BS EN 1870-3:2014

BSI Standards Publication

Safety of woodworking machines — Circular sawing machines

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

bsi.

...making excellence a habit.™

National foreword

This British Standard is the UK implementation of EN 1870-3:2014. It supersedes BS EN 1870-3:2001+A1:2009 which is withdrawn.

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

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

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

ISBN 978 0 580 79079 9

ICS 25.080.60; 79.120.10

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

This British Standard was published under the authority of the Standards Policy and Strategy Committee on 30 November 2014.

Amendments issued since publication

Date	Text affected

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 1870-3

November 2014

ICS 79.120.10

Supersedes EN 1870-3:2001+A1:2009

English Version

Safety of woodworking machines - Circular sawing machines - Part 3: Down cutting cross-cut saws and dual purpose down cutting cross-cut saws/circular saw benches

Sécurité des machines pour le travail du bois - Machines à scies circulaires - Partie 3: Tronçonneuses à coupe descendante et tronçonneuses mixtes à coupe descendante et à scies circulaires à table de menuisier

Sicherheit von Holzbearbeitungsmaschinen - Kreissägemaschinen - Teil 3: Von oben schneidende Kappsägemaschinen und kombinierte Kapp- und Tischkreissägemaschinen

This European Standard was approved by CEN on 11 October 2014.

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.

CEN members are the national standards bodies of 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 United Kingdom.

EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels

Contents

Page

Foreword

This document (EN 1870-3:2014) 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 May 2015, and conflicting national standards shall be withdrawn at the latest by May 2015.

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

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

The main modifications compared to EN 1870-3:2001+A1:2009 relate to the introduction of performance levels (PL) for control systems and to the following items:

— clarification of controls positions in 5.2.2;

— addition of PL where missing;

— addition of requirements on mode selection in 5.2.7 and on prevention of automatic restart in 5.2.8;

— deletion of material requirements on flanges in 5.3.3.3;

— addition of requirements on braking system in 5.3.4;

— up-date of references;

— addition of requirements in 5.4.3 on chips and dust performances;

— limitation of tightening torque for riving knife mounting screws in Annex B.

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

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

— 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 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);

— Part 18: Dimension saws;

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

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

Introduction

This document has been prepared to be a harmonized standard to provide one means of conforming to the essential safety requirements of the Machinery Directive, and associated EFTA regulations. This European Standard is a type “C” standard as defined in EN ISO 12100:2010.

The extent to which hazards are covered is 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 authorized representatives of down cutting cross-cut saws and dual purpose down cutting cross -cut saws/circular saw benches. They are also useful for designers.

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

Common requirements for tooling are given in EN 847-1:2013.

Electrically driven machines excluded by the scope of this document are covered by the requirements of EN 61029-1:2000, EN 61029-2-9:2009 and EN 61029-2-11:2009.

1 Scope

This European Standard deals with all significant hazards, hazardous situations and events as listed in Clause 4 which are relevant to down cutting cross-cut saws and dual purpose down cutting cross-cut saws/circular saw benches, herein after referred to as “machines”, designed to cut solid wood, chipboard, fibreboard, plywood and also these materials where they are covered with plastic edging and/or plastic/light alloy laminates when they are used as intended and under the conditions foreseen by the manufacturer including reasonably foreseeable misuse.

NOTE 1 For the definition of down cutting cross-cut saws and dual purpose down cutting cross -cut saws/circular saw benches, see 3.2.2, 3.2.3 and 3.2.4, and for the definition of displaceable machine, see 3.2.8.

This document does not apply to:

— machines for cross cutting logs;

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

NOTE 2 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 60745-1:2009 together with EN 60745-2–5:2010.

— transportable machines set up on a bench or a table similar to a bench, which are intended to carry out work in a stationary position, capable of being lifted by one person by hand i.e. maximum mass ≤ 25 kg.

NOTE 3 Transportable motor-operated electric tools are covered by the requirements of EN 61029-1:2009 together with EN 61029-2–9:2009 and EN 61029-2–11:2009.

This document is not applicable to down cutting cross-cut saws and dual purpose down cutting cross-cut saws/circular saw benches which are manufactured before the date of its publication as European Standard.

2 Normative references

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

EN 574:1996+A1:2008, *Safety of machinery - Two-hand control devices - Functional aspects - Principles for design*

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

EN 847-1:2013, *Tools for woodworking - Safety requirements - Part 1: Milling tools, circular saw blades*

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

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

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

EN 953:1997+A1:2009, *Safety of machinery - Guards - General requirements for the design and construction of fixed and movable guards*

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

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

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

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

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

EN 1870-19:2013, *Safety of woodworking machines - Circular sawing machines - Part 19: Circular saw benches (with and without sliding table) and building site saws*

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 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*

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

EN 60439-1:1999 [2)], *Low-voltage switchgear and controlgear assemblies — Part 1: Type-tested and partially type-tested assemblies (IEC 60439-1:1999 + A1:2004)*

EN 60529:1991 [3)], *Degrees of protection provided by enclosures (IP Code) (IEC 60529:1989 + A1:1999)*

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

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

EN 61496-2:2013, *Safety of machinery - Electro-sensitive protective equipment - Part 2: Particular requirements for equipment using active opto-electronic protective devices (AOPDs) (IEC 61496-2:2013)*

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)*

---

1) EN 60204-1:2006 is amended by EN 60204-1:2006/A1:2009, based on IEC 60204-1:2005/A1:2008.

2) EN 60439-1:1999 is impacted by EN 60439-1:1999/A1:2004.

3) EN 60529:1991 is impacted by EN 60529:1991/A1:2000.

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 3745:2012, *Acoustics - Determination of sound power levels and sound energy levels of noise sources using sound pressure - Precision methods for anechoic rooms and hemi-anechoic rooms (ISO 3745:2012)*

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 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: Measurement at discrete points (ISO 9614-1:1993)*

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

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

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

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

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

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

EN ISO 13856-1:2013, *Safety of machinery - Pressure-sensitive protective devices - Part 1: General principles for design and testing of pressure-sensitive mats and pressure-sensitive floors (ISO 13856-1:2013)*

EN ISO 13856-2:2013, *Safety of machinery - Pressure-sensitive protective devices - Part 2: General principles for design and testing of pressure-sensitive edges and pressure-sensitive bars (ISO 13856-2:2013)*

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

EN ISO 14119:2013, *Safety of machinery - Interlocking devices associated with guards - Principles for design and selection (ISO 14119:2013)*

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

ISO 14118:2000, *Safety of machinery — Prevention of unexpected start-up*

3 Terms and definitions

3.1 General

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

3.2 Terms and definitions

3.2.1
cross-cutting
operation of cutting across the grain of a wooden workpiece

3.2.2
down cutting cross-cut saw
machine where the saw blade spindle is situated above the workpiece when the saw blade is in its rest position and where the saw blade moves down through the workpiece during the cut (see Figure 1)

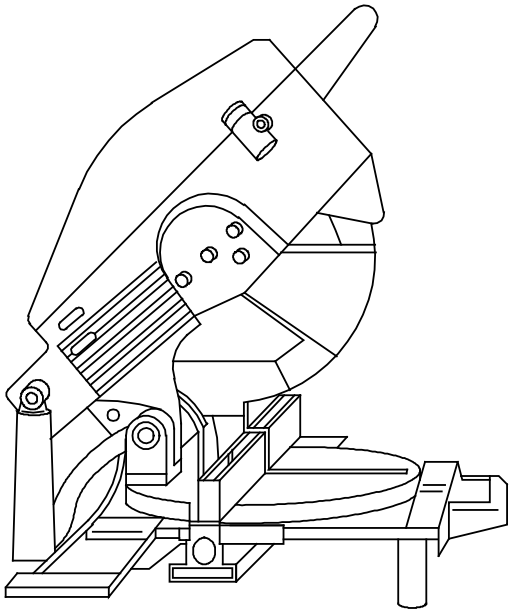
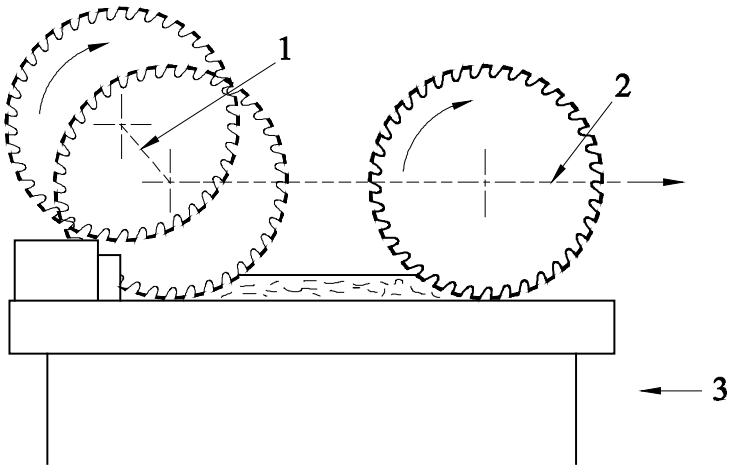


Figure 1 — Example of a down cutting cross-cut saw

3.2.3
down cutting and horizontal cutting cross-cut saw
machine where the saw unit is fed by hand and the workpiece is manually loaded and/or unloaded, and that can be used in two modes:

a) as a down cutting cross cut saw (see 3.2.2);

b) as a down cutting cross cut saw with an additional horizontal cutting stroke where the saw unit is pulled forward through wide work (see Figure 2)



Key

1 down cutting stroke

2 horizontal cutting stroke

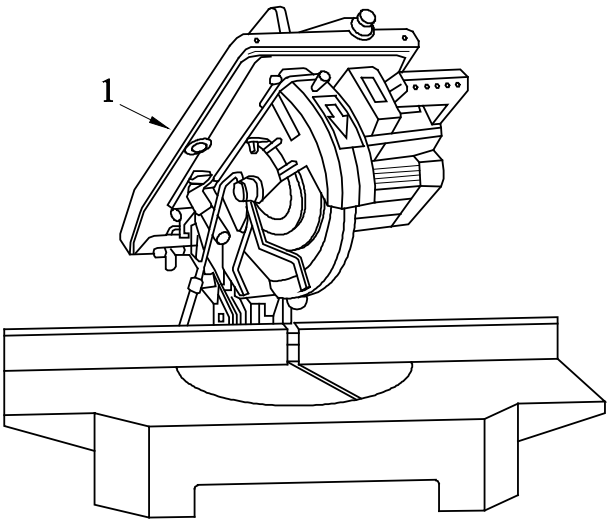
3 operators side

Figure 2 — Diagrammatic illustration of a down cutting and horizontal cutting cross-cut saw (guarding not shown)

3.2.4
dual purpose down cutting cross-cut saw/circular saw bench
machine which may be used in the following modes (see Figure 3):

a) as a down cutting cross cut saw;

b) as a circular saw bench (see EN 1870-19:2013, 3.1)



Key

1 table for use when saw unit is lowered into the circular saw bench mode

Figure 3 — Example of a dual purpose down cutting cross-cut saw/circular saw bench

3.2.5
manual cross-cut saw
machine where the saw unit is fed by hand and the workpiece is manually positioned for cutting to length

Note 1 to entry: This type of machine is not covered by Annex IV of the Machinery Directive.

3.2.6
semi-automatic cross-cut saw
machine where the saw unit has integrated feed which is initiated manually and the workpiece is positioned manually or by means of a positioning mechanism for cutting to length

Note 1 to entry: This type of machine is covered by Annex IV of the Machinery Directive.

3.2.7
automatic cross-cut saw
machine where the saw unit has integrated feed, the workpiece is manually loaded and/or unloaded, automatically positioned for cutting to pre-selected lengths and where the integrated feed of the saw unit is initiated automatically

Note 1 to entry: This type of machine is not covered by Annex IV of the Machinery Directive.

