

Safety of woodworking machines — Circular sawing machines —

Part 5: Circular saw benches/up-cutting cross-cut sawing machines

ICS 79.120.10

National foreword

This British Standard is the UK implementation of EN 1870-5:2002+A2:2012. It supersedes BS EN 1870-5:2002+A1:2009, which is withdrawn.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.

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**Safety of woodworking machines - Circular sawing machines -
Part 5: Circular sawbenches/up-cutting cross-cut sawing
machines**

Sécurité des machines pour le travail du bois - Machines à
scie circulaires - Partie 5: Scies circulaires combinées à
table et à coupe transversale ascendante

Sicherheit von Holzbearbeitungsmaschinen -
Kreissägemaschinen - Teil 5: Kombinierte
Tischkreissägemaschinen/von unten schneidende
Kappsägemaschinen

This European Standard was approved by CEN on 8 November 2001 and includes Amendment 1 approved by CEN on 30 July 2009 and Amendment 2 approved by CEN on 27 July 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.

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Foreword

This document (EN 1870-5:2002+A2:2012) has been prepared by Technical Committee CEN/TC 142 "Woodworking machines - Safety", the secretariat of which is held by UNI.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by March 2013, and conflicting national standards shall be withdrawn at the latest by March 2013.

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

This document includes Amendment 1, approved by CEN on 2009-07-30 and Amendment 2, approved by CEN on 2012-07-27.

This document supersedes $\square_{A2}$ EN 1870-5:2002+A1:2009 $\square_{A2}$.

The start and finish of text introduced or altered by amendment is indicated in the text by tags $\square_{A1}$ $\square_{A1}$ and $\square_{A2}$ $\square_{A2}$.

$\square_{A1}$ This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of the Machinery Directive.

$\square_{A2}$ For relationship with EU Directive, see informative Annex ZA, which is an integral part of this document. $\square_{A2}$ $\square_{A1}$

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

$\square_{A2}$ Annexes A, B, C, D, E, F, G and H are normative and Annex ZA is informative. $\square_{A2}$

$\square_{A1}$ EN 1870 *Safety of woodworking machines — Circular sawing machines* consists of the following parts:

$\square_{A2}$ *deleted text* $\square_{A2}$

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

Part 4: Multi-blade 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: Multi-blade cross-cut sawing machines with integrated feed of the workpiece and manual loading and/or unloading

Part 16: Double mitre sawing machines for V-cutting

Part 17: Manual horizontal cutting cross-cut sawing machines with one saw unit (manual radial arm saws) ^{A1}

^{A2} *Part 18: Dimension saws*

Part 19: Circular saw benches (with and without sliding table) and building site saws ^{A2}

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).

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, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

0 Introduction

This $\square_{A2}$ document $\square_{A2}$ 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 $\square_{A2}$ document $\square_{A2}$ is a type “C” standard as defined in $\square_{A2}$ EN ISO 12100:2010 $\square_{A2}$.

$\square_{A2}$ The machinery concerned and the extent to which hazards, hazardous situations and events are covered are indicated in the scope of this document.

When provisions of this type C standard are different from those which are stated in type A or B standards, the provisions of this type C standard take precedence over the provisions of other standards, for machines that have been designed and built in accordance with the requirements of the provisions of this type C standard. $\square_{A2}$

The extent to which hazards are covered is indicated in the scope of this $\square_{A2}$ document $\square_{A2}$.

The requirements of this $\square_{A2}$ document $\square_{A2}$ concern designers, manufacturers, suppliers and importers of circular saw benches/up-cutting cross-cut sawing machines. $\square_{A2}$ It is also useful for designers. $\square_{A2}$

This $\square_{A2}$ document $\square_{A2}$ also includes information to be provided by the manufacturer to the user.

Common requirements for tooling are given in $\square_{A2}$ EN 847-1:2005+A1:2007 $\square_{A2}$.

Electrically driven machines excluded by the scope of this $\square_{A2}$ document $\square_{A2}$ are covered by the requirements of $\square_{A2}$ EN 61029-1:2009 $\square_{A2}$.

