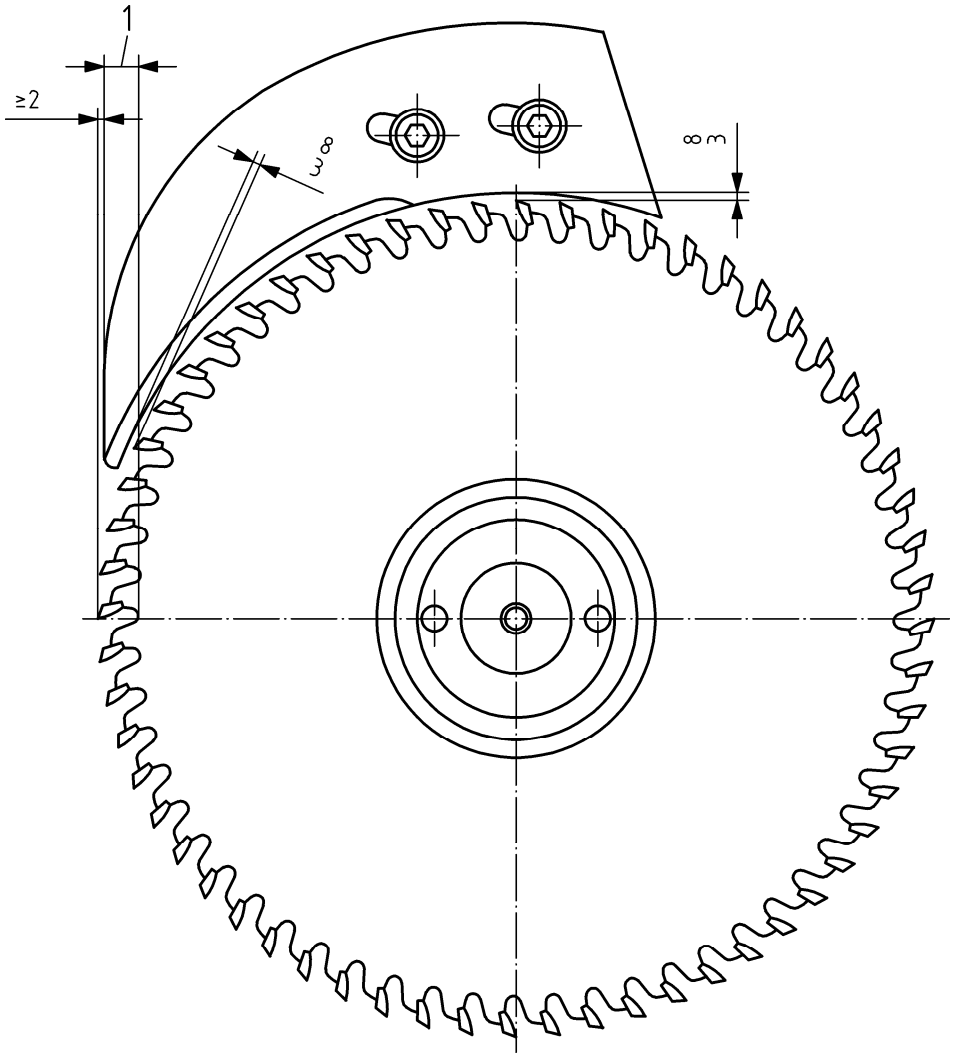
c) The leading edge of the riving knife shall be chamfered to provide a lead in and the riving knife shall be of constant thickness (within ± 0,05 mm) throughout its working length.

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

d) The riving knife shall be capable of adjustment so that its tip reaches a point located between the root of the saw teeth and a point which is at most 2 mm below the periphery of the aw blade when set in accordance with the requirements of this document (see Figure 4 a)).

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

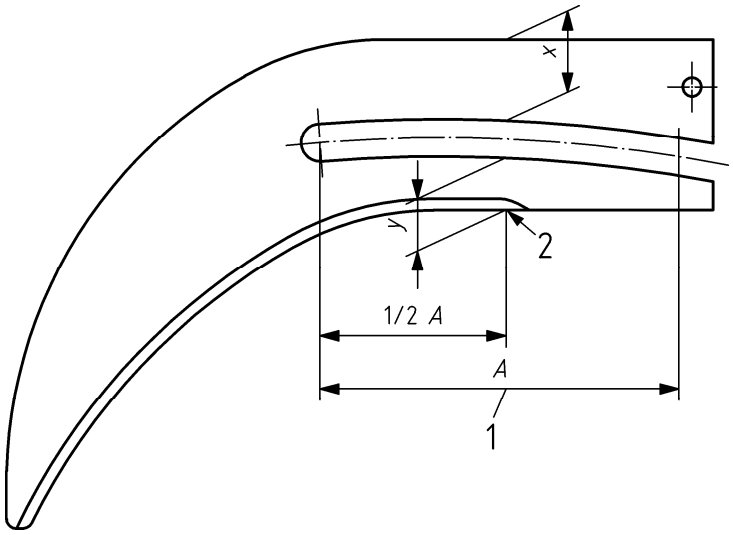
Dimension in millimetres



Key

1 riving knife tip adjustment area

a) Riving knife tip adjustment



Key

1 fixing area

2 measuring point

b) Riving knife mounting dimensions

Figure 4 — Riving knife adjustment

e) The riving knife shall be designed so that when it is mounted and adjusted so that its closest point to the saw blade is 3 mm from the saw blade, then at no point shall the gap between the saw blade and the riving knife exceed 8 mm, measured radially through the centre of the saw spindle (see Figure 4 a)).

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

f) The riving knife fixing arrangement shall be such that the position of the riving knife is within the width of saw blade cut (kerf).

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

g) The arrangement for fixing the riving knife shall be such that its stability is able to satisfy the requirements laid down in [A2] Annex C [A2]. or the following condition shall be met:

$$X + Y \geq \frac{D_{max}}{6}$$

where $X = Y \pm 0{,}5\ Y$

where D_{max} is the maximum saw blade diameter for which the riving knife can be used;

X and Y shall be measured midway along the riving knife fixing slot in the fixing area (see Figure 4 b)).

The fixing plates dimension shall not be less than 2 mm that of the riving knife in the fixing area.