3.2.8
displaceable machine
machine which is located on the floor, stationary during use and equipped with a device, normally wheels, which allow it to be moved between locations

3.2.9
machine actuator
power mechanism used to effect motion of the machine

3.2.10
hand feed
manual holding and/or guiding of the workpiece or of a machine element incorporating a tool (hand feed includes the use of a hand operated carriage on which the workpiece is placed manually or clamped and the use of a de-mountable power feed unit)

Note 1 to entry: The words in brackets are not applicable to this machine.

3.2.11
integrated feed
feed mechanism for the workpiece or tool which is integrated with the machine and where the workpiece or machine element with incorporated tool are held and controlled mechanically during the machining operation

3.2.12
cutting area of the saw blade
area where the saw blade can be involved in the cutting process

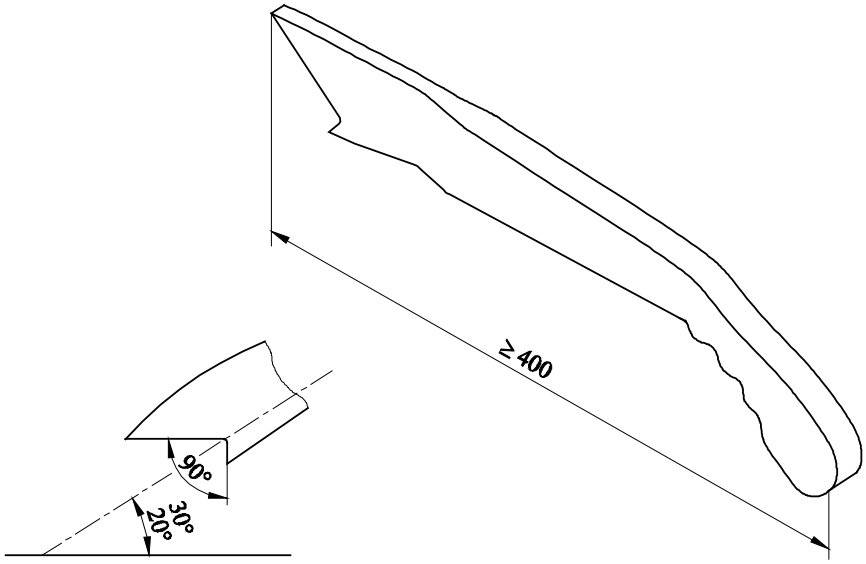
3.2.13
non-cutting area of the saw blade
area of the saw blade where the saw blade is not involved in the cutting process

3.2.14
ejection
unexpected movement of the workpiece or parts of it or part of the machine from the machine during processing

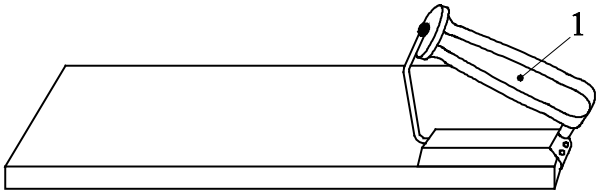
3.2.15
kickback
particular form of ejection and is describing the unexpected movement of the workpiece or parts of it or parts of the machine opposite to the direction of feed during processing

3.2.16
anti kick-back 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

3.2.17
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. as illustrated in Figure 4



a) Example of push stick



Key

1 handle

b) Example of push block

Figure 4 — Example of push stick and push block (for dual purpose down cutting cross-cut saws/circular saw benches in the saw bench mode)

3.2.18
run-down time
time elapsed from the actuation of the stop control device up to spindle standstill

3.2.19
manual loading of power fed machines
operation, where the workpiece is presented by the operator directly to the machine integrated feed, e.g. rotating feed rollers, travelling table or reciprocating carriage; i.e. for which there is no intermediate loading device to receive and transfer the workpiece from the operator to the integrated feed

3.2.20
manual unloading of power fed machines
operation, where the workpiece is removed by the operator directly from the machine out-feed; i.e. for which there is no intermediate unloading device to receive and transfer the workpiece from the machine out-feed to the operator

3.2.21
information from the supplier
statements, sales literature, leaflets or other documents where the manufacturer (or supplier) declares either the characteristics or the compliance of the material or product to a relevant standard

3.2.22
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]

3.2.23
safety related part of the control system
SRP/CS
part of a control system that responds to safety-related input signals and generate safety-related output signals

[SOURCE: EN ISO 13849-1:2008, 3.1.1]

4 List of significant hazards

Clause 4 contains all the significant hazards, hazardous situations and events (see EN ISO 12100:2010), identified by risk assessment as significant for the machines as defined in the scope and which require action to eliminate or reduce the risk. This document deals with these significant hazards by defining safety requirements and/or measures or by reference to relevant standards.

These hazards are listed in Table 1.

Table 1 — List of significant hazards

No	Hazards, hazardous situations and hazardous events	EN ISO 12100:2010	Relevant subclauses of this document
1	***Mechanical hazards related to:***		
	– machine parts or workpieces:		
	a) shape;		5.3.3, 5.3.5, 5.3.6, 5.3.7, 5.3.8, 5.3.9
	b) relative location;		5.2.2, 5.3.5, 5.3.6, 5.3.8
	c) mass and stability (potential energy of elements which may move under the effect of gravity);	6.2.2.1, 6.2.2.2, 6.3	5.3.7
	d) mass and velocity (kinetic energy of elements in controlled or uncontrolled motion);		5.3.7
	e) mechanical strength.		5.3.2, 5.3.3, 5.3.5, 5.3.6, 5.3.9
	– accumulation of energy inside the machinery:		
	f) elastic elements (springs), or	6.2.5, 6.3.3	5.3.7
	g) liquids and gases under pressure.	6.2.10, 6.3.5.4	5.3.7
1.1	Crushing hazard		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	6.2.10	5.3.2, 5.3.3, 5.3.5, 5.3.6, 5.3.8, 5.4.7
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
2.2	Contact of persons with parts which have become live under faulty conditions (indirect contact)	6.2.9	5.4.4, 5.4.13
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	5.4.2
6	***Hazards generated by radiation***		

No	Hazards, hazardous situations and hazardous events	EN ISO 12100:2010	Relevant subclauses of this document
6.5	Lasers	6.3.4.5	5.4.13
7	***Hazards generated by materials and substances (and their constituent elements) processed or used by the machinery***		
7.1	Hazards from contact with or inhalation of harmful fluids and dusts	6.2.3, 6.2.4	5.4.3
7.2	Fire hazard	6.2.4	5.4.1, 5.4.3
8	***Hazards generated by neglecting ergonomic principles in machinery design related to:***		
8.1	Unhealthy postures or excessive effort	6.2.7, 6.2.8, 6.2.11.12, 6.3.5.5, 6.3.5.6	5.2.2
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 d) 2)
8.7	Design, location or identification of manual controls	6.2.8.f, 6.2.11.8	5.2.2
8.8	Design or location of visual display units	6.2.8, 6.4.2	5.2.2
9	***Combination of hazards***	6.3.2.1	5.2.7
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	5.2.8
10.3	External influences on electrical equipment	6.2.11.11	5.2.1, 5.4.4, 5.4.12
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, 6.4	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	5.2.4, 5.2.5
13	***Failure of the power supply***	6.2.11.1, 6.2.11.4	5.2.8
14	***Failure of the control circuit***	6.2.11, 6.3.5.4	5.2.1
15	***Errors of fitting***	6.2.7, 6.4.5	5.3.3
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

5 Safety requirements and/or measures

5.1 General

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

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

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

5.2 Controls

5.2.1 Safety and reliability of control systems

5.2.1.1 General

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

— starting: PL = c (see 5.2.3);

— normal stopping: PL = c (see 5.2.4);

— emergency stopping: PL = c (see 5.2.5);

— interlocking: PL = c (see 5.2.3, 5.3.7.4, 5.3.7.4.2, 5.3.7.6);

— interlocking with guard locking: PL = c (see 5.3.7.3, 5.3.7.4, 5.3.7.6);

— clamping: PL = c (see 5.3.8);

— braking system: PL = b or PL = c (see 5.2.4, 5.2.5, 5.3.4);

— two hand control: PL = c (see 5.3.7.2);

— interlocking of the positioning of the workpiece or of the integrated feed of the saw unit: PL = c (see 5.2.3);

— pressure sensitive mats: PL = c (see 5.3.7.4);

— active opto-electronic protective devices: PL = c (see 5.3.7.4);

— mechanically actuated trip device (trip bar): PL = c (see 5.3.7.4).

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) pressure sensitive mats shall be designed to detect persons weighing more than 35 kg, be fitted with a reset device and shall conform to the requirements of EN ISO 13856-1:2013. The system as a whole (including sensor(s), control system and outlet interface, interlocking control circuit) shall conform at least to PL = c in accordance with the requirements of EN ISO 13849-1:2008;

b) active opto-electronic protective devices (light barrier) shall as minimum be in accordance with type 2 as defined in EN 61496-2:2013 and the associated control system shall conform to at least PL = c in accordance with the requirements of EN ISO 13849-1:2008;

c) magnetic/proximity switches shall be in accordance with the requirements of 6.3 of EN ISO 14119:2013 and the related control system shall conform to at least PL = c in accordance with the requirements of EN ISO 13849-1:2008;

d) time delay and the related control system shall be at least PL = c in accordance with the requirements of EN ISO 13849-1:2008.

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

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

5.2.2 Position of controls

5.2.2.1 General

According to the size of the machine emergency stops required by 5.2.5 shall be positioned:

a) within 1,0 m of the loading position;

b) within 1,0 m of the unloading position;

c) at the main control panel;

d) within 500 mm of the two hand control (where provided);

e) within 3,0 m of the saw unit.

NOTE A single emergency stop can fulfil more than one of these requirements.

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

5.2.2.2 Manual machines

The start control and the stop control required by 5.2.3 and 5.2.4 shall be either:

a) incorporated in, or adjacent to the operating handle of the machine; or

b) at the front of the machine, below the workpiece support, and at a minimum height of 600 mm from the floor level.

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

5.2.2.3 Semi-automatic machines

The requirements in EN 60204-1:2006, 10.1.1 apply and in addition the two hand control (see 5.3.7.2) shall be situated:

a) at the front of the machine;

b) below the workpiece support;

c) at a minimum height of 750 mm from the floor level.

Where the control for the clamps is separate from the two hand control it shall be within 400 mm, measured horizontally, of the two hand control.

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

5.2.2.4 Automatic machines

The requirements in EN 60204-1:2006, 10.1.1 apply.

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

5.2.3 Starting

The requirements in EN 60204-1:2006, 9.2.5.2 apply and in addition:

For the purpose of this European Standard “all of the safeguards in place and functional” is achieved by the interlocking arrangements described in 5.3.7.1 and 5.3.7.2 and “operation” means rotation and/or powered adjustment of the saw spindle and/or powered movement of any workpiece holding and feeding device and/or any machine element in which a saw blade is mounted.

The exceptions described in EN 60204-1:2006, 9.2.5.2 are not relevant.

See also 5.2.6.

On automatic machines, the positioning of the workpiece shall only take place when the saw unit is in its rest position.

All reset controls shall be located outside protected areas and not reachable when standing inside a protected area.

The safety related part of the control system for the interlocking function between the work piece positioning feed and the saw blade unit and between cutting stroke and the saw blade rotation shall conform to at least PL = c in accordance with the requirements of EN ISO 13849-1:2008.

Closure of movable interlocked guards shall not lead to an automatic restart of hazardous movements. For each restart a deliberate action of the operator is required.

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

5.2.4 Normal stopping

5.2.4.1 General

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

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

The safety related part of control system for normal stopping shall be at least PL = c in accordance with the requirements of EN ISO 13849-1:2008.

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

5.2.4.2 Manual machines

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

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

a) cut power to all machine actuators and actuate the brake;

b) cut power to brake after stopping sequence is complete.

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

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

5.2.4.3 Automatic and semi-automatic machines

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

When initiated the stopping sequence shall be:

a) initiate the return stroke of the saw unit;

b) remove power to workpiece clamping;

c) cut power to saw spindle motor and initiate the brake (where fitted);

d) when braking sequence is complete, cut power to brake (if electrical brake is fitted).