1 Scope

A1 This document deals with all significant hazards, hazardous situations and events as listed in Clause 4 which are relevant to circular saw benches/up-cutting cross-cut sawing machines, hereinafter referred to as “machines”, designed to cut solid wood, chipboard, fibreboard, plywood and also these materials **A2** if (where) **A2** they are covered with plastic edging and/or plastic/light alloy laminates **A2** when they are used as intended and under the conditions foreseen by the manufacturer including reasonably foreseeable misuse **A2**. **A1**

This **A2** document **A2** does not apply to:

- **A1** hand-held motor-operated electric tools or any adaptation permitting their use in a different mode, i.e. bench mounting; **A1**

A1 NOTE 1 Hand-held motor-operated electric tools and saw benches to form an integrated whole with a hand-held motor-operated electric tools are covered by EN 60745-1:2006 together with EN 60745-2-5:2007. **A1**

- **A1** machines set up on a bench or a table similar to a bench, which is intended to carry out work in a stationary position, capable of being lifted by one person by hand. **A1**.

A1 NOTE 2 Transportable motor-operated electric tools are covered by the requirements of EN 61029-1:2000 together with EN 61029-2-1:2002. **A1**

A1 *deleted text* **A1**

A2 This document is not applicable to machines which are manufactured before the date of issue of this EN. **A2**

A1 NOTE 3 **A1** Circular saw benches are dealt with in **A2** prEN 1870-19:2011 **A2**.

A2 NOTE 4 Machines covered by this document are listed under 1.1 of Annex IV of the Machinery Directive. **A2**

2 Normative references

A1 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**.

A1 *deleted text* **A1**

A1 **A2** EN 614-1:2006+A1:2009 **A2**, *Safety of machinery — Ergonomic design principles — Part 1: Terminology and general principles* **A1**

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

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

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

EN 894-3:2000+A1:2008 ^{A2}, *Safety of machinery — Ergonomics requirements for the design of displays and control actuators — Part 3: Control actuators* ^{A1}

^{A1} *deleted text* ^{A1}

^{A2} *deleted text* ^{A2}

^{A1} ^{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 ^{A2}, *Safety of machinery — Human physical performance — Part 2: Manual handling of machinery and component parts of machinery*

^{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 ^{A2}, *Safety of machinery — Human physical performance — Part 4: Evaluation of working postures and movements in relation to machinery*

^{A2} EN 1037:1995+A1:2008 ^{A2}, *Safety of machinery — Prevention of unexpected start-up* ^{A1}

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

^{A1} 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* ^{A1}

^{A1} EN 60204-1:2006 ^{A1}, *Safety of machinery — Electrical equipment of machines — Part 1: General requirements* ^{A1} (IEC 60204-1:2005, modified) ^{A1}

^{A1} EN 60439-1:1999¹⁾, *Low-voltage switchgear and controlgear assemblies — Part 1: Type-tested and partially type-tested assemblies* (IEC 60439-1:1999) ^{A1}

EN 60529²⁾, *Degree of protection provided by enclosures (IP code)* (IEC 60529:1989)

^{A1} EN 60825-1:2007, *Safety of laser products — Part 1: Equipment classification and requirements* (IEC 60825-1:2007) ^{A1}

^{A1} EN 60497-4-1:2001 ^{A1}, *Low voltage switchgear and control gear — Part 4: Contactors and motor starters — Section 1: Electromechanical contactors and motor starters* ^{A1} (IEC 60947-4-1:2000) ^{A1}

^{A1} EN 60947-5-1:2004 ^{A1}, *Low voltage switchgear and control gear — Part 5: Control circuit devices and switching elements — Section 1: Electromechanical control circuit devices* ^{A1} (IEC 60947-5-1:2003) ^{A1}

^{A2} EN 61029-1:2009 ^{A2}, *Safety of transportable motor operated electric tools — Part 1: General requirements* ^{A1} (IEC 61029-1:1990, modified) ^{A1}

^{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}

1) ^{A2} EN 60439-1:1999 is impacted by EN 60439-1:1999/A1:2004. ^{A2}

2) ^{A2} EN 60529:1991 is impacted by EN 60529:1991/A1:2000. ^{A2}

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

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

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

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

EN ISO 3745:2009³⁾, *Acoustics — Determination of sound power levels of noise sources using sound pressure — Precision methods for anechoic and semi-anechoic rooms* (ISO 3745:2003)