Verification: By checking the relevant drawings and measurements or carrying out the test in accordance with [A2] Annex C [A2].

h) The riving knife shall conform to the lateral stability test laid down in [A2] Annex D [A2].

Verification: By checking the relevant drawings and carrying out the test in accordance with [A2] Annex D [A2].

i) The riving knife shall be held in position by guiding elements, e.g. guiding pins. The riving knife fixing slot shall be no more than 0,5 mm wider than the guiding elements.

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

5.3.6 Work piece supports and guides

5.3.6.1 Work piece support

When the panel is placed on the machine, it shall be stable. In order to achieve this, the minimum angle between the workpiece support and the vertical shall be 5°.

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

At the base of the workpiece support, arrangements shall be made to prevent the panel from slipping off the machine, e.g. by provision of elements protruding the workpiece support by at least 5 mm.

Where rollers are provided, the gaps between rollers shall be filled in, except in those areas where it is necessary for the saw unit to pass below the level of these rollers.

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

Any workpiece supporting structure behind the panel which is capable of being contacted by the saw blade shall be made of wood, wood based materials, such as chipboard, fibreboard, plywood or plastic or light alloy.

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

5.3.6.2 Middle support device

If the machine is fitted with a middle support device for cutting small work pieces this device shall be in accordance with the following requirements:

a) it shall be hinged to the frame supporting the work piece support of the machine so that it can be turned from its rest position behind the machine workpiece support to its working position in front of the machine workpiece support and vice versa. It shall be possible to handle these movements easily e.g. by providing a grip or by design of the middle support device;

b) it shall be mechanically locked in the working position and the return movement to the rest position shall only be possible after having released the locking device;

c) any workpiece supporting structure which is capable of being contacted by the saw blade shall be made of wood, wood based materials, such as chipboard, fibreboard, plywood or plastic or light alloy;

d) provision shall be made that it cannot fall from its rest position inadvertently into the working position e.g. by fitting a locking device or be so designed that it is held in the rest position by gravity.

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

5.3.6.3 Angle cutting device

If the machine is fitted with an angle cutting device it shall be in accordance with the following requirements:

a) the machine frame shall be provided with end stops for correct positioning of the supporting system of its adjustable work piece support;

b) it shall be possible to fix the device securely to the machine frame e.g. by screwing;

c) any work piece supporting structure which is capable of being contacted by the saw blade shall be made of wood, wood based materials, such as chipboard, fibreboard, plywood or plastic or light alloy;

d) for cutting different angles its work piece support shall be adjustable between 0° to 45° to the horizontal cutting line of the saw unit;

e) it shall be possible to lock the workpiece support in the adjusted angle position;

f) the device shall be fitted with a scale for indicating the adjusted angle, which shall be so designed and positioned that the adjusted angle is indicated directly and easy legible e.g. by using a magnifying glass.

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

5.3.6.4 Programmable stop

If the machine is fitted with a programmable stop it shall be in accordance with the following requirements:

a) the maximum speed of the stop movement shall not exceed 25 m min^{-1};

b) any workpiece supporting structure which is capable of being contacted by the saw blade shall be made of wood, wood based materials, such as chipboard, fibreboard, plywood or plastic or light alloy;

c) crushing and shearing hazards between the stop and fixed parts of the machine e.g. frame shall be avoided either:

[A2]

— by controlling any programmable stop movement by means of a hold-to-run control device the control system of which is PL = c in accordance with the requirements of EN ISO 13849-1:2008; alternatively the control circuit may be PL = b in accordance with the requirements of EN ISO 13849-1:2008 if used in conjunction with an enabling device in PL = c in accordance with the requirements of EN ISO 13849-1:2008, the control system for the movement itself can be PL = b in accordance with the requirements of EN ISO 13849-1:2008; or [A2]

— by limiting the maximum force at the shearing or crushing point to 50 N maximum.

[A2] The safety related part of control system (see also 5.2.1) for the monitoring the operating speed shall be at least PL = b in accordance with the requirements of EN ISO 13849-1:2008. [A2]

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

5.3.7 Prevention of access to moving parts

5.3.7.1 Safeguarding of the rear frame

Access to moving parts (e.g. rotating tool, powered movements of the saw unit or the moving beam) from the rear side of the machine shall be prevented by filling in the rear frame. Any gaps in rear guarding system shall be in accordance with the safety distances specified in [A1] 4.2.4.1 of EN ISO 13857:2008 [A1].

If the filling in material is capable of being contacted by the saw blade it shall be made of wood, wood based materials, such as chipboard, fibreboard, plywood or plastic or light alloy.

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

5.3.7.2 Safeguarding of the tool

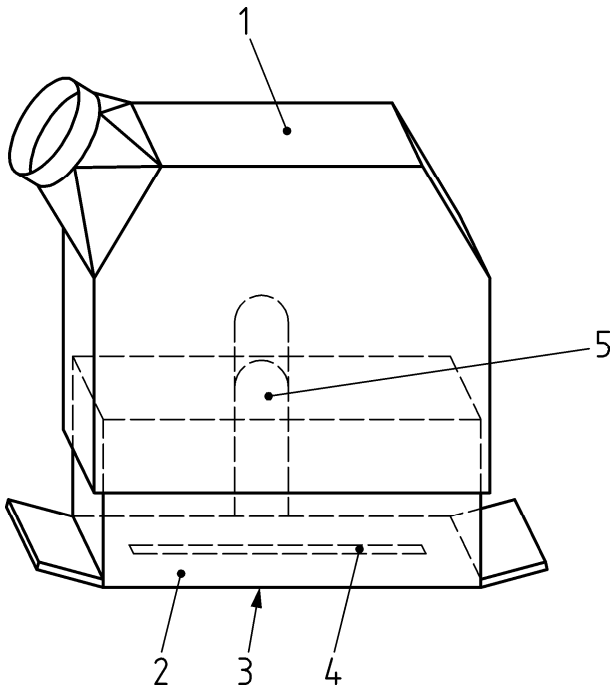
Access to the saw blade in front of the work piece support shall be prevented by means of a combination of a fixed guard and a self closing moveable guard (pressure shoe) through which the saw blade projects during cutting, and which encloses the saw blade when retracted from the workpiece (see Figure 5). [A2] Fixed guards that are to be demounted by the user e.g. for maintenance and cleaning purposes shall be fitted with unlosable screws; see 6.3 x). [A2] When the saw unit is in the rest position, the self closing moveable guard shall be locked in position so as to prevent access to the saw blade.