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

A separate stop control is not required where the machine is fitted with an emergency stop which performs the same function.

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

5.2.5 Emergency stop

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

Machines with more than one machine actuator shall be fitted with an emergency stop control system which shall conform to the requirements of EN 60204-1:2006, 9.2.5.4 and 10.7. However EN 60204-1:2006, 10.7.4 does not apply. The emergency stop control device shall be at any time of self latching type.

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

When actuated the emergency stop shall disconnect power from all machine actuators and actuate the brake (if provided). When initiated the stopping sequence shall be:

a) initiate the return stroke of the saw unit;

b) remove power to workpiece clamping;

c) cut power to saw spindle motor and initiate the brake (where fitted);

d) when braking sequence is complete, cut power to brake (if electrical brake is fitted).

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

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

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

5.2.6 Integrated feed

On semi-automatic and automatic machines the cutting stroke shall only be capable of being initiated via a manual control after saw blade rotation and workpiece clamping have been initiated.

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

5.2.7 Mode selection

A mode selector shall be provided for machines designed to operate in semi-automatic as well as in automatic mode and it shall be in accordance with the following requirements (see also EN ISO 12100:2010, 6.2.11.10):

a) the mode selected shall override all other control or operating modes, with the exception of the emergency stop;

b) the mode selector shall be lockable in any position e.g. by a key-operated switch;

c) changing the mode shall not initiate any movement of the machine;

d) when changing modes the machine shall be brought to a normal stop except when changing from a mode with lower safety measures (e.g. setting) into a mode with higher safety measures.

All the requirements for each type of machine shall apply when operating in the corresponding mode. The mode selector shall be lockable.

The safety related part of the control system for mode selection shall conform at least to PL = c in accordance with the requirements of EN ISO 13849-1:2008.

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

5.2.8 Failure of the power supply

In the case of supply interruption the automatic restart of the machine shall be prevented and parameters affecting safety functions of the machine shall not change in an uncontrolled way after restoration of the supply.

For electric supply see EN 60204-1:2006, 7.5 paragraphs 1 and 3.

The requirements of ISO 14118:2000, Clause 6 apply and in addition:

In the event of loss of pneumatic or hydraulic pressure, clamping of the work-piece shall be maintained until the return stroke of the tool is initiated. Where non-return valves are used to meet this requirement, they shall be fitted directly at the actuating cylinders.

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

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

5.3 Protection against mechanical hazards

5.3.1 Stability

Machines shall be equipped with the facility to fix the machine to the floor, bench or other stable structure, e.g. by providing holes in the machine frame.

Displaceable machines fitted with wheels shall have facilities to make them stable during cutting e.g. brakes for the wheels or a device to retract the wheels from the floor.

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

5.3.2 Risk of break-up during operation

The guards for the saw blade shall be manufactured from:

a) steel having an ultimate tensile strength of at least 350 N mm^{-2} and a wall thickness of at least 1,5 mm;

b) light alloy with characteristics as shown in Table 2;

Table 2 — Characteristics of light alloy saw blade guards

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

c) polycarbonate with a wall thickness of at least 3 mm or other plastic material passing the test in Annex E;

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

Verification: by checking the relevant drawings, measurement, performing for plastic material not conforming to the requirements in c) the impact test given in Annex E and inspection of the machine.

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

5.3.3 Tool holder and tool design

5.3.3.1 Saw spindle design

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

The saw blade spindle shall be manufactured from steel with a minimum ultimate tensile strength of 580 N mm^{-2}.

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

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

5.3.3.2 Spindle locking

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

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

Verification: by checking the relevant drawings, inspection, measurement and relevant functional testing of the machine. Alternatively on machines with locking bars, by the following test: after starting the spindle drive motor with the locking bar in place the spindle shall remain stationary.

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

5.3.3.3 Saw blade fixing device

Saw flanges (or in the case of flush mounted saw blades - a flange) shall be provided.

For saw blades with a diameter ≤ 450 mm, the diameter of both flanges (or flange for flush mounting) shall be at least $D/4$ (where D = the diameter of the largest saw blade for which the machine is designed).

For saw blades with a diameter > 450 mm, the diameter of the flanges (or flange for flush mounting) shall be at least $D/6$, but not less than 115 mm.

For flanges other than those for flush mounted saw blades the clamping surface at the outside part of flange shall be at least 5 mm in width and recessed to the centre (see Figure 5).

Where two flanges are provided, both outside diameters shall be within a tolerance of ± 1 mm.

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

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

Dimensions in millimetres

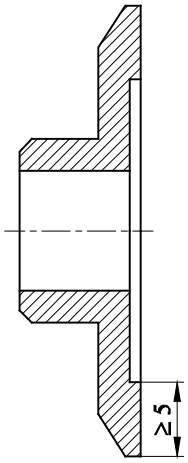


Figure 5 — Saw flange detail

5.3.4 Braking

An automatic brake shall be provided for the saw spindle where the un-braked run-down time is more than 10 s.

The braked run-down time shall be less than 10 s.

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

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

Where a spring operated mechanical brake or any other type of brake not using electronic components is fitted the last paragraph of EN 60204-1:2006, 9.3.4 does not apply (see 6.3 a)).

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

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

The test shall:

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

b) be independent from the intention of the operator;

c) be performed at least once within every 8 h of machine running.

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

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

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

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

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

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

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

5.3.5 Devices to minimize the possibility or the effect of ejection

Every dual purpose down cutting cross-cut saw/circular saw bench shall be supplied with a riving knife/riving knives to accommodate the range of saw blades which are intended for use with that machine when used in the saw bench mode, as indicated in the instruction handbook.

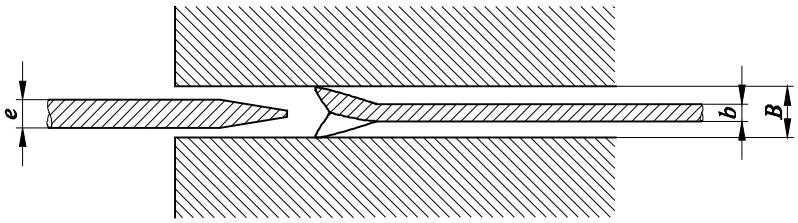
Verification: by checking the relevant drawings and inspection of the machine.

The riving knife and its mounting arrangements shall have the following characteristics:

a) riving knives shall be manufactured from steel with an ultimate tensile strength of at least 580 N mm^{-2}, or of a comparable material, have flat sides (within 0,1 mm in 100 mm) and shall have a thickness between the width of the saw blade plate and the kerf (width of saw teeth) (see Figure 6).

Verification: by checking the relevant drawings and measurement;

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 cut

b width of saw blade

Figure 6 — Thickness of riving knife in relation to saw blade dimensions

b) the leading edge of the riving knife shall be chamfered to provide a “lead-in” (see Figure 7) and the riving knife shall be of constant thickness (within ± 0,05 mm) throughout its working length.

Verification: by checking the relevant drawings, inspection and measurement;

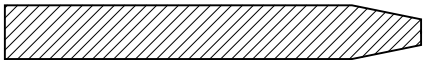


Figure 7 — Chamfered leading edge of riving knife

c) the riving knife shall be capable of vertical adjustment so that its tip reaches a point level with or higher than the highest point on the periphery of the saw blade when set in accordance with the requirements of this document (see Figure 8).

Verification: by checking the relevant drawings, inspection and measurement;

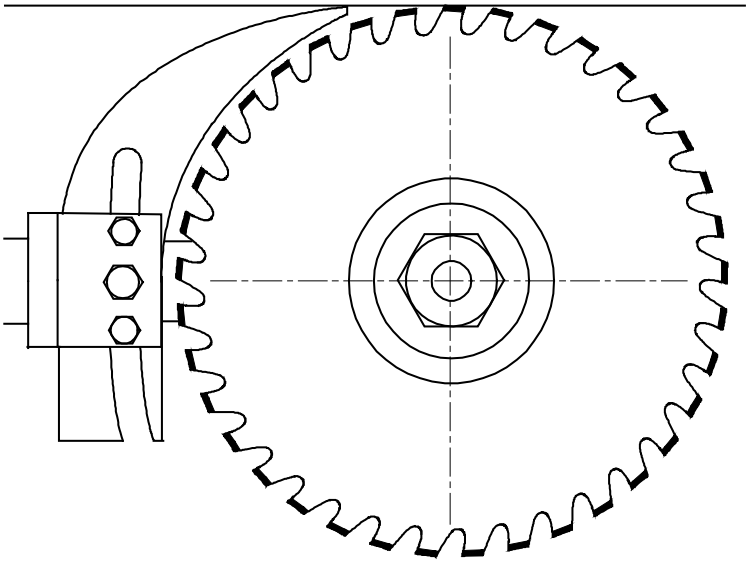


Figure 8 — Riving knife height adjustment

d) the riving knife shall be so designed 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 blade spindle (see Figure 9).

Verification: by checking the relevant drawings, inspection and measurement;

Dimensions in millimetres

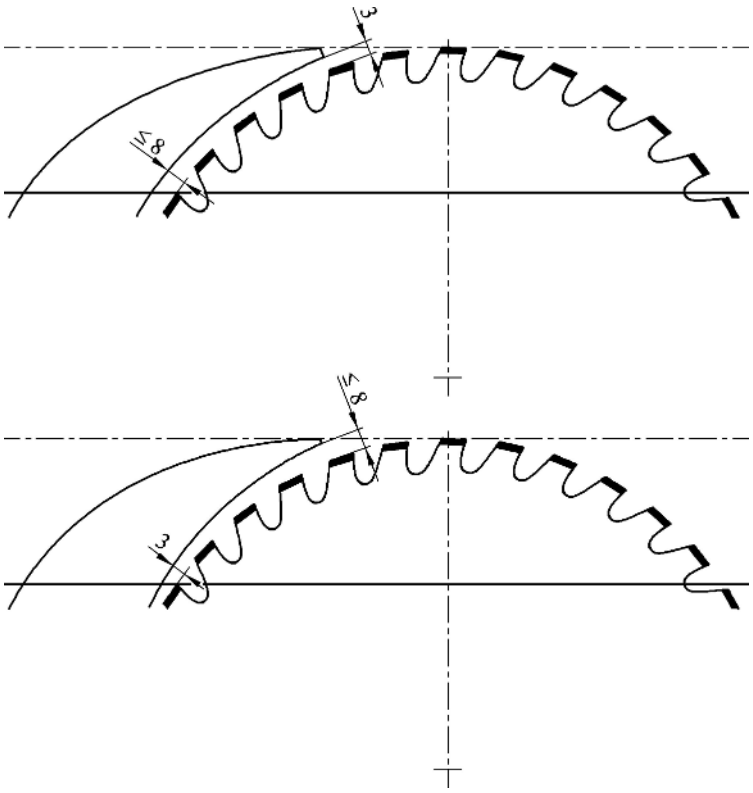
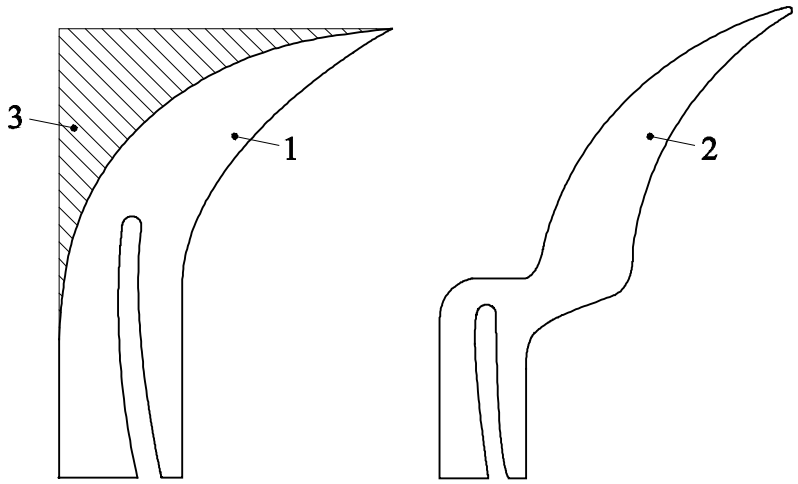


Figure 9 — Positioning limits for riving knife design

e) the front and rear contours of the riving knife shall be continuous curves or straight lines, without any flexure which would weaken it (for example see Figure 10).