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

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

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

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

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

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

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

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

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

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

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

EN deleted text

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

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

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

Ⓐ₁ 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* Ⓐ₁

Ⓐ₁ HD 22.4 S4:2004⁴⁾, *Cables of rated voltages up to and including 450/750 V and having crosslinked insulation — Part 4: Cords and flexible cables* Ⓐ₁

⁴⁾ Ⓐ₂ HD 22.4 S4:2004 is superseded by EN 50525-2-21:2011, *Electric cables — Low voltage energy cables of rated voltages up to and including 450/750 V (Uo/U) — Part 2-21: Cables for general applications — Flexible cables with crosslinked elastomeric insulation*. Ⓐ₂

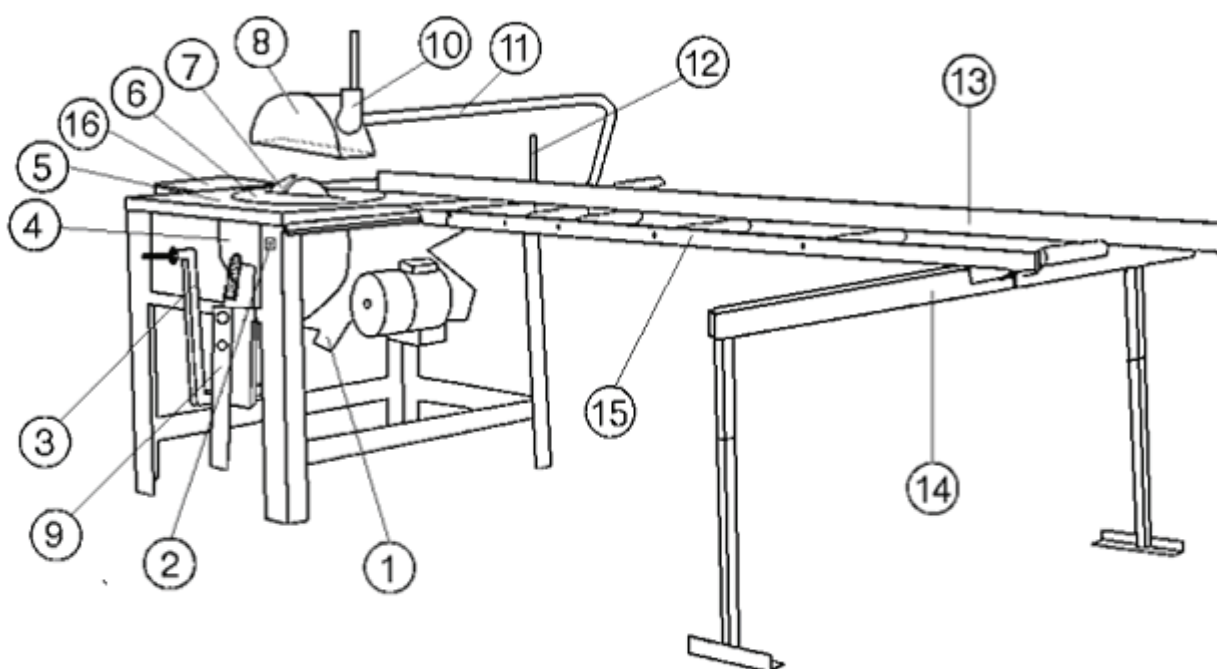
3 Terms and definitions

3.1 General

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

3.2 Terms

The main parts of the machine and their terminology are illustrated in Figure 1.



