BS EN 1870-12:2013

BSI Standards Publication

Safety of woodworking machines — Circular sawing machines

Part 12: Pendulum cross-cut sawing machines

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National foreword

This British Standard is the UK implementation of EN 1870-12:2013. It supersedes BS EN 1870-12:2003+A1:2009 which is withdrawn.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.

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This European Standard was approved by CEN on 21 September 2013.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
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Foreword

This document (EN 1870-12:2013) has been prepared by Technical Committee CEN/TC 142 “Woodworking machines - Safety”, the secretariat of which is held by UNI.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by April 2014 and conflicting national standards shall be withdrawn at the latest by April 2014.

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

This document supersedes EN 1870-12:2003+A1:2009.

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

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

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

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

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

Part 4: 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

The following technical modifications have been introduced during the revision:

— deletion of automatic machines;

— deletion of displaceable machines;

— introduction of PL;

— more precise requirements for access for saw blade change;

— more precise requirements for braking;

— addition of provisions to prevent saw unit accelerating or lifting-up during cutting.

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

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

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

Introduction

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

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

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

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

The requirements of this document are directed to manufacturers and their authorised representatives of pendulum cross-cut sawing machines. It is also useful for designers.

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

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

1 Scope

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

This European Standard does not apply to:

a) machines for cross cutting logs;

b) machines where the saw unit can be rotated about a horizontal axis.

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

This European Standard is primarily directed at machines which are manufactured after the date of its publication as EN.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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, moveable sources in reverberant fields — Part 1: Comparison method for hard-walled test room (ISO 3743-1:2010)*

EN ISO 3743-2:2009, *Acoustics — Determination of sound power levels of noise sources using sound pressure — Engineering methods for small, moveable 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 and hemi-anechoïc 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 4413:2010, Hydraulic fluid power — *General rules and safety requirements for systems and their components (ISO 4413:2010)*

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

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

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

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

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

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

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

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

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

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

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

EN ISO 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)*

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

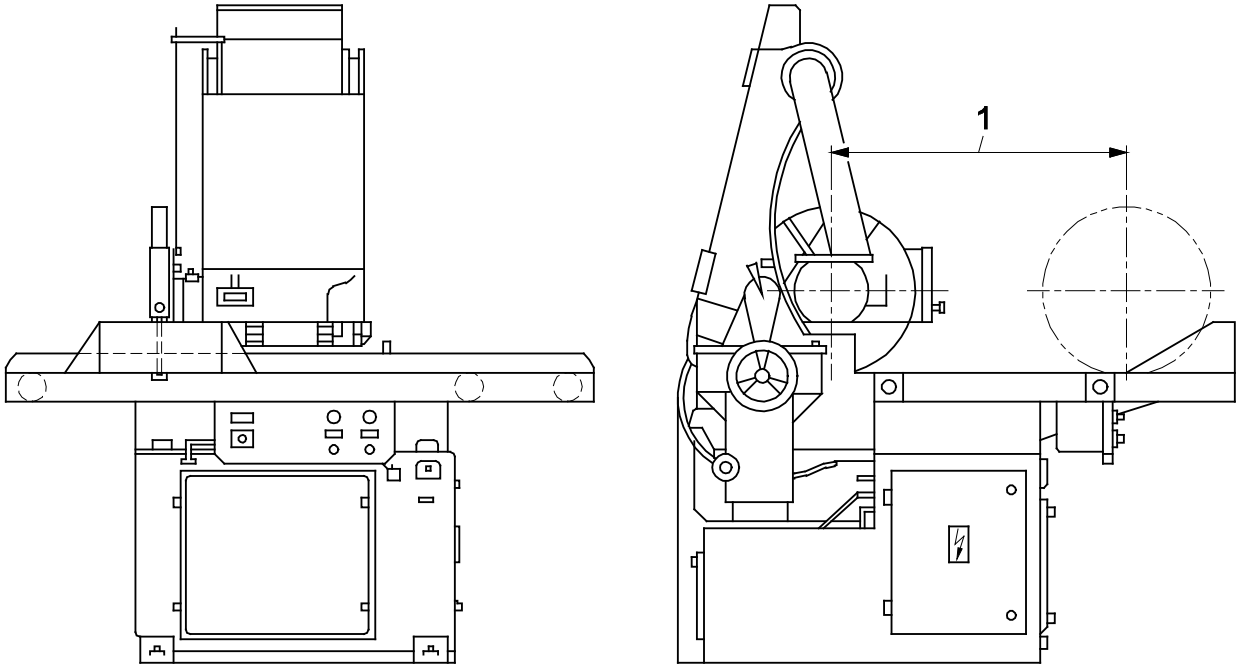
HD 22.1 S4:2002, *Cables of rated voltages up to and including 450/750 V and having cross-linked insulation — Part 1: General requirements*