Verification: by checking the relevant drawings and inspection;



Key

1 example of acceptable riving knife shape

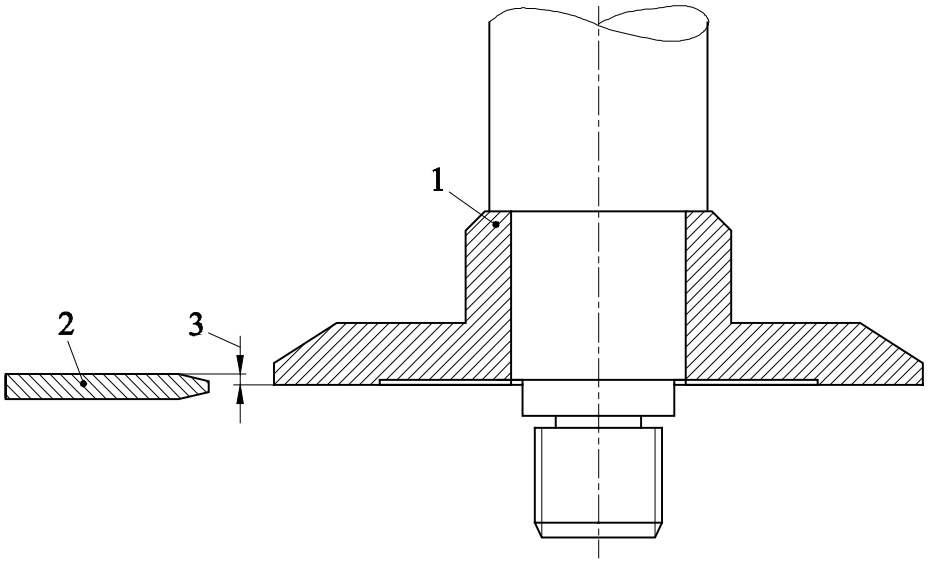
2 example of unacceptable riving knife shape

3 shaded area represents shape of riving knife for machines with the top guard mounted on the riving knife

Figure 10 — Shape of riving knife

f) the riving knife fixing arrangement shall be such that the relative position of the riving knife and the fixed saw flange is in accordance with the tolerance shown in Figure 11. The relative position of the riving knife and the fixed saw blade flange shall be maintained with the rise and fall and tilt of the saw blade.

Verification: by checking the relevant drawings, inspection, measurement and relevant functional testing of the machine;



Key

1 fixed saw flange

2 riving knife

3 maximum tolerance 0,2 mm

Figure 11 — Positioning of riving knife in relation to the fixed saw flange

g) the arrangement for fixing the riving knife shall be such that its stability is able to satisfy the requirements laid down in Annex B.

Verification: by checking the relevant drawings and carrying out the test in accordance with Annex B;

h) the riving knife shall either conform with the lateral stability test laid down in Annex C, or the width of the riving knife on each side of the riving knife slot within the fixing area shall be designed in accordance with the requirements of the following formulae:

- for riving knives supporting a saw guard:

$$X + Y \geq \frac{D_{max}}{5} \text{ where } X = Y \pm 0{,}5\,Y$$

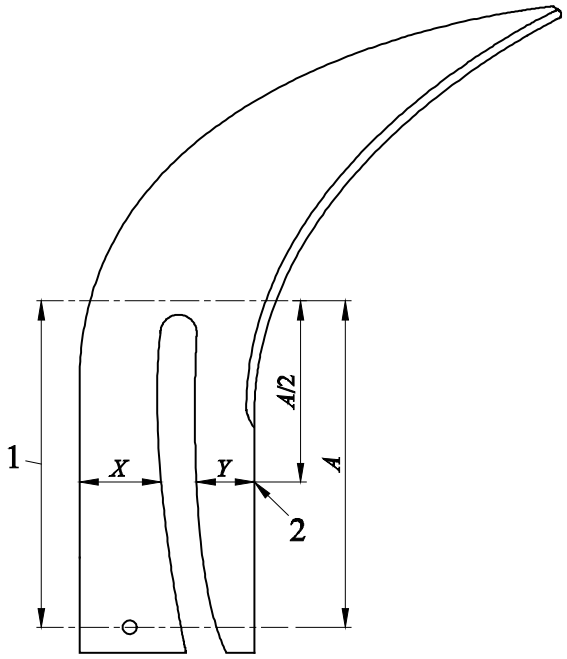
- for riving knives not supporting a saw guard:

$$X + Y \geq \frac{D_{max}}{6} \text{ where } X = Y \pm 0{,}5\,Y$$

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 12).

Verification: carry out, as appropriate, test at Annex C or check relevant drawings, inspection and measurement;



Key

1 fixing area

2 measuring point

Figure 12 — Width of riving knife at fixing slot

i) the riving knife shall be held in position by guiding elements, e.g. guiding pins (see Figure 13). 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 and measurement;

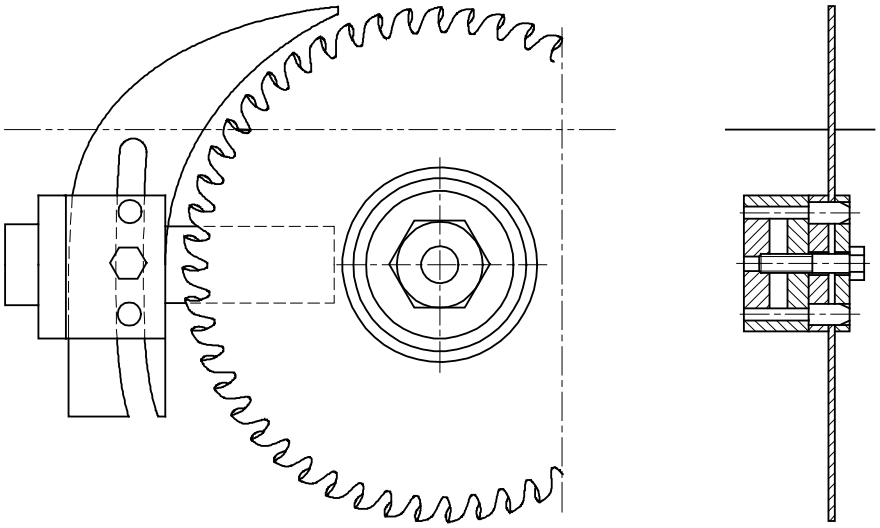


Figure 13 — Example of riving knife fixing arrangement

j) where it is necessary to change the riving knife to accommodate different widths of saw blade, the riving knife fixing slot shall be open ended.

Verification: by checking relevant drawings and inspection.

5.3.6 Workpiece supports and guides

5.3.6.1 Workpiece support

All machines shall be fitted with a workpiece support (see Figure 14) which complies with the following requirements:

a) for manual and semi-automatic machines with a maximum saw blade diameter ≤ 315 mm, the workpiece support shall extend at least 500 mm on each side of the cutting line taking account of the saw blade's ability to cant or pivot for angled cutting. This workpiece support shall be a fixed table or be a fixed table with detachable or retractable extension pieces;

b) for manual and semi-automatic machines with a saw blade diameter > 315 mm the workpiece support shall extend at least 1,0 m on each side of the cutting line taking account of the saw blade's ability to cant or pivot for angled cutting. This workpiece support shall be a fixed table or be a fixed table with extension pieces;

c) for automatic machines the workpiece support shall extend at least 250 mm on each side of the cutting line taking account of the saw blade's ability to cant or pivot for angled cutting;

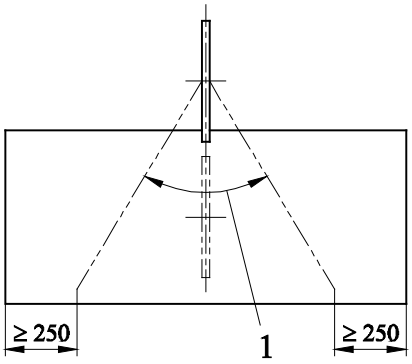
d) the workpiece support in the cutting area shall extend forward such that the front edge of the saw blade will not project beyond the workpiece support when the saw unit is at its maximum forward position. Outside the cutting area, the width of the workpiece support shall be at least 60 % of the maximum cutting capacity of the machine;

e) the workpiece support in the cutting area shall be made from a material which is easily cut by the saw blade, e.g. plastic, wood or light alloy, to minimize the risk of damage in the event of contact between the saw blade and the workpiece support;

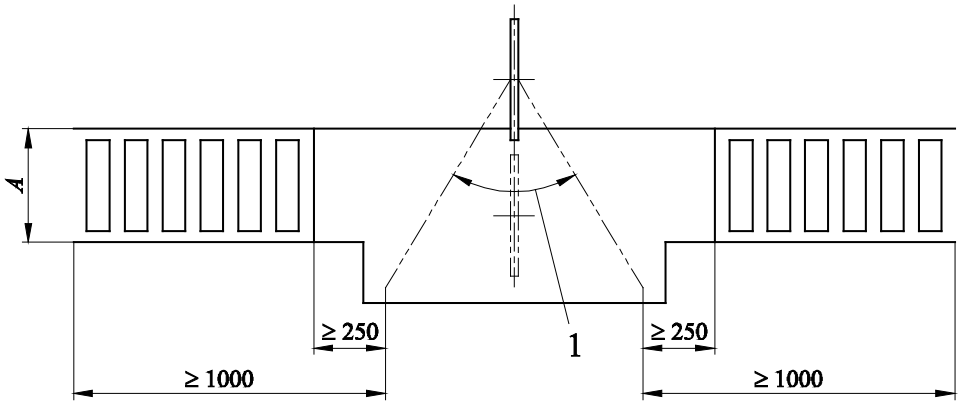
f) there shall be no table rollers within 250 mm of the saw line taking into account the saw blade's ability to cant or pivot for angled cutting.

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

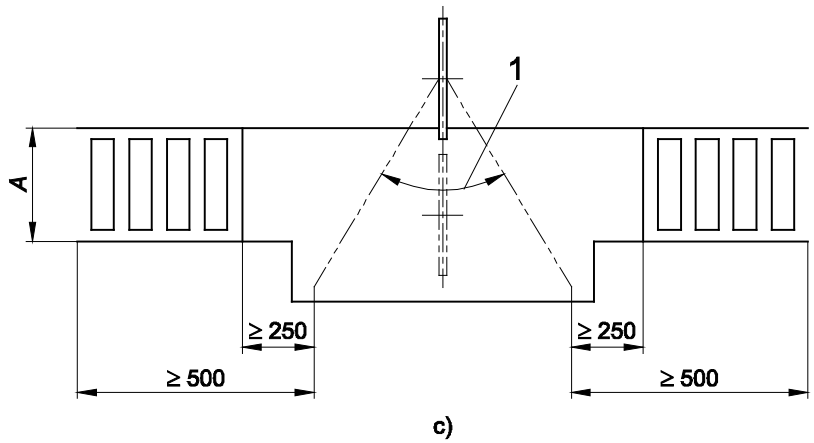
Dimensions in millimetres



a) Workpiece supports for automatic machines



b) Workpiece supports for manual and semi-automatic machines with saw blade diameters > 315 mm



c) Workpiece supports for manual and semi-automatic machines with saw blade diameters ≤ 315 mm

Key

1 pivoting adjustment

A ≥ 60 % of maximum cutting capacity

Figure 14 — Workpiece supports (plan view)

g) dual purpose down cutting cross-cut saws/circular saw benches (see 3.2.4) shall be provided with a workpiece support for the saw bench mode the size of which shall be in accordance with the requirements of Table 3 (see Figure 15).