Key	1	Under table extraction point
	2	Controls
	3	Elevation arm
	4	Fixed guard beneath table
	5	Table
	6	Rotating part of table
	7	Riving knife
	8	Saw blade guard
	9	Push stick
	10	Saw blade guard exhaust outlet
	11	Saw guard support
	12	Moveable roller table locking clamp
	13	Rip- and cross-cut fence
	14	Moveable roller table support
	15	Moveable roller table
	16	Extension table

Figure 1 — Terminology

3.3 Definitions

A2 3.3.1 A2

circular saw bench/up-cutting cross-cut sawing machine

circular sawing machine with a single saw blade **A2** and **A2** one fixed rotational speed

A2 NOTE **A2** The saw unit is situated below the workpiece support (table) and the machine may be used in three modes:

- a) for ripping, with the saw blade set parallel to the fence. The workpiece is fed manually or by a demountable power feed (see Figure 2); or
- b) for cross-cutting, with the saw unit set at 90° to the fence. The workpiece is fed manually by use of a sliding infeed table which moves at 90° to the fence (see Figure 3); or
- c) for cross cutting where the saw unit is raised manually e.g. by a hand lever, to cut through the stationary workpiece (see Figure 4)

In addition, in each mode the saw unit may be tilted about the horizontal axis of the saw spindle to produce an angled cut on the workpiece. In the cross-cutting modes the saw unit can be additionally rotated about a vertical axis to produce a bevelled cut.