The slot for the saw blade in the sliding surface of the self closing moveable guard through which the saw blade projects during the cutting operation shall be designed in accordance with the requirements for safety distances in [A1] 4.2.4.1 of EN ISO 13857:2008 [A1].

The material of the slot lining in the sliding surface of the pressure shoe or the sliding surface itself shall be plastic, e.g. polypropylene, polyamide, polyethylene or other plastics with similar characteristics or light alloy.

Openings necessary for the tool spindle(s) including the spindle nut(s) (see Figure 5) and the adjustment of the riving knife in the self closing moveable guard shall be reduced to a clearance of 4 mm maximum.

Where access to the tool is required for maintenance and servicing, then the guarding system shall incorporate a movable guard which is interlocked with the tool spindle drive motor and on machines with integrated feed also with the drive motor of the saw unit and moving beam.



Key

1 fixed guard preventing access to the saw blade
2 self closing moveable guard (pressure shoe)
3 sliding surface
4 slot for the saw blade
5 tool spindle opening

Figure 5 — Example of saw blade guarding system - Pressure shoe preventing access to saw blade

If the machine is designed for using grooving tools the self closing moveable guard (pressure shoe) of the tool guarding system shall be replaceable with a further pressure shoe to prevent access to the mounted grooving tool.

This pressure shoe shall fulfil the following requirements:

a) when the grooving tool unit (saw unit fitted with grooving tool) is in the rest position the pressure shoe shall be locked in position such that the grooving tool does not project the sliding surface of the pressure shoe. The minimum distance between the sliding surface and the grooving tool of maximum diameter for which the machine is designed shall be 15 mm;

b) in working position for the maximum grooving depth the pressure shoe shall not be capable of being retracted by more than 6 mm from the workpiece surface (see Figure 6). It shall not be possible to lock the pressure shoe inside the moving travel;

NOTE The maximum grooving depth itself is limited by a limiting device e.g. a disk fixed together with the grooving tool.

c) the slot in the sliding surface of the pressure shoe shall be limited such that:

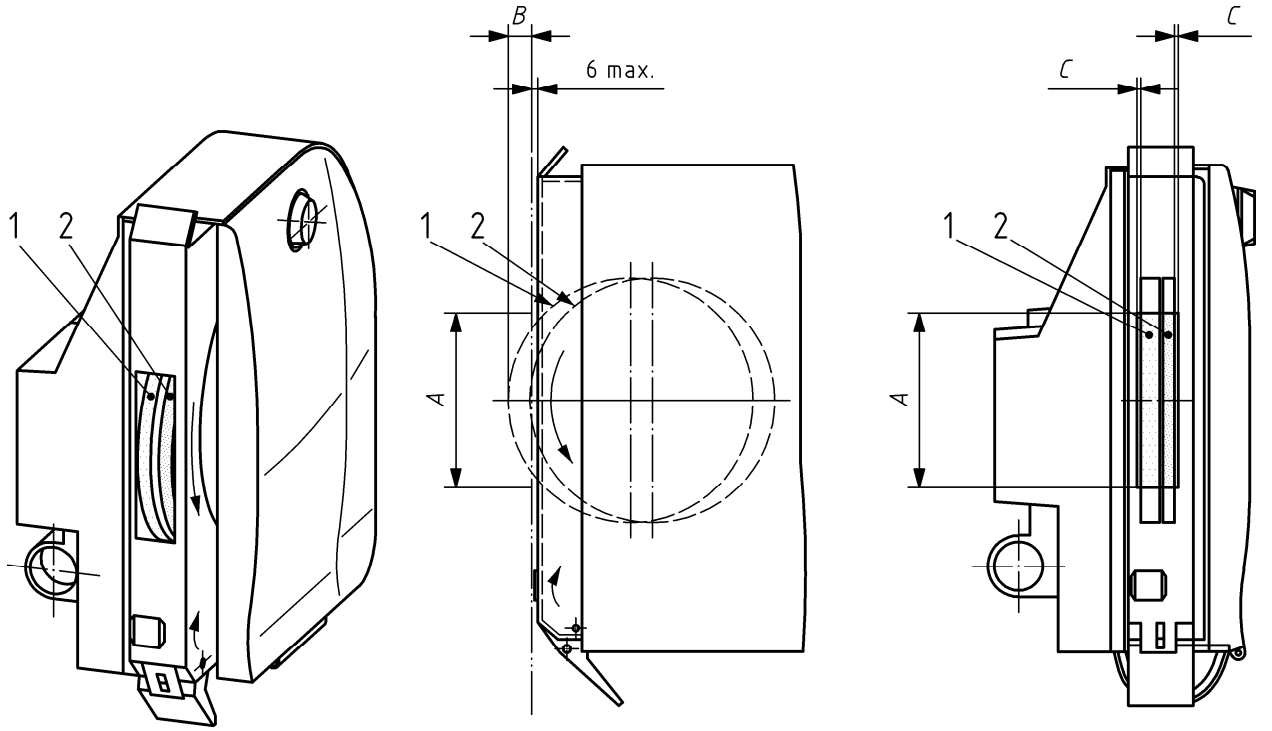
1) its length A (see Figure 6) does not exceed more than 4 mm the maximum length of the grooving tool with maximum diameter for which the machine is designed, which projects the sliding surface of the pressure shoe when grooving with maximum depth;

2) its width C (see Figure 6) does not exceed more than 4 mm the maximum width of the limitation disk together with the grooving tool with the maximum width for which the machine is designed.