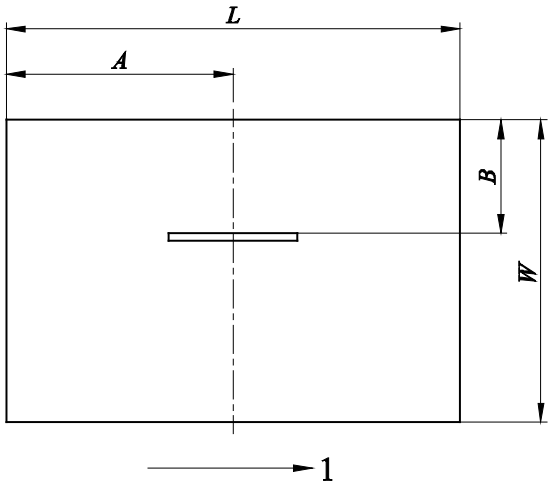
Table 3 — Saw bench table dimensions

Dimensions in millimetres

Maximum cutting height capacity in the saw bench mode	≤ 40	> 40 to ≤ 50	> 50 to ≤ 60
L	≥ 300	≥ 370	≥ 500
W	≥ 200	≥ 250	≥ 345
A	≥ 150	≥ 185	≥ 250
B	≥ 70	≥ 90	≥ 110

Where the maximum cutting height capacity is greater than 60 mm, see EN 1870-19:2013, Annex G.

Verification: by checking the relevant drawings, inspection and measurement.



Key

1 feed direction

Figure 15 — Table dimensions (for machines where the cutting height capacity is ≤ 60 mm)

5.3.6.2 Workpiece guides

On machines where the workpiece is manually held during cutting, a fence shall be provided on either side of the saw line.

The fence shall be to a height of at least 60 % of the maximum depth of cut for which the machine is designed.

On machines with the facility for angled or bevelled work, the fences shall have adequate clearance to accommodate this feature, and shall be provided with replaceable inserts to give support to the workpiece.

In all cases, that part of the fence or the replaceable inserts within 10 mm of the cutting line, taking account of the saw unit's ability to pivot and/or cant, shall be made of e.g. wood, plastic or light alloy.

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

Dual purpose down cutting cross-cut saws/circular saw benches (see 3.2.4) shall be provided, in the saw bench mode, with a rip fence which is adjustable at right angles to the saw blade at least over the whole width of that part of the workpiece support at the right side of the saw blade.

The workpiece guiding part of this fence shall:

a) be made from plastic, light alloy or wood if there is a possibility of contact with the saw blade;

b) be adjustable parallel to the saw blade so that its out-feed end can be positioned from a point in line with the front edge of the riving knife, to a point at workpiece support level which is in line with the first cutting tooth of the largest saw blade for which the machine is designed and adjusted to the maximum cutting height;

c) have two guiding surfaces with a high position for deep work and a low position for shallow and angled cutting (see Figure 16). The height of the fence in the high position shall be at least equal to the maximum cutting capacity for which the machine is designed, and the height shall be 6 mm to 8 mm for the low position;

d) be so designed that when in its low position, the saw blade shall not be capable of touching the rip fence at the point B as shown in Figure 17 when the saw blade is fully tilted;

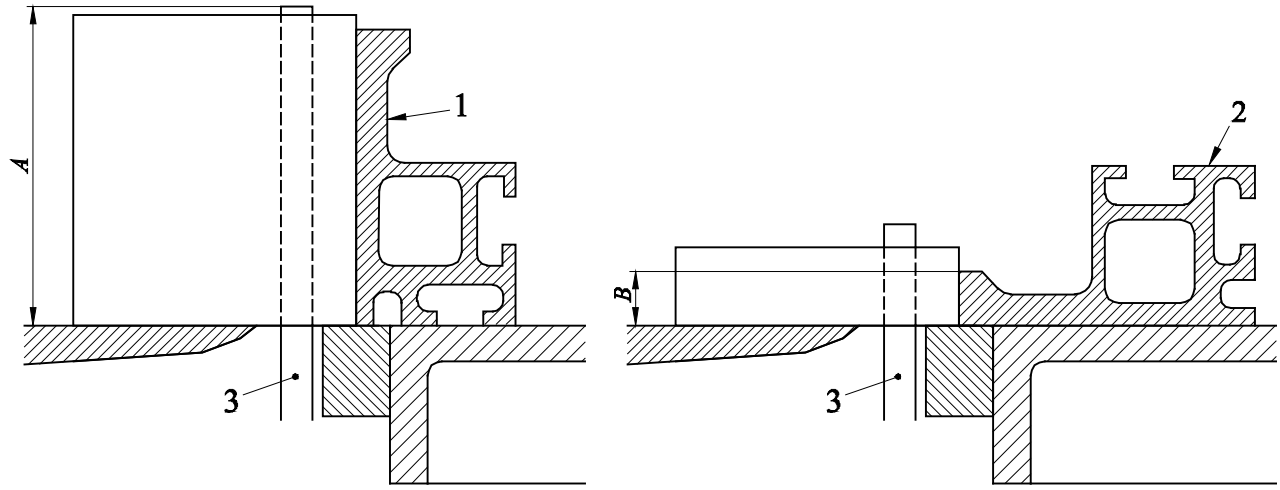
e) be so designed that when it is in its low position, the saw guard can be lowered to the minimum height of the workpiece guiding part of the fence.

All adjustments to the fence position shall be possible without the aid of a tool.

On dual purpose down cutting cross-cut saws/circular saw benches (see 3.2.4) used in the saw bench mode, where a cross-cutting fence is provided, the fixing arrangements shall ensure that the fence cannot rise or swing out of position during use (see Figure 18). If the cross-cutting fence extends beneath the saw guard then the height of that section of the fence shall not exceed 15 mm.

If the workpiece guiding part of the cross-cutting fence is adjustable in length and if there is a possibility of contact between this fence and the saw blade, this part of the fence shall be made from plastic, light alloy or wood.

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



Key

1 fence high position for deep work

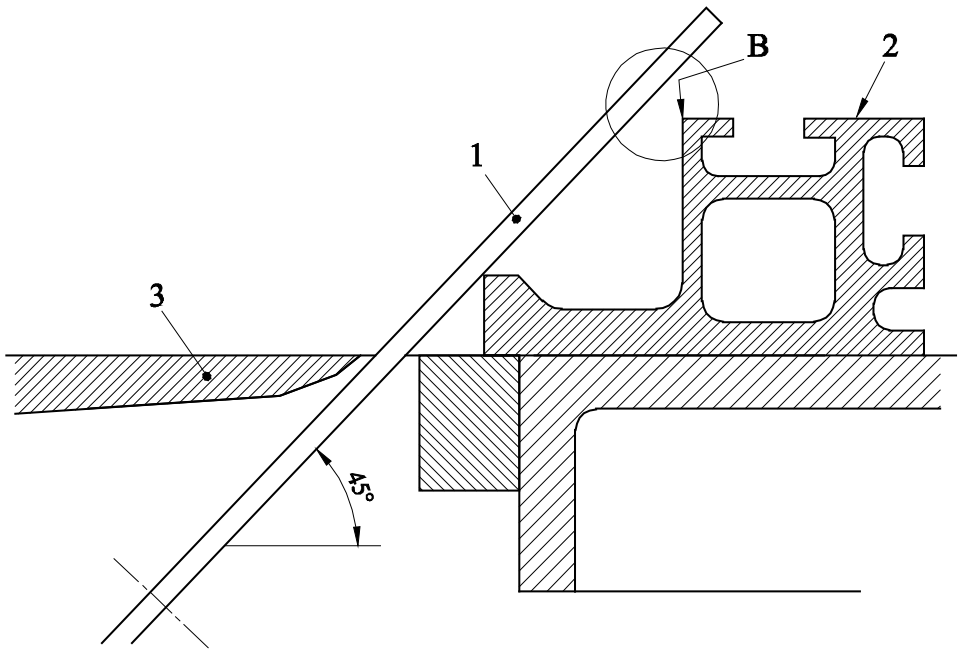
2 fence low position for shallow or angled cutting

3 saw blade

A maximum cutting capacity

B 6 mm ≤ B ≤ 8 mm

Figure 16 — Two position rip fence



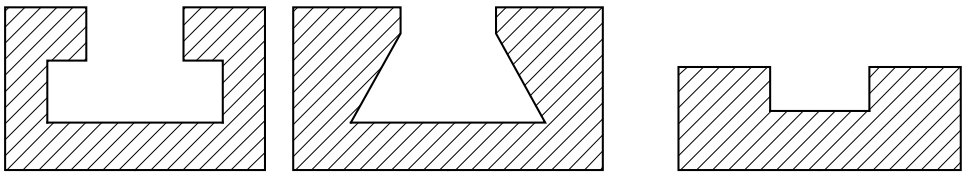
Key

1 saw blade

2 rip fence in low position

3 table

Figure 17 — Design of rip fence in low position



Key

1 acceptable design

2 unacceptable design

Figure 18 — Examples of slot shape for locating the cross-cut fence on saw benches

5.3.7 Prevention of access to moving parts

5.3.7.1 Guarding of the saw blade on manual machines

Access to the non-cutting area of the saw blade shall be prevented by a fixed guard extending to the lowest point on the periphery of the saw flange.

If the fixed guards are to be demounted by the user e.g. for maintenance, cleaning purposes their fixing systems, e.g. un-losable screws, shall remain attached to the guard or to the machine when the guard is removed (see 6.3 s)).

Where access is required for saw blade changing, and when the access component is a moveable guard hinged to the fixed guard it shall be interlocked with the spindle drive motor. As an alternative a fixed guard shall be provided which shall only be capable of being removed with the aid of a tool in accordance with EN 953:1997+A1:2009, 7.2. The guard shall not remain in place without its fixing.

Access to the cutting area of the saw blade shall be prevented either with:

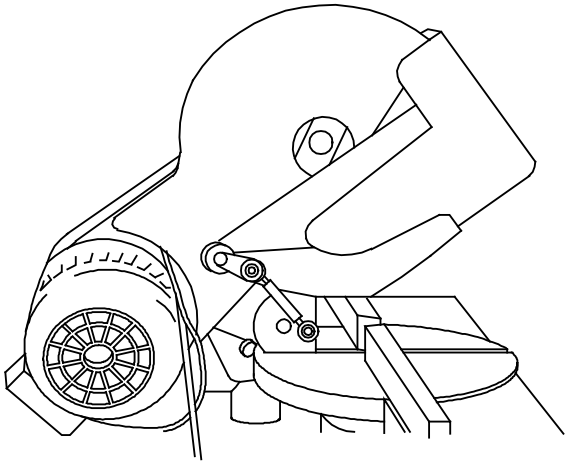
a) a self closing guard on both sides of the saw teeth which extends beyond the periphery of the saw blade (see Figure 19 a)) in accordance with the dimensions given in Figure 20 a) and which opens when it makes contact with the workpiece or the fence. The guard shall lie on the workpiece or the fence during cutting to afford maximum protection; or

b) a self closing guard which covers at least the periphery of the saw blade and both sides of the saw teeth (see Figure 19 b)) in accordance with the dimensions in Figure 20 b). This guard shall be completely closed in the rest position and shall progressively open and be fully open when the saw blade is at its lowest position for which the machine is designed.

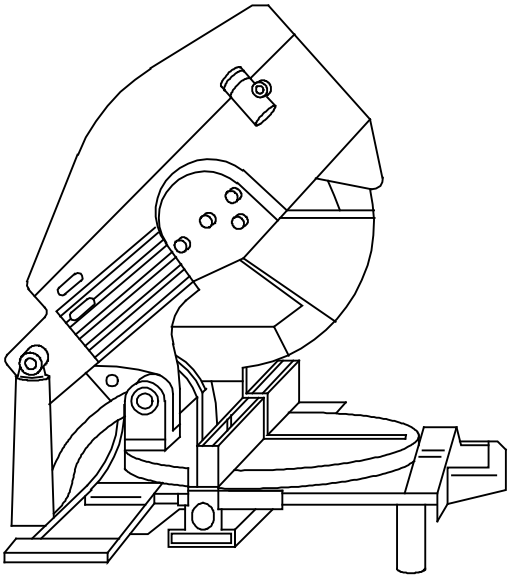
Both types of guard shall be locked in the fully closed position when the saw unit is in the rest position and shall permit the changing of the saw blade without removing the guard from the machine.