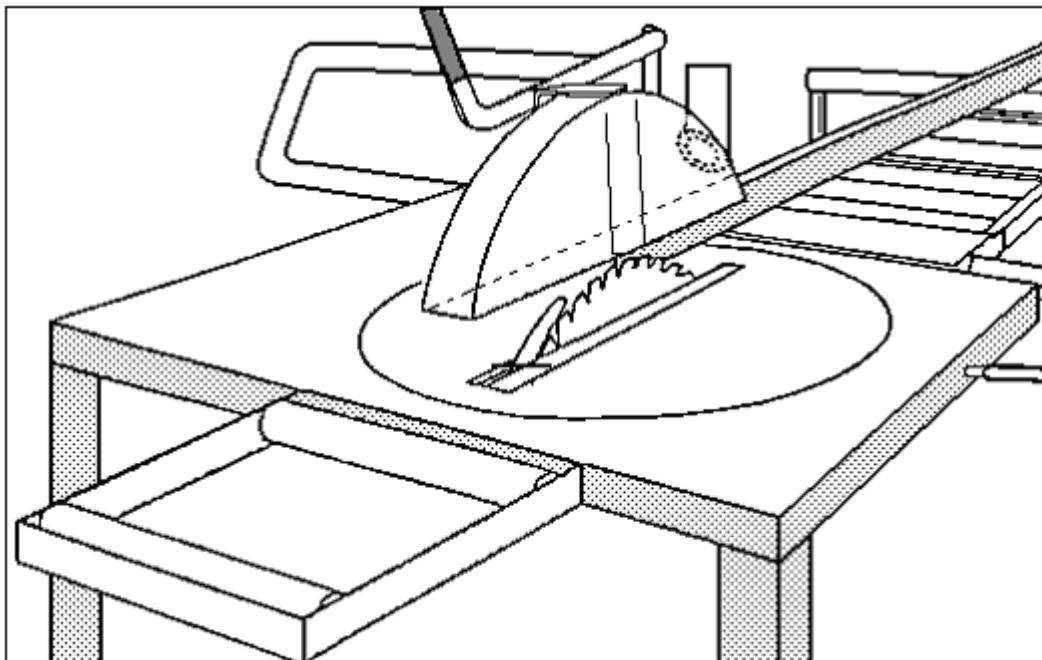


Figure 2 — Example of a machine in the ripping mode

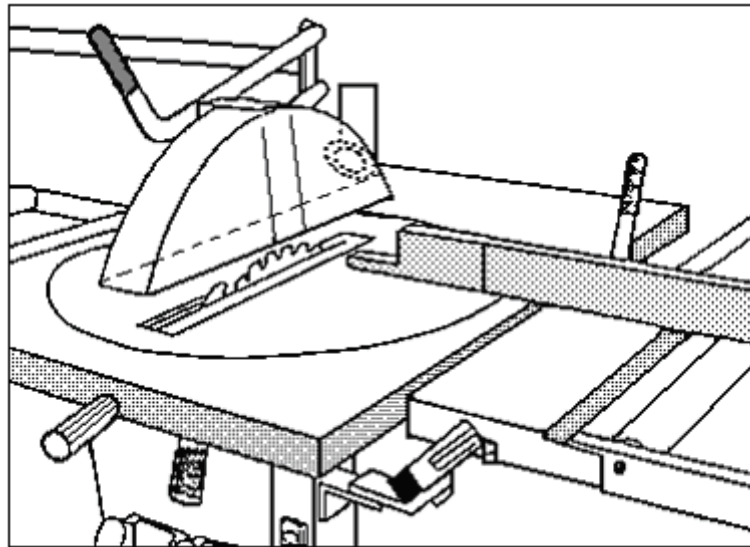


Figure 3 — Example of a machine in the cross-cutting mode with moved workpiece

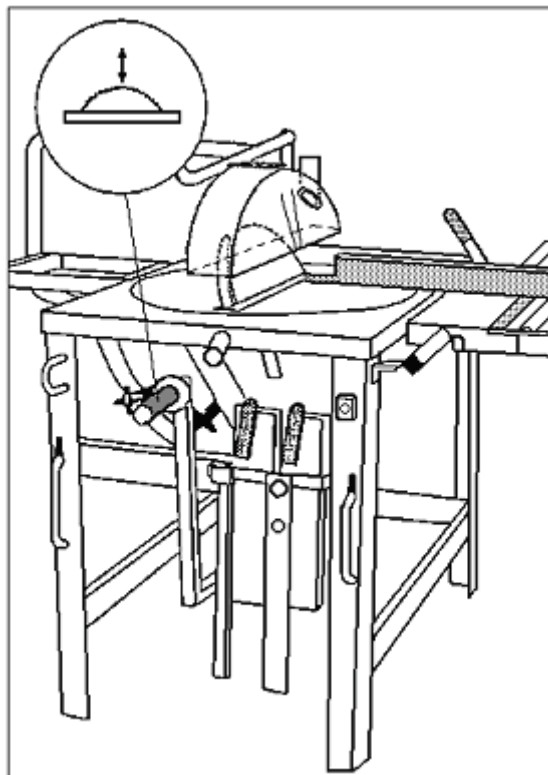


Figure 4 — Example of a machine in the cross-cutting mode with stationary workpiece

A2 3.3.2 A2

infeed table

additional table at the infeed of the machine, used as:

- a) a support for the rip fence and to facilitate feeding the workpiece for ripping during use of the machine as a circular saw bench;

- b) a sliding table for cross-cutting with the saw blade unit in a fixed position;
- c) additional fixed position workpiece support during use of the machine as an up-cutting cross-cut sawing machine

A2 3.3.3 A2

operator position

that area occupied by the operator for use in the bench sawing mode and for use in both cross-cut sawing modes, as shown in Figure 5

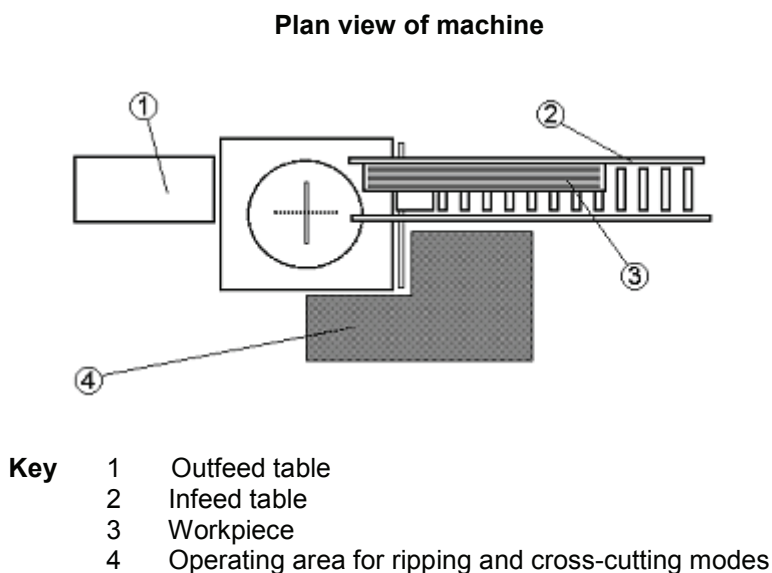


Figure 5 — Operating position

A2 3.3.4 A2

A1 displaceable machine A1

machine which is located on the floor, stationary during use and equipped with a device, normally wheels, which allows it to be moved between locations