〚A2〉 The safety related part of the control system (see also 5.2.1) for interlocking shall be at least PL = c in accordance with the requirements of EN ISO 13849-1:2008. 〈A2〛

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 grooving tool
2 limitation disk
A length of the slot in the sliding surface for grooving tools
B maximum grooving depth
C width of the slot in the sliding surface for grooving tools

Figure 6 — Example of grooving tool guarding system — Pressure shoe preventing access to grooving tool

5.3.7.3 Crushing/shearing hazards between power operated moving saw unit and fixed parts of the machines

[A2] Crushing/shearing hazards between power operated movement of the saw unit from its rest position to the cutting position as well as its power operated movements from its position for vertical cutting to its position for horizontal cutting and vice-versa shall be avoided by initiation of the movement by actuation of an initiation control device (e.g. push button), the safety related part of control system of which conforms at least to PL = c in accordance with the requirements of EN ISO 13849-1:2008. [A2]

If the machine is fitted with a powered feed movement a dedicated control device for initiating the cutting cycle shall be provided (see 5.2.3 and 5.2.6).

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

5.3.8 Guarding of drives

Access to the drive mechanism (to tool spindle(s), moving beam etc.) shall be prevented either by a fixed guard or a movable guard interlocked with the relevant drive motor. [A2] Fixed guards that are to be demounted by the user e.g. for maintenance and cleaning purposes shall be fitted with un-losable screws; see 6.3 x). [A2]

[A2] The safety related part of the control system (see also 5.2.1) for interlocking function shall be at least PL = c in accordance with the requirements of EN ISO 13849-1:2008. [A2]

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 result of contact between the tool and fixed machine parts shall be avoided in accordance with the requirements of 5.3.6, 5.3.7.1 and 5.3.7.2.

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 [A2] EN ISO 11688-1:2009 [A2] 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 tool.

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 of vertical panel sawing machines shall be measured in accordance with the enveloping surface measuring method given in [A2] EN ISO 3746:2010 [A2] 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 [A2] is given in 8.3.3, Formula (12) of EN ISO 3746:2010 [A2];

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;

[A2] *deleted text* [A2]

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

f) 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. [A2] EN ISO 3743-1:2010 [A2], [A2] EN ISO 3743-2:2009 [A2], [A2] EN ISO 3744:2010 [A2] and [A2] EN ISO 3745:2009 [A2] without the preceding modifications.

For determination of the emission sound power level by sound intensity method, use [A2] EN ISO 9614-1:2009 [A2] (subject to agreement between the supplier and the purchaser).

Emission sound pressure levels at the workstation shall be measured in accordance with [A2] EN ISO 11202:2010 [A2] with the following modifications:

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

2) the difference between the background emission sound pressure level and the workstation sound pressure level shall be equal to or greater than 6 dB [A2] according to EN ISO 11202:2010, 6.4.1, accuracy grade 2 (Engineering) [A2];

3) the local environmental correction K_{3A} shall be calculated in accordance with A.2 of [A2] EN ISO 11204:2010 [A2] with the reference restricted to [A2] EN ISO 3746:2010 [A2] instead of the method given in [A2] EN ISO 11202:2010 [A2], or in accordance with [A2] EN ISO 3743-1:2010 [A2],, [A2] EN ISO 3743-2:2009 [A2], [A2] EN ISO 3744:2010 [A2] or [A2] EN ISO 3745:2009 [A2] where one of these standards has been used as the measuring method.

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

5.4.3 Emission of chips and dust

The tool guarding system and the frame of the machine shall include capture devices for the chip and dust fitted with outlets for the connection to a chip and dust extraction system.

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.

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 shall be based on a conveying velocity of extracted air in the duct of 20 m s^{-1} for dry chips.

[A2] NOTE 2 The pressure drop between the inlet of all capture devices and the connection to the CADES should be maximum 1 500 Pa (for the air conveying velocity of 20 m/s). [A2]

[A2] NOTE 3 [A2] A low dust emission can be expected if on machines fitted with a rear side exhaust system for horizontal and vertical cuts the following features shown in Table 3 can be followed:

Table 3 — Low dust emission design

Extraction outlet	Minimum diameter of extraction outlet mm	Minimum conveying air velocity m s^{-1}	Minimum airflow $m^3 h^{-1}$
Saw unit	120		
Rear side	120		
Total extraction connection outlet	160	20	1,450

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

Verification: By checking the relevant drawings and inspection of the machine. Run the machine (disconnected from the chips and dust extraction system) under the conditions given in Annex P of ISO 7960:1995. Check if the machine creates an air flow from the inlet(s) of the capture device(s) to the connection outlet(s) to the chips and dust extraction system by use of smoke at the connection outlet(s). Measure the pressure drop (machine connected to the chips and dust extraction system) at the given air flow rate by measurements under conditions given in Annex P of ISO 7960:1995.

[A2] NOTE 4 For measurement of chip and dust extraction system performance two standardised methods are useful: concentration method (EN 1093-9:1998+A1:2008) and index method (EN 1093-11:2001+A1:2008). [A2]

5.4.4 Electricity

[A2] The requirements of EN 60204-1:2006 with the exception of 6.3 apply unless stated otherwise in this document.

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

NOTE 1 The protection of people against electrical shock due to indirect contacts should be normally ensured by automatic isolation of the electrical power supply of the machine by the operation of a protective device installed by the user in the line powering the machine (see the information provided by the manufacturer in the instruction handbook (see 6.3 w)). [A2]

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 caused by over heating of power circuit(s) is not present where they 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 [A2] EN 60529:1991 and EN 60529:1991/A1:2000 [A2].

[A1] In accordance with 18.2 of EN 60204-1:2006 the test 1 for the continuity of the protective bonding circuit and with 18.6 of EN 60204-1:2006 functional tests apply. [A1]

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, test 1" and 18.6 of EN 60204-1:2006.

[A1] NOTE 2 [A1] For electrical components characteristics the information from the electrical component supplier can be useful.

5.4.5 Ergonomics and handling

The requirements of [A2] EN 614-1:2006+A1:2009 [A2] apply and in addition:

The machine and its controls shall be designed according to ergonomic principles in accordance with [A2] EN 1005-4:2005+A1:2008 [A2] for work posture which is not fatiguing.

For the positioning, labelling and illumination (if necessary) of control devices, and facilities for materials and tool set handling the ergonomic principles of [A2] EN 894-1:1997+A1:2008 [A2], [A2] EN 894-2:1997+A1:2008 [A2], [A2] EN 894-3:2000+A1:2008 [A2], [A2] EN 1005-1:2001+A1:2008 [A2], [A2] EN 1005-2:2003+A1:2008 [A2], [A2] EN 1005-3:2002+A1:2008 [A2] apply.