On down cutting and horizontal cutting machines (see 3.2.3) the horizontal cutting movement shall not be possible until the saw unit is fully lowered to the maximum depth of cut, and the saw unit shall not be capable of being lifted during the forward movement of the cutting stroke.

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

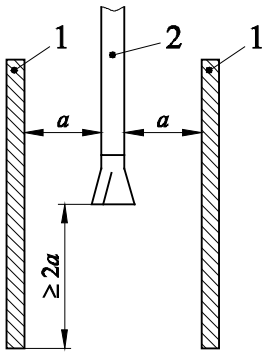


a) Self closing guard in accordance with the requirements of 5.3.7.1 a)

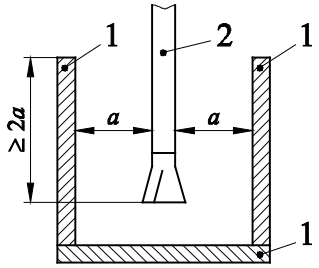


b) Self closing guard in accordance with the requirements of 5.3.7.1 b)

Figure 19 — Guarding the cutting area of the saw blade



a) Guard for the cutting area in accordance with the requirements of 5.3.7.1 a)



b) Guard for the cutting area in accordance with the requirements of 5.3.7.1 b)

Key

1 guard

2 saw blade

Figure 20 — Dimensions of self closing guards

5.3.7.2 Guarding of the saw blade on semi-automatic machines

Access to the saw blade shall be prevented:

a) in accordance with the requirements of 5.3.7.3; or

b) in accordance with the requirements of 5.3.7.1 with an additional two-hand control of at least type 3B in accordance with EN 574:1996+A1:2008 to control the cutting stroke.

The safety related part of the control system (see also 5.2.1.1) for the two hand control shall be at least PL = c in accordance with the requirements of EN ISO 13849-1:2008.

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

5.3.7.3 Guarding of the saw blade on automatic machines

Access to the saw blade shall be prevented by a fixed guard.

If the fixed guards are to be demounted by the user e.g. for maintenance, cleaning purposes their fixing systems, e.g. un-losable screws, shall remain attached to the guard or to the machine when the guard is removed (see 6.3 s)).

Openings in this fixed guard to allow workpiece loading and unloading shall be in accordance with the requirements of EN ISO 13857:2008, Table 4.

Where access is needed e.g. for maintenance or saw blade changing, this shall be via a moveable interlocked guard with guard locking with at least unconditional unlocking in accordance with the requirements of EN ISO 14119:2013, Annex N.

The safety related part of the control system (see also 5.2.1.1) for the interlocking with guard locking function shall be at least PL = c in accordance with the requirements of EN ISO 13849-1:2008.

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

5.3.7.4 Guarding of workpiece positioning mechanism

5.3.7.4.1 General

Except in the loading and unloading area, access to dangerous parts (e.g. with crushing or shearing hazards) at the workpiece positioning mechanism shall be prevented either:

a) by fixed guards, any openings in which shall be in accordance with the requirements of EN ISO 13857:2008, Table 4. Fixed guard shall be fitted with fixing system attached to the guard or to the machine e.g. un-losable screws if they are demountable by the user e.g. for maintenance, cleaning purposes (see 6.3 s)); or

b) by moveable interlocked guards with guard locking with at least unconditional unlocking in accordance with the requirements of EN ISO 14119:2013, Annex N and the safety related part of the control system (see also 5.2.1.1) for the interlocking with guard locking function shall be at least PL = c in accordance with the requirements of EN ISO 13849-1:2008; or

c) an active opto-electronic protective device (light beam) in accordance with 5.2.1.2 b). The light beam shall be interlocked with the dangerous movement and positioned at a distance of at least 1,3 m, measured horizontally to the nearest dangerous part of the workpiece positioning mechanism. It shall have at least 2 horizontal beams, one at 400 mm from the floor level and one at 900 mm from the floor level; or

d) by using pressure sensitive mats in accordance with 5.2.1.2 a) which are interlocked with the dangerous movement and which shall be operative over a distance of at least 1,3 m measured horizontally to the nearest dangerous part of the workpiece positioning mechanism; or

e) a combination of any of these measures.

Access to the dangerous parts at the infeed opening of the workpiece positioning mechanism may be prevented by the measures in a) to e) or shall be prevented by using a trip bar in accordance with the requirements of EN ISO 13856-2:2013 and its associated safety related control systems shall be at least PL = c in accordance with the requirements of EN ISO 13849-1:2008.

Where a trip bar is used it shall be located above the infeed opening, and shall meet the following requirements:

1) when operated it shall stop the workpiece positioning mechanism before a hand resting on the workpiece and moving at the maximum positioning speed for which the machine is designed can reach the drawing-in or shearing point;

2) the width of the trip bar shall be at least equal to the width of the infeed opening;

3) the bottom edge of the trip bar shall be no more than 25 mm above the surface of any workpiece for which the machine is designed and automatically adjusted to the height of each workpiece;

4) the trip bar shall not in itself create a trapping hazard.

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

5.3.7.4.2 Guarding of powered roller tables

Where powered roller tables are fitted at the machine infeed and/or out-feed, access to the drawing-in points between the rollers shall be prevented either by:

a) filling-in the drawing-in points in accordance with the dimensions shown in Figure 21; or

b) an active opto-electronic protective device (light beam) in accordance with 5.2.1.2 b) which is interlocked with the dangerous movement and positioned at a distance of at least 1,3 m measured horizontally to the nearest drawing in point of the powered roller table. It shall have at least 2 horizontal beams, one at 400 mm from the floor level and one at 900 mm from the floor level; or

c) pressure sensitive mats in accordance with 5.2.1.2 a) which is interlocked with the dangerous movement and operative over a distance of at least 1,3 m measured horizontally to the nearest drawing point; or

d) a combination of any of these measures.

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

Dimensions in millimetres

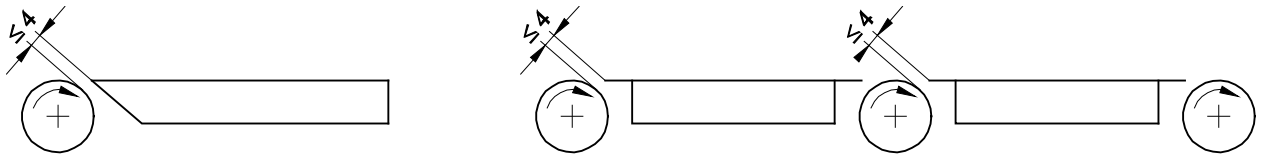


Figure 21 — Guarding of powered rollers

5.3.7.5 Guarding of dual purpose down cutting cross-cut saws/circular saw benches

When used as a down cutting cross-cut saw:

a) access to that part of the saw blade below the saw bench table shall be prevented in accordance with the requirements in 5.3.7.1;

b) access to that part of the saw blade above the saw bench table shall be prevented with a detachable guard without interlocking.

When used as a circular saw bench:

c) access to that part above the saw bench table shall be prevented in accordance with the relevant requirements of EN 1870-19:2013, 5.3.7.1 and 5.3.7.1.4 or EN 1870-19:2013, 5.3.7.1.1 and 5.3.7.1.2;

d) access to that part of the saw blade below the saw bench table shall be prevented either:

   1) in accordance with the requirements of 5.3.7.1, where the saw teeth are totally enclosed by these guards; or

   2) in accordance with the requirements of 5.3.7.1 with additional guarding e.g. a detachable guard without interlocking, where the saw teeth are not totally enclosed by the guards required in 5.3.7.1.

The saw unit shall be capable of being locked in position when used as a circular saw bench.

It shall not be necessary to detach the riving knife when the machine is used as a down cutting cross-cut saw.

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

5.3.7.6 Guarding of drives

Access to the saw blade drive and any other drive mechanism shall be prevented either by a fixed guard, or a movable interlocked guard.

If the fixed guards are to be demounted by the user e.g. for maintenance, cleaning purposes their fixing systems shall remain attached to the guard or to the machine when the guard is removed e.g. fitted with un-losable screws (see 6.3 s)).

If fitted with a movable interlocked guard, the saw blade drive guard shall be fitted with guard locking in accordance with at least EN ISO 14119:2013, Annex N if it is possible to gain access to the revolving saw blade with the guard open.

The safety related part of the control system (see also 5.2.1.1) for the interlocking function shall be at least PL = c in accordance with the requirements of EN ISO 13849-1:2008.

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

5.3.7.7 Stroke control

5.3.7.7.1 Manual machines

In the rest position, the saw unit shall be provided with a retaining latch, the release control button of which is positioned on or adjacent to the handle for moving the saw blade through its cutting stroke.

The saw unit shall return to the rest position automatically, actuated e.g. by a compression spring or weight, with a speed of not more than 0,5 m s^{-1}.

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

5.3.7.7.2 Semi-automatic machines

The saw unit shall be prevented from inadvertently falling, e.g. by a spring in compression or a non-return valve in the pneumatic system positioned at the pneumatic cylinder.

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

5.3.8 Clamping devices

Power operated workpiece clamping shall be provided on all semi-automatic and automatic machines.

Where crushing hazards are not prevented by the means described in 5.3.7 they shall be prevented by e.g.

a) two stage clamping with a clamping force not exceeding 50 N for the first stage, followed by full clamping force actuated by a manual control; or

b) reduction of the clamp/workpiece gap to 6 mm or less by a manually adjustable device; and stroke limitation to a maximum of 10 mm; or

c) limitation of the clamp closing speed to 10 mm s^{-1} or less; or

d) guarding of the clamp by a guard fixed to the clamping device to reduce the gap between the workpiece and the guard to 6 mm or less. The maximum extension of the clamp outside the guard shall not be more than 6 mm.

The safety related parts of the control systems for the monitoring of the first stage clamping force (see 5.3.8 a)) and the limitation of the clamp closing speed (see 5.3.8 c)) shall be at least PL = c in accordance with the requirements of EN ISO 13849-1:2008 (also see 5.2.1).

Where pneumatic clamping is provided, in the event of loss of pneumatic pressure, clamping of the workpiece shall be maintained until the return stroke of the saw blade is initiated.

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

5.3.9 Safety appliances

Dual purpose down cutting cross-cut saws/circular saw benches (see 3.2.4) shall be provided in the saw bench mode with a push stick and push block handle. Provision shall be made for locating the push stick and push block handle on the machine.

The minimum length for push sticks shall be 400 mm (see Figure 4).

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

Push sticks and push block handles shall be made from plastic, wood or plywood with the exception that the elements for fastening the handle to the block may be of other material.

Verification: by checking the technical specification and inspection.

5.4 Protection against non-mechanical hazards

5.4.1 Fire

To minimize fire hazards, the requirements in 5.4.3 and 5.4.4 shall be met.

Also see 5.3.6.1 and 5.3.6.2 for avoiding sparks as result of contact between the saw blade and the machine table slot lining.

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

5.4.2 Noise

5.4.2.1 Noise reduction at the design stage

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

5.4.2.2 Noise emission measurement

Operating conditions for noise measurement shall comply with the requirements of ISO 7960:1995, Annex N and where relevant Annex A.

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 ISO 7960:1995, either Annex N or Annex A/Annex N, is not applicable, e.g. for different spindle speeds and saw blade diameters, the detailed operating conditions used shall be given in the test report.

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

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

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

c) only the parallelepiped measurement surface shall be used at 1,0 m from the reference surface;

d) where the distance from the machine to an auxiliary unit is less than 2,0 m the auxiliary unit shall be included in the reference surface;

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

f) the number of microphone positions shall be nine in accordance with the requirements of ISO 7960:1995, Annex A and Annex N.