A2 3.3.5 A2

machine actuator

power mechanism used to effect motion of the machine

A2 3.3.6 A2

hand feed

manual holding and/or manual guiding of the workpiece (or of a machine element incorporating a tool) **A2** which **A2** includes the use of a hand operated carriage on which the workpiece is placed manually or clamped, and the use of a demountable power feed unit

NOTE The words in brackets are not applicable to this machine.

A2 3.3.7 A2

demountable power feed unit

feed mechanism which is mounted on the machine so that it can be moved from the working position without the use of a spanner or similar additional device

A2 3.3.8 A2

ejection

unexpected movement of the workpiece or parts of it or part of the machine from the machine during processing

A2 3.3.9 A2

kickback

particular form of ejection and is describing the unexpected movement of the workpiece or parts of it or parts of the machine opposite to the direction of feed during processing

A2 3.3.10 A2

anti-kickback device

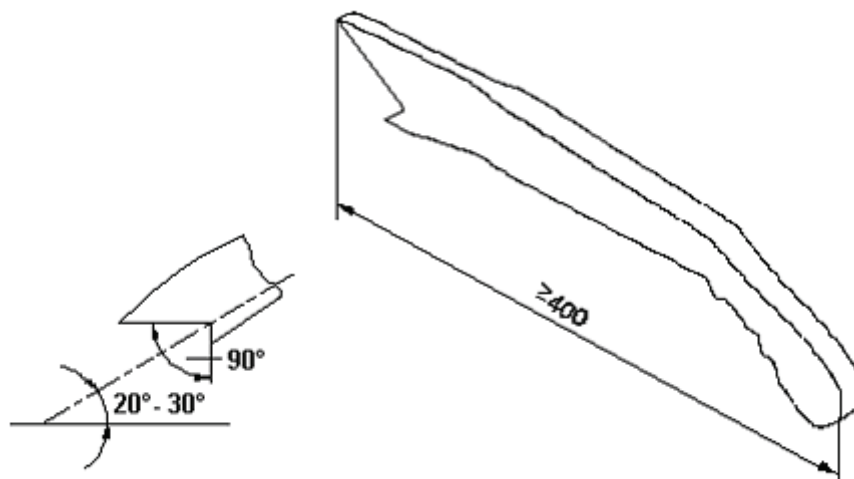
device which either reduces the possibility of kickback or arrests the motion during kickback of the workpiece or parts of it or parts of the machine

A2 3.3.11 A2

safety appliance

additional device which is not an integral part of the machine but which assists the operator in the safe feeding of the workpiece, e.g. see Figure 6

A2 Dimensions in millimetres **A2**



a) — Example of push stick

A2



A2

b) — Example of push block

A2 Key

1 push block handle **A2**

Figure 6 — Examples of a push stick and push block

A2 3.3.12 A2

run-down time

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

A2 3.3.13 A2

A1 information from the supplier **A1**

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

A2 3.3.14

performance level PL

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

[SOURCE: EN ISO 13849-1:2008, 3.1.23] **A2**

4 List of significant hazards

A1 This clause contains all significant hazards, hazardous situations and events (see **A2** EN ISO 12100:2010 **A2**) **A2** *deleted text A2*, 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.