Vertical panel sawing machines with hand feed shall be provided with an operating handle for moving the saw unit during the cutting cycle, which is positioned so that shearing hazards between it and fixed parts of the machine is avoided.

The saw unit on vertical panel saws with hand feed shall be counterbalanced such that the maximum force required to move the saw unit up and down the moving beam shall be 50 N and the maximum force required to turn the saw unit from its vertical cutting mode to its horizontal cutting mode shall be 120 N. The counter balancing mechanism shall be designed such that a single failure in any of its working parts does not permit the saw unit to drop and that any such failure shall render the machine inoperable until the counterbalancing mechanism is repaired.

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.

[A1] Machines and components with a mass exceeding 25 kg shall include necessary attachments to accommodate the fitting of a lifting device e.g. lugs positioned such as to avoid their overturn or fall or move in an uncontrolled way during transport, assembly, dismantling, disabling and scrapping. [A1]

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 [A1] Table A.1 of EN 61310-1:2008 [A1].

If the machine is equipped with scales the requirements of [A2] EN 894-2:1997+A1:2008 [A2] shall apply.

Useful information on ergonomics can also be found in EN 60204-1:2006, [A2] EN 614-1:2006+A1:2009 [A2] and [A2] EN 614-2:2000+A1:2008 [A2].

See also 5.2.2 for position of controls 6.3, [A2] EN 894-3:2000+A1:2008 [A2] and [A2] EN 1005-3:2002+A1:2008 [A2].

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 [A2] EN ISO 4414:2010 [A2] shall apply.

Also see 5.2.9, 5.4.10, 5.4.11, 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 correctly in accordance with EN 50370-1:2005, 50370-2:2003 and ⟦A2⟩ EN 60439-1:1999 and EN 60439-1:1999/A1:2004 ⟨A2⟧.

NOTE Machines which incorporate CE-marked electrical component 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.

⟦A2⟩ *deleted text* ⟨A2⟧

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 a tool of greater diameter than the largest tool for which the machine is designed.

A pictogram shall be positioned close or adjacent to the saw blade changing position to indicate the direction of rotation of the tool(s).

See also 6.3.

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

5.4.10 Supply disconnection (isolation)

The requirements of Clause 5 of ⟦A2⟩ EN 1037:1995+A1:2008 ⟨A2⟧ 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 the machine is fitted with an electrical brake, the electric isolator shall be equipped either:

a) with a blocking device and it shall only be possible to switch off the isolator after manually overriding the blocking device; or

b) the isolator shall not be situated on the same side of the machine or on the same side of the pendant as the start and stop control.

Where pneumatic energy is used, a pneumatic isolator shall be provided in accordance with the first indent of ⟦A2⟩ 5.2.8 of EN ISO 4414:2010 ⟨A2⟧ 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.

5.4.11 Maintenance

The basic principles in ⟦A2⟩ 6.2.15 of EN ISO 12100:2010 ⟨A2⟧ 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 lubrication points are provided they shall be located outside of the tool guarding system.

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.

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 ▌A2⟩ 6.4.3 of EN ISO 12100:2010 ⟨A2▐ 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 shall be indicated by a red warning light positioned in close proximity to the installed location of the stop control device for the tool 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

6.2.1 Marking of the machine

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) ▌A1⟩ business name and address of the machine manufacturer and, where applicable, of his authorised representative; ⟨A1▐

b) ▌A1⟩ year of construction, that is the year in which the manufacturing process is completed; ⟨A1▐

c) ▌A1⟩ designation of the machinery and designation of series or type; ⟨A1▐

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) and grooving tools for which the machine is designed;

g) bore diameter of the saw blade(s) and shank diameter of grooving tools;

h) function and operational position of the electrical supply disconnecting device (isolator) by a label or a pictogram fitted on or close to the installed location of the isolator;

i) where fitted with a pneumatic system with nominal pressure for the pneumatic circuits.

Where the machine is fitted with a pneumatic isolator its function, location and operational position shall be clearly identified e.g. by a label or a pictogram. The label or pictogram shall be fitted in a position in close proximity to the installed location of the isolator on the machine.

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

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 the machine is fitted with a tool (saw blade and / or grooving tool) the requirements for marking the tool in Clause 7 of ▌A2⟩ EN 847-1:2005+A1:2007 ⟨A2▌ apply.

See also 5.4.5.

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

6.2.2 Marking of riving knives and pressure shoes

Riving knives shall be permanently marked with:

a) its thickness;

b) range of saw blade diameters for which it is intended;

c) width of the riving knife mounting slot.

Pressure shoes shall be permanently marked with tool maximum diameter.

Permanently marked means e.g. engraving, etching, embossing or stamping.

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

6.3 Instruction handbook

The basic principles of ▌A2⟩ 6.4.5.3 of EN ISO 12100:2010 ⟨A2▌ 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 ▌A2⟩ and reasonably foreseeable misuse ⟨A2▌;

c) a warning regarding residual risks (e.g. dust, noise, contact with the tool, kickback);

d) the maximum and minimum dimensions of the panels which can be machined;

e) requirements for the need to fix the machine to the floor and how this is to be done;

f) the range of saw blade diameters and thickness for which the machine is designed;

g) the recommendation that only correctly sharpened saw blades manufactured in accordance with the requirements (including marking) of [A2] EN 847-1:2005+A1:2007 [A2] shall be used;

h) if the machine is designed for using grooving tools the range of tool diameters for which the machine is designed and the recommendation that only grooving tools manufactured in accordance with the requirements (including marking) of [A2] EN 847-1:2005+A1:2007 [A2] and marked with MAN and a maximum cutting width of 20 mm shall be used;

i) guidance on the selection of the correct riving knife for particular saw blade dimensions;

j) instructions that the riving knife shall be used, set so that its tip is positioned at least 2 mm below the periphery of the saw blade but not more than the root of the saw blade teeth and that the gap between the riving knife and the saw blade shall be at least 3 mm and shall not exceed 8 mm;

k) information that operators shall be adequately trained in the use, adjustment and operation of the machine including the correct use. [A1] This includes precautions during setting and machining and instruction on how the following points can be satisfied: [A1]

1) to stop the machine whilst unattended;

2) to ensure that the floor area around the machine is level, well maintained and free from loose material e.g. chips and off-cuts;

3) to report faults in the machine, including guards or tools as soon as they are discovered;

4) on 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) the safe handling of workpiece when cutting;

7) to use the appropriate pressure shoe;

8) how to isolate the machine from the power source(s);

9) how to change the tool(s);

10) instructions that the dust extraction equipment is to be switched on before commencing machining;

11) to use personal protective equipment e.g. for ear and eye protection according the local relevant legislation;

12) recommendation to use personal protective equipment with regard to wood dust;

l) warning that the machine is producing a considerable amount of wood dust and therefore it is strongly recommended to connected it to an external chip and dust extraction system;

[A2] NOTE [A2] External chip and dust extraction equipment with fixed installations are dealt within [A2] EN 12779:2004+A1:2009 [A2].