Alternatively, where the facilities exist and the measurement method applies to the machine type, emission sound power levels may also be measured in accordance with a method with higher precision i.e. EN ISO 3743-1:2010, EN ISO 3743-2:2009, EN ISO 3744:2010 and EN ISO 3745:2012 without the preceding modifications.

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

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

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

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

3) the correction of the local environmental factor K_{3A} shall be calculated in accordance with EN ISO 11204:2010, A.2 with reference restricted to EN ISO 3746:2010 instead of the method given in EN ISO 11202:2010, Annex A or in accordance with EN ISO 3743-1:2010, EN ISO 3743-2:2009, EN ISO 3744:2010 or EN ISO 3745:2012 where one of these standards has been used as the measuring method.

For noise declaration, 6.3 n) shall be met.

5.4.3 Emission of chips and dust

Provision shall be made for the extraction of chips and dust from the machine by providing outlet(s) to enable the machine to be connected to a separate chip and dust collection system (see also 6.3 k)).

It shall be impossible to reach the saw blade and moveable parts through any dust extraction outlet when the exhaust system is not connected.

The opening of the capture device should preferably face the projection. When the opening of the capture device cannot face the projection, the flow of chips and dust shall be guided efficiently to the opening of the capture device.

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

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

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

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

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

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

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

— Measure the pressure drop at the chosen air flow rate by measurement under the condition given for noise measurement in the relevant C-standard or ISO 7960:1995.

— Run the machine (without processing a work piece) under the conditions for noise measurement in the relevant C-standard or ISO 7960:1995. The CADES shall be disconnected. Check if the machine creates an air flow from the inlet(s) of the capture device(s) to the connection outlet(s) to the CADES by use of smoke at the connection outlet(s).

NOTE 2 For measurement of chip and dust extraction system performance two standardised methods can be used:

— Concentration method, EN 1093-9:1998+A1:2008;

— Index method; EN 1093-11:2001+A1:2008.

5.4.4 Electricity

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

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

The protection of people against electrical shock due to indirect contacts should be normally ensured by automatic isolation of the electrical power supply of the premises (see the information provided by the manufacturer in the instruction handbook (see 6.3 r)).

Single phase motors with a rated input ≤ 1 kW, manufactured in accordance with EN 61029-1:2000 may be used.

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

a) for three phase motors the degree of protection shall be at least IP5X in accordance with EN 60529:1991;

b) the last sentence of EN 60204-1:2006, 12.3 does not apply.

The power supply cord of displaceable machines shall be at least of type H0 7 in accordance with the requirements of EN 50525-2-21:2011.

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

Verification: by checking the relevant drawings and/or circuit diagrams, inspection and relevant tests (specified in EN 60204-1:2006, test 1 of 18.2 and 18.6).

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

5.4.5 Ergonomics and handling

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

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

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

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

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

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

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

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

Also see 5.2.2 for position of controls, 6.3, EN 894-3:2000+A1:2008 and EN 1005-3:2002+A1:2008.

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

5.4.6 Lighting

Where lighting is provided it shall be in accordance with EN 60204-1:2006, 16.2 and with EN 1837:1999+A1:2009.

See also 6.3 d).

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

5.4.7 Pneumatics

If the machine is fitted with pneumatic system, the requirements of EN ISO 4414:2010 shall apply.

See also 5.2.1, 5.4.11 of this document and EN ISO 12100:2010, 6.2.10.

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

5.4.8 Substances

The requirements of 5.4.3, 6.3 d) apply.

5.4.9 Electromagnetic compatibility

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

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

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

5.4.10 Laser

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

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

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

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

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

5.4.11 Errors of fitting

The machine shall be designed so that it is not possible to mount saw blades with dimensions larger than those for which it has been designed.

See also 6.2.1 and 6.3 g).

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

5.4.12 Isolation

The requirements of ISO 14118:2000, Clause 5 shall apply and in addition:

The electrical isolator of stationary machines shall be in accordance with EN 60204-1:2006, 5.3, except that the isolator shall not be of type d) as shown in EN 60204-1:2006, 5.3.2.

For the electrical isolation of displaceable machines with a rated current not exceeding 16 A and a total power rating not exceeding 3 kW see EN 60204-1:2006, 5.3.2 d).

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

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

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

b) equipped with a blocking device.

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

Where pneumatic energy is used, pneumatic isolators shall be provided with a device for locking the isolator in the isolated condition (e.g. a padlock). Where the pneumatic supply is used only for clamping, a quick action coupling (see EN ISO 4414:2010) without the means for locking shall be acceptable.

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

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

5.4.13 Maintenance

The basic principles of EN ISO 12100:2010, 6.2.15 shall be observed and, in addition, at least the information for maintenance listed in EN ISO 12100:2010, 6.4.5.1 e) shall be provided.

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

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

Provision shall be made for storing the tools necessary for changing the saw blade.

Verification: by checking the instruction handbook.

6 Information for use

6.1 General

The principles of EN ISO 12100:2010, 6.4 shall be observed and -if fitted with a saw blade- the requirements of EN 847-1:2013, Clause 7 shall apply.

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

6.2 Marking

6.2.1 Riving knife marking

The riving knife shall be permanently marked with:

a) its thickness;

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

c) the width of the mounting slot.

Permanently marked means for example, engraving, or etching.

Verification: by checking relevant drawings and inspection of the components.

6.2.2 Machine marking

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

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

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

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

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

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

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

f) width of the riving knife guiding elements adjacent to the mounting position of the riving knife;

g) where the machine is fitted with a pneumatic system the nominal pressure for the pneumatic circuits;

h) where the machine is fitted with a pneumatic isolator its function, location and operational position(s) e.g. by a label or a pictogram;

i) direction of rotation of the saw spindle;

j) maximum and minimum diameter of saw blade and the bore diameter of the saw blade for which the machine is designed;

k) on dual purpose down cutting cross-cut saws/circular saw benches (see 3.2.4) the width of the riving knife guiding elements adjacent to the mounting position of the riving knife.

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

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

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

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

6.3 Instruction handbook

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

a) 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) intended use of the machine including foreseeable misuse;

c) warning regarding residual risks as:

   1) Instructions on factors that influence exposure to noise. This includes:

      i) the use of saw blades designed to reduce the emitted noise;

      ii) optimum speed selection;

      iii) saw blade and machine maintenance;

   2) information on factors that influence exposure to dust. This includes:

      i) type of material being machined;

      ii) importance of local extraction (capture at source);

      iii) proper adjustment of hoods/baffles/chutes;

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

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

d) instruction for safe use in accordance with EN ISO 12100:2010, 6.4.5.1 d). This includes instructions on how the following points can be satisfied:

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

   2) adequate general or localized lighting to be provided;

   3) stock and finished workpieces to be located close to the operators normal working position;

   4) the use of a push block or push stick to avoid working with the hands close to the saw blade when using a dual purpose machine in the saw bench mode;

   5) the wear of suitable personal protective equipment when necessary; this may include:

      i) hearing protection to reduce the risk of induced hearing loss;

      ii) respiratory protection to reduce the risk of inhalation of harmful dust;

      iii) gloves for handling saw blades (saw blades should be carried in a holder wherever practicable);

   6) to stop the machine running while unattended;

   7) to report faults in the machine, including guards or saw blades, as soon as they are discovered;

   8) to adopt safe procedures for cleaning, maintenance and remove chips and dust regularly to avoid the risk of fire;

9) to follow manufacturer's instructions for use, adjustment and repair of saw blades;

10) to select the correct riving knife, depending on the saw blade thickness and diameter, when using a dual purpose machine in the saw bench mode;

11) to observe the maximum speed marked on the saw blades;

12) to use correctly sharpened saw blades;

13) to ensure that any saw flanges and spindle rings used are suitable for the purpose as stated by the manufacturer (see 5.3.3.2);

14) to refrain from removing any off-cut or other part of the workpiece from the cutting area while the machine is running except by using a push stick;

15) to ensure that guards and other safety devices necessary for machine operation are in position, in good working order and properly maintained;

e) information that operators are adequately trained in the use, adjustment and operation of the machine;

f) installation and maintenance requirements including a list of those devices e.g. the brake which shall be verified, how frequently the verification shall be carried out and by what method;

g) the range of saw blade diameters and thicknesses for which the machine is designed, and on dual purpose down cutting cross-cut saws/circular saw benches, guidance to the user on the selection of the correct riving knife for particular saw blade dimensions;

h) a statement that only saw blades made in conformity to EN 847-1:2013 shall be used on the machine;

i) on dual purpose down cutting cross-cut saws/circular saw benches information concerning maintenance and repair of push block handles and push sticks;

j) information regarding the dust extraction equipment fitted to the machine as follows:

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

2) pressure drop at each dust extraction connection outlet;

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

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

k) if fitted with a laser, a statement that no exchange with a different type of laser is permitted, that no additional optical equipment shall be used and that repair shall only be carried out by the laser manufacturer or authorized persons together with a repetition of the laser manufacturer instructions for setting and use of the laser (where appropriate);

l) a recommendation that a Residual Current Device (RCD) should be used with all displaceable machines;

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

— A-weighted emission sound pressure levels at workstations;

— A-weighted sound power level emitted by the machinery.

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

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

2 dB when using EN ISO 3743-1:2010 or EN ISO 3743-2:2009 or EN ISO 3744:2010;

1 dB when using EN ISO 3745:2012

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

accompanied uncertainty *K* = 4 dB

Measurement made in accordance with EN ISO 3746:2010.

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

The noise declaration shall be accompanied by the following statement:

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

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

n) 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;

o) 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;

p) 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);

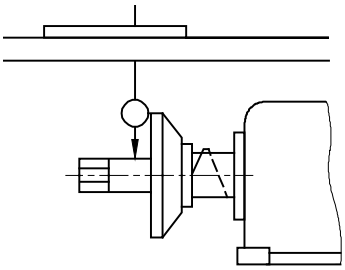
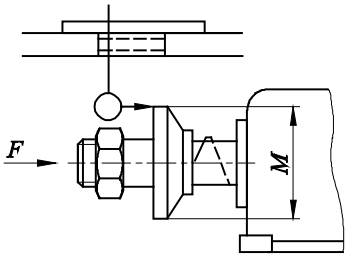
q) information on how to provide protection of people against electrical shock due to indirect contact in the machine by a device for automatic disconnection of the power supply to be installed by the user in the line powering the machine;

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

Verification: by checking the instruction handbook and relevant drawings.

Annex A
(normative)

Dimensional tolerances of saw spindles

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 B
(normative)

Riving knife mounting strength test

The machine shall be fitted with the largest saw blade for which it is designed set in its highest position.

The riving knife shall be positioned so that its tip is at the same level as the highest point on the periphery of the saw blade and securely tightened with a tightening torque of 25 Nm maximum. A horizontal load of 500 N is applied to the tip (see Figure B.1). In order to comply with this test, the deflection *A* shall not be greater than the values given in Table B.1.

Table B.1 — Riving knife deflexion

Saw blade diameter for which riving knife is designed	**Up to 315 mm**	**Above 315 mm**
Maximum deflection "*A*"	1,5 mm	2,0 mm

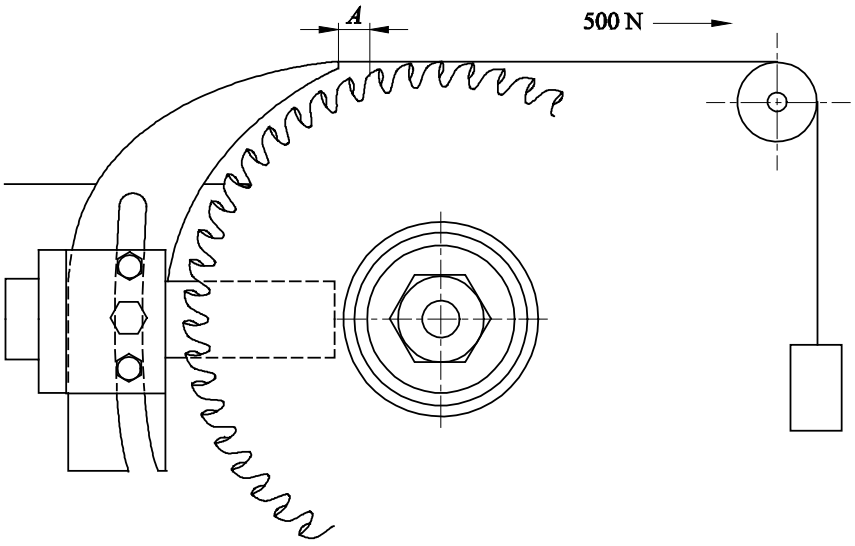


Figure B.1 — Riving knife mounting strength test

Annex C
(normative)

Riving knife lateral stability test

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 Figure C.1. The maximum deflection *d* shall not exceed 8 mm.