A2 These hazards are listed in Table 1: **A2**

A2 Table 1 — List of significant hazards (1 of 3)

No	Hazards, hazardous situations and hazardous events	EN ISO 12100:2010	Relevant sub-clause of this document
1	Mechanical hazards related to: - machine parts or workpieces:		
	a) shape;	6.2.2.1, 6.2.2.2, 6.3	5.3.3, 5.3.5, 5.3.6, 5.3.7, 5.3.8
	b) relative location;		5.2.2, 5.3.5, 5.3.6, 5.3.7
	c) mass and stability (potential energy of elements which may move under the effect of gravity)		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, 5.3.3, 5.3.5, 5.3.6
	- accumulation of energy inside the machinery:		
g) liquids and gases under pressure;	6.2.10, 6.3.5.4	5.4.7, 5.4.8	

Table 1 (2 of 3)

No	Hazards, hazardous situations and hazardous events	EN ISO 12100:2010	Relevant sub-clause of this document
1.1	Crushing hazard	6.2.10	5.3.7, 5.3.8
1.2	Shearing hazard		5.3.7, 5.3.8
1.3	Cutting or severing hazard		5.3.2, 5.3.3, 5.3.4, 5.3.7
1.4	Entanglement hazard		5.3.7
1.5	Drawing-in or trapping hazard		5.3.7
1.9	High pressure fluid injection or ejection hazard		5.3.7
2	Electrical hazards due to:		
2.1	Contact of persons with live parts (direct contact)	6.2.9, 6.3.5.4	5.4.4, 5.4.13, 5.4.14
2.2	Contact of persons with parts which have become live under faulty conditions (indirect contact)	6.2.9	5.4.4, 5.4.16, 5.4.17
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.		5.4.2
6	Hazards generated by radiation		
6.5	Lasers	6.3.4.5	5.4.11
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
7.2	Fire hazard	6.2.4	5.4.1, 5.4.3, 6.3
8	Hazards generated by neglecting ergonomic principles in machinery design related to:		
8.1	Unhealthy postures or excessive effort	6.2.7, 6.2.8.2, 6.2.11.12, 6.3.5.5, 6.3.5.6	5.2.2
8.2	Hand-arm or foot-leg anatomy	6.2.8.3	5.2.2
8.4	Local lighting	6.2.8.6	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	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	5.2.5

Table 1 (3 of 3)

No	Hazards, hazardous situations and hazardous events	EN ISO 12100:2010	Relevant sub-clause of this document
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
10.2	Restoration of energy supply after an interruption	6.2.11.4	5.2.6, 5.2.5, 5.4.7
10.3	External influences on electrical equipment	6.2.11.11	5.2.1, 5.4.4, 5.4.10
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	5.2.1, 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	5.2.2, 5.2.4
13	Failure of the power supply	6.2.11.1, 6.2.11.4	5.2.5
14	Failure of the control circuit	6.2.11, 6.3.5.4	5.2.1
15	Errors of fitting	6.2.7, 6.4.5	5.3.3, 5.4.12
16	Break-up during operation	6.2.3	5.3.2
17	Falling or ejected objects or fluids	6.2.3, 6.2.10	5.3.2, 5.3.3, 5.3.5, 5.3.6, 5.3.8
18	Loss of stability / overturning of machinery	6.3.2.6	5.3.1

A2

5 Safety requirements and/or measures

5.1 A2 General A2

A2 The machine shall comply with the safety requirements and/or protective measures of Clause 5.

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

For guidance in connection with risk reduction by design, see EN ISO 12100:2010, 6.2, and for safeguarding measures, EN ISO 12100:2010, 6.3. A2

5.2 Controls

5.2.1 Safety and reliability of control systems

5.2.1.1 General

For the purposes of this European Standard a safety related control system is one from and including the initial manual control or position detector to the point of input to the final actuator or element e.g. motor.  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: 

- a) Starting  and restarting   : PL=c  (see  5.2.3 
- b) normal stopping  : PL=c  (see  5.2.4 



- c) Prevention of automatic restart: PL=c (see 5.2.5); 
- d) interlocking  : PL=c  (see  5.3.7.3, 5.3.7.4 
- e) the braking system  : PL=b or PL=c  (see  5.2.4, 5.3.4 

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

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



5.2.1.2 Use of protective devices

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

- a) magnetic/proximity switches shall be in accordance with the requirements of EN 1088:1995+A2:2008, 6.3 and the related control system shall at least conform to PL=c in accordance with the requirements of EN ISO 13849-1:2008;
- b) time delay shall at least be PL=c in accordance with the requirements of EN ISO 13849-1:2008.

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

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

5.2.2 Position of controls

The start control and the stop control shall be located in the shaded area X of Figure 7.