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

1) necessary air flow in $m^3\ h^{-1}$;

2) the pressure drop at each connection outlet at the recommended conveying air velocity;

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

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

n) recommendation to provide adequate general or localised lighting;

o) instruction that whenever possible maintenance shall be only done if the machine is isolated from all energy sources and involuntary restart is prevented;

p) 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:

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

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

3) the brake - by functional testing to check that the machine is braked within the specified time and that the brake shall be tested after any intervention of the overload protection;

4) indication of the selected speed on machines designed to operate at more than one main tool spindle speed – by functional testing;

q) information about safe cleaning;

r) if fitted with a pneumatic system the method for the safe dissipation of residual energy (see 5.4.10);

s) 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 machine to be produced, measured in accordance with the methods given in [A1] 5.4.2.2, i.e.:

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

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

The [A1] 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 [A2] EN ISO 4871:2009 [A2] as follows:

4 dB when using [A2] EN ISO 3746:2010 [A2] and [A2] EN ISO 11202:2010 [A2];

2 dB when using [A2] EN ISO 3743-1:2010 [A2], or [A2] EN ISO 3743-2:2009 [A2] or [A2] EN ISO 3744:2010 [A2];

1 dB when using [A2] EN ISO 3745:2009 [A2];

for example, for a sound power level [A2] L_{WA} = xx dB [A2] (measured value)

Associated uncertainty K = 4 dB

Measurement made in accordance with [A2] EN ISO 3746:2010 [A2]

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";

〚A2〛 Information on noise emission shall also be provided in the sales literature when performance data are provided. 〚A2〛

〚A1〛

t) information on conditions necessary to ensure that throughout the foreseeable lifetime the machine including its components cannot overturn or fall or move in an uncontrolled way during transport, assembly, dismantling, disabling and scrapping; 〚A1〛

〚A1〛

u) the operating method to be followed in the event of accident or breakdown; if a blockage is likely to occur, the operating method to be followed so as to enable the equipment to be safely unblocked; 〚A1〛

〚A2〛

v) the identification data of the spare parts to be changed by the user, when these affect the health and safety of operators (parts to be changed only by the manufacturer or personal charged by the manufacturer are excluded); 〚A2〛

〚A2〛

w) information on how to provide protection of people against electrical shock due to indirect contact in the machine by a device for automatic disconnection of the power supply to be installed by the user in the line powering the machine; 〚A2〛

〚A2〛

x) description of fixed guards which have to be removed by the user for maintenance and cleaning purposes (guards to be dismounted only by the manufacturer or personal charged by the manufacturer are excluded). 〚A2〛

Verification: By checking the information given in the instruction handbook.

〖A2〉 *deleted text* 〈A2〉

Annex A
(normative)

Impact test method for guards

A.1 General

This annex defines tests for guards used on vertical panel sawing machines 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 guards' materials.

A.2 Test method

A.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.

A.2.2 Testing equipment

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

A.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 N mm^{-2} to 690 N mm^{-2};

b) yield strength: $R_{0,2} \geq$ 330 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.

A.2.4 Sampling

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

A.2.5 Test procedure

The impact test shall be executed with projectile indicated in ⟦A2⟩ A.2.3 ⟨A2⟩ and an impact speed of 70 m s^{-1} ⟦A2⟩ ± 5 % ⟨A2⟩.

Impact shall be as square to the material sample surface or the guard surface as possible. [A2] The targets for the projectiles shall be the weakest and most unfavourable spot on the guard or in the centre of material sample. [A2]

A.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.

A.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 [A2] A.3 [A2].

A.5 Test report

The test report shall give the following minimum information:

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

b) projectile mass, dimensions, speed;

c) applicant identification;

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

e) clamping or fixing of the test object;

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

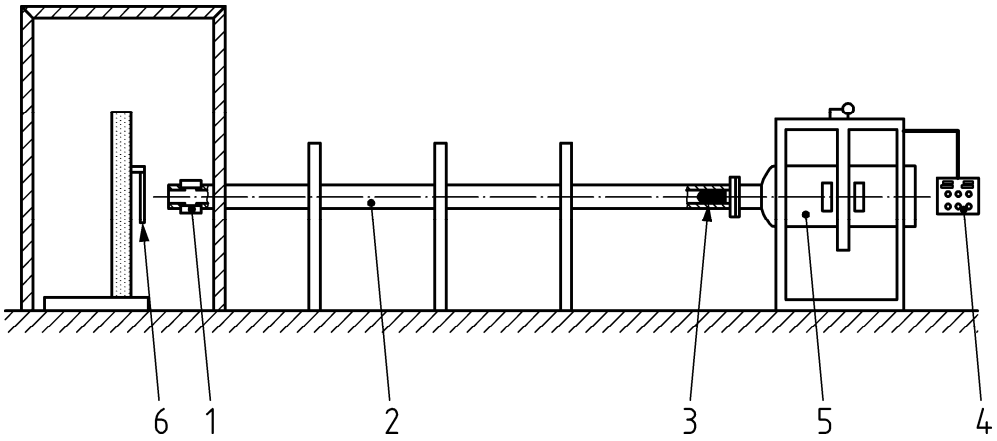
g) test result.

A.6 Test equipment for impact test

The propulsion device consists of a compressed air vessel with flanged gun barrel (see [A2] Figure A.1 [A2]). 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.