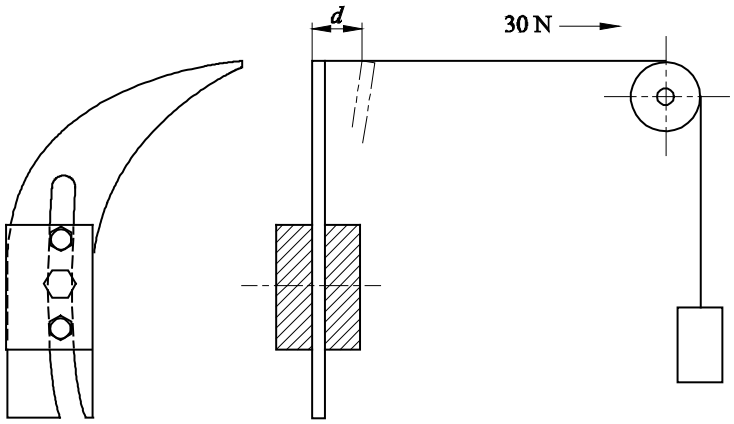


Figure C.1 — Riving knife lateral stability test

Annex D
(normative)

Braking tests

D.1 Conditions for all tests

a) Spindle unit shall be set in accordance with the intended use of the machine especially with respect to belt tension (in accordance with 6.3);

b) The saw blade used in the tests shall be of maximum diameter for which the machine is designed;

c) before beginning the test the saw spindle shall be run for at least 15 min at idle speed;

d) verify that the actual spindle speed is within ± 10 % of the intended speed.

D.2 Tests

D.2.1 Un-braked run-down time

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

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

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

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

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

D.2.2 Braked run-down time

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

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

b) activate the saw spindle drive stop and measure the braked run-down time;

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

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

The braked run-down time is the average of the 10 measurements taken.

Annex E
(normative)

Impact test method for guards

E.1 General

Annex E defines tests for guards used on down cutting cross-cut circular sawing machines in order to minimize risks of ejection of parts of saw blade or of workpieces out of the working zone.

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

E.2 Test method

E.2.1 Preliminary remarks

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

E.2.2 Testing equipment

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

E.2.3 Projectile for guards

The projectile shall be a 8 mm diameter ball 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.

E.2.4 Sampling

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

E.2.5 Test procedure

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

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

E.3 Results

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

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

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

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

d) penetration (projectile penetrating the test object);

e) guard window loosened from its fixing;

f) guard loosened from guard support.

E.4 Assessment

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

E.5 Test report

The test report shall give the following minimum information:

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

b) projectile mass, dimensions, speed;

c) applicant identification;

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

e) clamping or fixing of the test object;

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

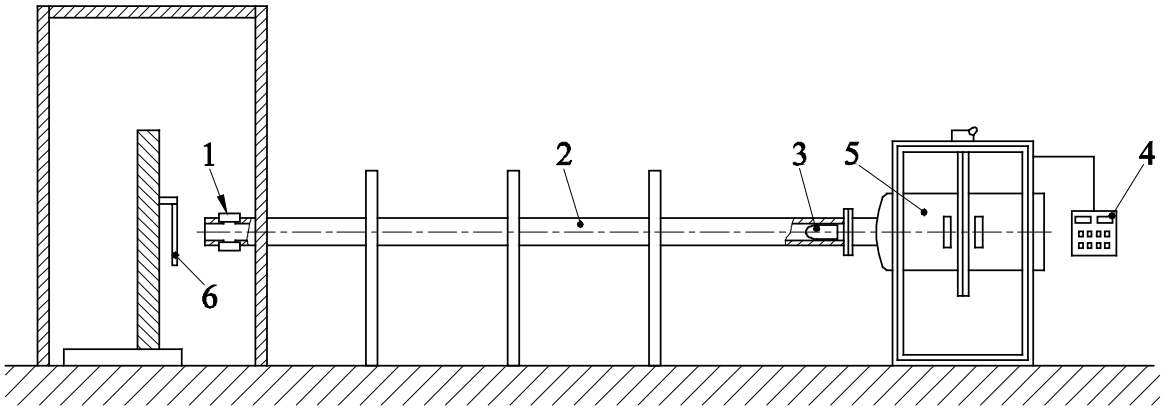
g) test result.

E.6 Test equipment for impact test

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

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

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



Key

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

Figure E.1 — Example of equipment for impact test

Annex ZA
(informative)

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

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

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

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

Clause(s)/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, 5.2.8, 5.4.12, 6.3	a) fitted for its function
Clause 5, 6	b) eliminate or reduce the risks, give measures, inform
Clause 5, 6	c) intended use and reasonably foreseeable misuse
5.4.5, 6.3	d) constraints in use
5.3.1, 5.3.9, 6.3	e) equipment
5.3.2, 5.3.5, 5.3.6.2, 5.4.3	1.1.3 Materials and products
5.4.6, 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
5.2.6, 5.2.7	1.1.7 Operating position
5.2.1, 5.2.7, 5.2.8, 5.4.9, 5.4.12	1.2.1 Safety and reliability of control systems
5.2.2, 5.2.3, 5.2.4, 5.2.5, 5.2.6, 5.2.7, 5.2.8, 6.3	1.2.2 Control devices
5.2.2, 5.2.3, 5.2.6, 5.2.7	1.2.3 Starting
5.2.2, 5.2.4, 5.2.5	1.2.4 Stopping
5.2.4	1.2.4.1 Normal stop
5.2.5	1.2.4.3 Emergency stop

Clause(s)/sub-clause(s) of this EN	**Essential Requirements (ERs) of Directive 2006/42/EC**
5.2.6, 5.2.7, 6.3	1.2.5 Selection of control or operating mode
5.2.8, 5.4.7, 5.4.12	1.2.6 Failure of the power supply
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	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	1.3.6 Risks relating to variations in the operating conditions
5.2.7, 5.3.7	1.3.7 Risks related to moving parts
5.3.7	1.3.8 Choice of protection against risks related to moving parts
5.3.7.6	1.3.8.1 Moving transmission parts
5.3.7.1, 5.3.7.2, 5.3.7.3, 5.3.7.4, 5.3.7.5, 5.3.7.7,	1.3.8.2 Moving parts involved in the process
5.3.5, 5.3.6	1.3.9 Risk of uncontrolled movements
5.3.5, 5.3.6, 5.3.7	1.4.1 Required characteristics of guards and protective devices - General requirements
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
5.2.8, 5.4.7	1.5.3 Energy supply other than electricity
5.4.11, 6.3	1.5.4 Errors of fitting
5.4.1	1.5.6 Fire
5.4.2	1.5.8 Noise
5.4.9	1.5.11 External radiation
5.4.3	1.5.13 Emission of hazardous materials and substances
5.4.13	1.6.1 Machinery maintenance
5.2.2, 5.3.7, 5.4.13	1.6.2 Access to operating position and servicing points
5.4.12	1.6.3 Isolation of energy sources
5.2.2, 5.3.7, 5.4.5, 5.4.13, 6.3	1.6.4 Operator intervention

Clause(s)/sub-clause(s) of this EN	**Essential Requirements (ERs) of Directive 2006/42/EC**
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
6.1	1.7.1.2 Warning devices 1.7.2 Warning of residual risks
6.2.2	1.7.3 Marking of machinery
6.3	1.7.4 Instructions
	2.3 Machinery for working wood and analogous materials
5.3.6, 5.3.7	a) guiding
5.3.5	b) ejection
5.3.4	c) brake
5.2.7, 5.3.7, 5.3.9	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 614-2:2000+A1:2008, *Safety of machinery - Ergonomic design principles - Part 2: Interactions between the design of machinery and work tasks*

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

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

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

[5] EN 50525-1:2011, *Electric cables - Low voltage energy cables of rated voltages up to and including 450/750 V (U0/U) - Part 1: General requirements*

[6] 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 11688-2:1998)*

[7] EN ISO 13849-2:2012, *Safety of machinery - Safety-related parts of control systems - Part 2: Validation (ISO 13849-2:2012)*

[8] EN ISO 14163:1998, *Acoustics - Guidelines for noise control by silencers (ISO 14163:1998)*

[9] ISO 286-2:2010, *Geometrical product specifications (GPS) — ISO code system for tolerances on linear sizes — Part 2: Tables of standard tolerance classes and limit deviations for holes and shafts*

[10] Directive 2006/42/EC of the European Parliament and of the Council of 17 May 2006 on machinery, and amending Directive 95/16/EC (recast), OJ L 157, 9.6.2006, p. 24–86, available from: http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2006:157:0024:0086:EN:PDF

This page deliberately left blank

British Standards Institution (BSI)

BSI is the national body responsible for preparing British Standards and other standards-related publications, information and services.

BSI is incorporated by Royal Charter. British Standards and other standardization products are published by BSI Standards Limited.

About us

We bring together business, industry, government, consumers, innovators and others to shape their combined experience and expertise into standards -based solutions.

The knowledge embodied in our standards has been carefully assembled in a dependable format and refined through our open consultation process. Organizations of all sizes and across all sectors choose standards to help them achieve their goals.

Information on standards

We can provide you with the knowledge that your organization needs to succeed. Find out more about British Standards by visiting our website at bsigroup.com/standards or contacting our Customer Services team or Knowledge Centre.

Buying standards

You can buy and download PDF versions of BSI publications, including British and adopted European and international standards, through our website at bsigroup.com/shop, where hard copies can also be purchased.

If you need international and foreign standards from other Standards Development Organizations, hard copies can be ordered from our Customer Services team.

Subscriptions

Our range of subscription services are designed to make using standards easier for you. For further information on our subscription products go to bsigroup.com/subscriptions.

With **British Standards Online (BSOL)** you'll have instant access to over 55,000 British and adopted European and international standards from your desktop. It's available 24/7 and is refreshed daily so you'll always be up to date.

You can keep in touch with standards developments and receive substantial discounts on the purchase price of standards, both in single copy and subscription format, by becoming a **BSI Subscribing Member**.

PLUS is an updating service exclusive to BSI Subscribing Members. You will automatically receive the latest hard copy of your standards when they're revised or replaced.

To find out more about becoming a BSI Subscribing Member and the benefits of membership, please visit bsigroup.com/shop.

With a **Multi-User Network Licence (MUNL)** you are able to host standards publications on your intranet. Licences can cover as few or as many users as you wish. With updates supplied as soon as they're available, you can be sure your documentation is current. For further information, email bsmusales@bsigroup.com.

BSI Group Headquarters

389 Chiswick High Road London W4 4AL UK

Revisions

Our British Standards and other publications are updated by amendment or revision.

We continually improve the quality of our products and services to benefit your business. If you find an inaccuracy or ambiguity within a British Standard or other BSI publication please inform the Knowledge Centre.

Copyright

Useful Contacts:

Customer Services
Tel: +44 845 086 9001
Email (orders): orders@bsigroup.com
Email (enquiries): cservices@bsigroup.com

Subscriptions
Tel: +44 845 086 9001
Email: subscriptions@bsigroup.com

Knowledge Centre
Tel: +44 20 8996 7004
Email: knowledgecentre@bsigroup.com

Copyright & Licensing
Tel: +44 20 8996 7070
Email: copyright@bsigroup.com

bsi.

...making excellence a habit.™