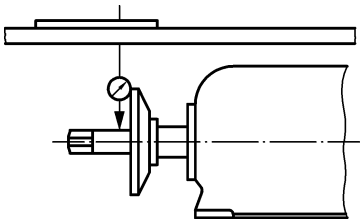
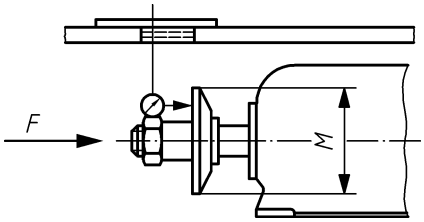
Key

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

Figure A.1 — Example of equipment for impact test

Annex B
(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

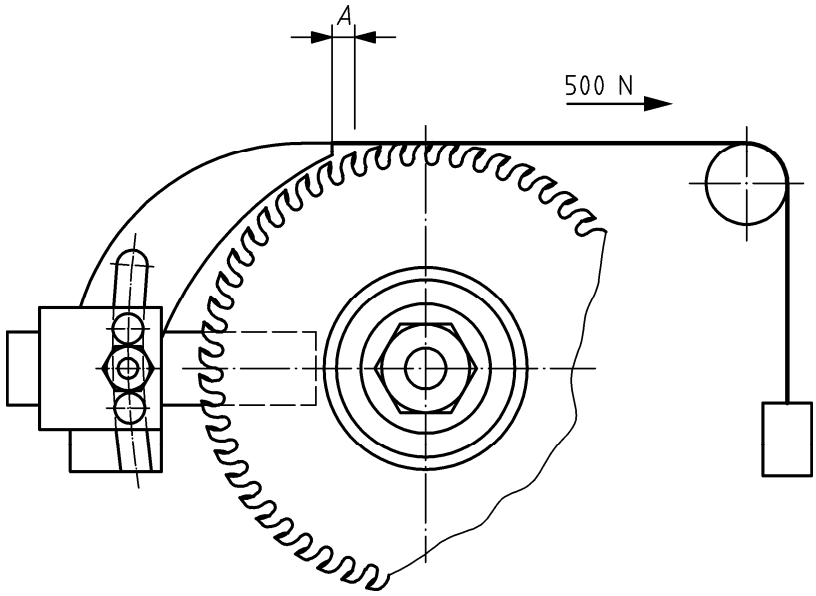
Annex C
(normative)

Riving knife mounting strength test

The machine shall be fitted with the largest saw blade for which it is designed. The riving knife shall be positioned so that its tip is 2 mm below the periphery of the saw blade and securely tightened with a tightening torque of 25 Nm. A load of 500 N is applied to the tip (see A2 Figure C.1 A2). In order to comply with this test, the deflection *A* shall not be greater than the values given in A2 Table C.1 A2.

A2 Table C.1 A2 — Maximum deflection in relation to the saw blade diameter

Saw blade diameter for which riving knife is designed	≤ 315 mm	> 315 mm
Maximum deflection *A* (see A2 Figure C.1 A2)	1,5 mm	2,0 mm

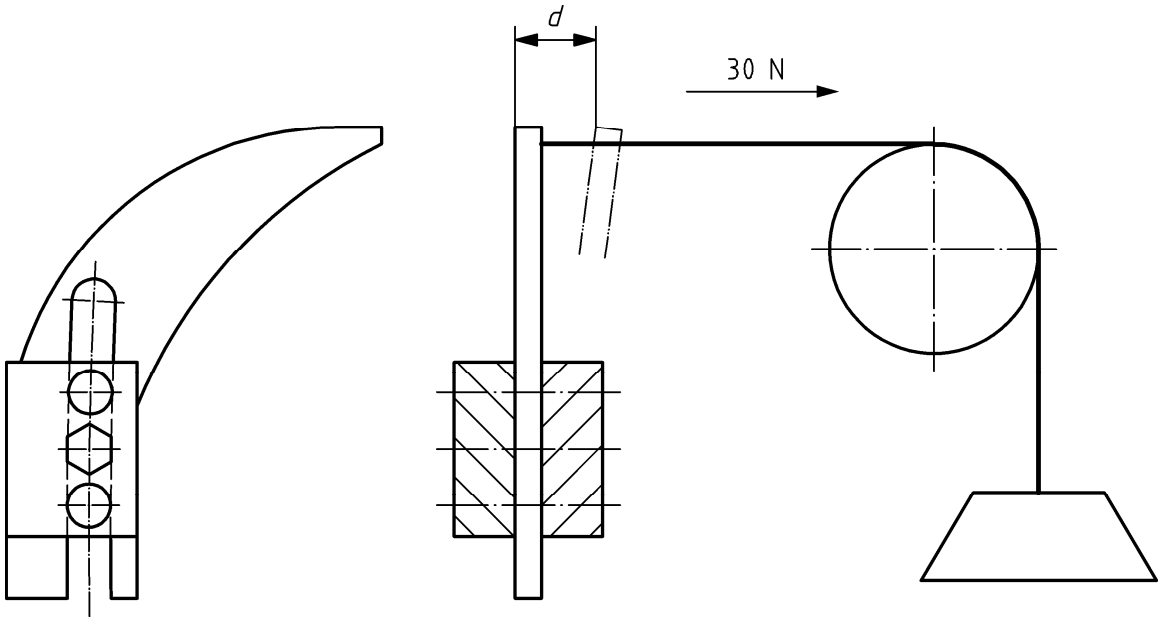


A2 Figure C.1 A2 — Riving knife mounting strength test

Annex D
(normative)

Riving knife testing - Lateral stability

With the riving knife securely tightened in position to suit the maximum diameter saw blade for which the machine is designed, a horizontal load of 30 N is applied to the tip as shown in [A2] Figure D.1 [A2]. The maximum deflection (*d*) shall not exceed 8 mm.



[A2] Figure D.1 [A2] — Riving knife lateral stability test

Annex E
(normative)

Braking tests

E.1 Conditions for all tests

a) The spindle unit 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 tools, conditions shall be chosen which create the greatest kinetic energy for which the machine is designed (taking into account tool sizes, types, spindle speed etc.).

c) Before beginning the test the spindle unit 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 average 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. The standard deviation of the 10 measurements shall not exceed 10 % of this average.

[A2⟩ *deleted text* ⟨A2]

〚A2〉 *deleted text* 〈A2〛

Annex ZA
(informative)

[A1] Relationship between this European Standard and the Essential Requirements of EU Directive 2006/42/EC

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

Once this standard is cited in the Official Journal of the European Union under that Directive [A2] *deleted text* [A2], compliance with the normative clauses of this standard [A2] *deleted text* [A2] confers, within the limits of the scope of this standard, a presumption of conformity with the relevant Essential Requirements of that Directive and associated EFTA regulations.

[A2] Table ZA.1 [A2] — Correspondence between this European Standard and Directive 2006/42/EC

Clause(s)/sub-clause(s) of this EN	Essential Requirements (ERs) of Directive 2006/42/EC
	1.1.2 Principles of safety integration
5.2.1, 5.2.2, 5.2.3, 5.2.4, 5.2.5, 5.2.6, 5.2.7, 5.3.6, 5.3.7, 5.3.8, 5.4.11, 6.3	a) fitted for its function
Clauses 5 and 6	b) eliminate or reduce the risks, give measures, inform
Clauses 5 and 6	c) intended use and reasonably foreseeable misuse
5.4.5, 6.3	d) constraints in use
5.3.1, 5.4.8, 6.3	e) equipment
5.3.2, 5.3.5, 5.3.6, 5.3.7, 5.4.3	1.1.3 Materials and products
6.3	1.1.4 Lighting
5.2.2, 5.3.7, 5.4.5	1.1.5 Design of machinery to facilitate its handling
5.4.5	1.1.6 Ergonomics
5.2.2, 5.3.6, 6.3	1.1.7 Operating position

〚A2〛 Table ZA.1 〈A2〉 *(continued)*

5.2.1, 5.2.7, 5.2.8, 5.2.10, 5.4.9, 5.4.10, 5.4.11 〚A2〛 *deleted text* 〈A2〉	1.2.1 Safety and reliability of control systems
5.2.2, 5.2.3, 5.2.4, 5.2.5, 5.2.6, 5.3.6, 5.3.7, 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
5.2.4	1.2.4.1 Normal stop
5.2.6	1.2.4.2 Operational stop
5.2.5	1.2.4.3 Emergency stop
5.2.3, 5.2.6	1.2.5 Selection of control or operating modes
5.2.8, 5.4.6, 5.4.10, 5.4.11	1.2.6 Failure of the power supply
5.2.3, 5.2.4, 5.2.5, 5.2.6, 5.2.7, 5.3.1, 5.3.2, 5.3.3, 5.3.4, 5.3.5, 5.3.6, 5.3.7, 5.3.8, 6.1, 6.2, 6.3	1.3 Protection against mechanical hazards
5.3.1, 6.3	1.3.1 Risk of loss of stability
5.3.2, 6.3	1.3.2 Risk of break-up during operation
5.3.2, 5.3.3, 5.3.5, 5.3.7	1.3.3 Risks due to falling or ejected objects
5.1	1.3.4 Risk due to surfaces, edges or angles
5.2.6, 5.2.7, 5.3.6	1.3.6 Risks relating to variations in the operating conditions
5.3.7	1.3.7 Risks related to moving parts
5.3.7, 5.3.8	1.3.8 Choice of protection against risks related to moving parts
5.3.8	1.3.8.1 Moving transmission parts
5.3.7	1.3.8.2 Moving parts involved in the process
5.3.5, 5.3.6	1.3.9 Risk of uncontrolled movements

[A2] Table ZA.1 [A2] *(continued)*

[A2] 5.2.1 [A2], 5.3.7	1.4.1 Required characteristics of guards and protective devices - General requirements
5.3.2, 5.3.7	1.4.2.1 Fixed guards
5.3.7	1.4.2.2 Interlocking movable guards
5.3.7	1.4.2.3 Adjustable guards restricting access
5.2.8, 5.4.4, 5.4.12	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, 6.3	1.5.4 Errors of fitting
5.4.1	1.5.6 Fire
5.4.2	1.5.8 Noise
5.4.7 [A2] *deleted text* [A2]	1.5.11 External radiation
5.4.3	1.5.13 Emission of hazardous materials and substances
5.4.11	1.6.1 Machinery maintenance
5.2.2, 5.3.7, 5.4.11	1.6.2 Access to operating position and servicing points
5.4.10	1.6.3 Isolation of energy sources
5.2.2, 5.2.6, 5.2.7, 5.2.8, 5.3.7, 5.4.5, 5.4.11, 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	1.7.1 Information and warnings on the machinery
5.2.1, 5.3.3, 5.4.5	1.7.1.1 Information and information devices
6.1	1.7.2 Warning devices
6.2	1.7.3 Marking of machinery
6.3	1.7.4 Instructions

Table ZA.1 *(continued)*

	2.3 Machinery for working wood and analogous materials
5.3.6, 5.3.7	a) guiding
5.3.5	b) ejection
5.3.4	c) brake
5.2.6, 5.3.7	d) accidental tool contact

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

Bibliography

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

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

[3] EN 1050:1996, *Safety of machinery — Principles for risk assessment*

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

[5] EN 1093-11:2001+A1:2008, *Safety of machinery — Evaluation of the emission of airborne hazardous substances — Part 11: Decontamination index*

[6] EN 12779:2004+A1:2009, *Woodworking machines — Chip and dust extraction systems with fixed installation — Safety related performance and safety requirements*

[7] EN 60947-4-1:2001, *Low voltage switchgear and control gear — Part 4-1: Contactors and motor starters — Electromechanical contactors and motor starters (IEC 60947-4-1:2000)*

[8] EN 60947-5-1:2004, *Low voltage switchgear and controlgear — Part 5-1: Control circuit devices and switching elements — Electromechanical control circuit devices (IEC 60947-5-1:2003)*

[9] EN ISO 11688-2:2000, *Acoustics — Recommended practice for the design of low-noise machinery and equipment — Part 2: Introduction to the physics of low-noise design (ISO/TR 11688-2:2001)*

[10] HD 21.1 S4:2002, *Cables of rated voltages up to and including 450/750 V and having thermoplastic — Part 1: General requirements*

[11] HD 22.1 S4:2002, *Cables of rated voltages up to and including 450/750 V and having cross-linked insulation — Part 1: General requirements*

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