3 Terms and definitions

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

3.1
cross-cutting
operation of cutting across the grain of a wooden workpiece

3.2
pendulum cross-cut sawing machine
machine to carry out cross cuts by moving the saw unit for the cutting stroke across the work piece manually or by integrated feed and after the cut back to its starting (rest) position



Key

1 stroke

Figure 1 — Example of a pendulum cross-cut sawing machine

3.3
manual pendulum cross-cut sawing machine
machine to carry out cross cuts by moving the saw unit for the cutting stroke manually and where the work piece has to be positioned manually at the fence

3.4
semi-automatic pendulum cross-cut sawing machine
machine to carry out cross cuts with integrated feed, by loading and/or unloading the work piece manually and positioning manually the work piece for cutting to length

3.5
stationary machine
machine designed to be located on or fixed to the floor or other parts of the structure of the premises and to be stationary during use

3.6
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

3.7
machine actuator
power mechanism used to effect motion of the machine

3.8
hand feed on pendulum cross-cut sawing machines
manual holding and/or guiding of the workpiece or the manual guiding of the saw unit with the saw blade

3.9
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

3.10
cutting area of the saw blade
area where the saw blade can be involved in the cutting process

3.11
non-cutting area of the saw blade
area of the saw blade where the saw blade is not involved in the cutting process

3.12
cutting area of a pendulum cross-cut sawing machine
area in front of the fence which is limited by the machine to carry out the cross cuts by using a saw blade with the maximum diameter for which the machine is designed

3.13
run-up time
time elapsed from the actuation of the start control device until the spindle reaches the intended speed

3.14
un-braked run-down time
time elapsed from the actuation of the stop control, but not the braking device (if fitted) up to spindle standstill

3.15
braked run-down time
time elapsed from the actuation of the stop control and the brake device up to spindle standstill

3.16
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

3.17
manual unloading of power fed machines
operation where the workpiece is removed by the operator directly from the machine outfeed; i.e. for which there is no intermediate unloading device to receive and transfer the workpiece from the machine outfeed to the operator

3.18
information from the supplier
statements, sales literature, leaflets or other documents where a manufacturer (supplier) declares either the characteristics of e.g. a material or product or the compliance of the material or product to a relevant standard

3.19
performance level (PL)
discrete level used to specify the ability of safety-related parts of control systems to perform a safety function under foreseeable condition

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

4 List of significant hazards

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

These hazards are listed in Table 1.

Table 1 — List of significant hazards

N°	Hazards, hazardous situations and hazardous events	EN ISO 12100:2010	Relevant sub-clause of this document
1	**Mechanical hazards** related to: - machine parts or workpieces:		
	a) shape;	6.2.2.1, 6.2.2.2, 6.3	5.3.3, 5.3.6, 5.3.7, 5.3.8
	b) relative location;		5.2.2, 5.2.3, 5.2.5, 5.4.5
	c) mass and stability (potential energy of elements which may move under the effect of gravity);		5.3.1
	d) mass and velocity (kinetic energy of elements in controlled or uncontrolled motion);		5.3.7.6
	e) mechanical strength.		5.3.2
	- accumulation of energy inside the machinery:		
	f) elastic elements (springs);	6.2.10, 6.3.5.4	5.3.7.6
	g) liquids and gases under pressure;	6.2.10, 6.3.5.4	5.4.6, 5.4.7
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
1.6	Impact hazard		5.3.7.4
1.8	Friction or abrasion hazard		5.3.4
1.9	High pressure fluid injection or ejection hazard		5.3.4, 5.4.6, 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, 5.4.12, 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, 5.4.12, 5.4.13

Table 1 *(continued)*

N°	Hazards, hazardous situations and hazardous events	EN ISO 12100:2010	Relevant sub-clause of this document
2.4	Electrostatic phenomena	6.2.9	5.4.10
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, 6.3
4.2	Interference with speech communication, acoustic signals.		5.4.2, 6.3
6	**Hazards generated by radiation**		
6.5	Lasers	6.3.4.5	5.4.9
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, 6.4
7.2	Fire hazard	6.2.4	5.4.1, 5.4.3
8	**Hazards generated by neglecting ergonomic principles in machinery design** related to:		
8.1	Unhealthy postures or excessive effort	6.2.7, 6.2.8, 6.2.11.12, 6.3.5.5, 6.3.5.6	5.2.2, 5.4.5, 6.4
8.2	Hand-arm or foot-leg anatomy	6.2.8.3	5.2.2, 5.4.5, 6.4
8.4	Local lighting	6.2.8.6	6.4
8.6	Human error, human behaviour	6.2.8, 6.2.11.8, 6.2.11.10, 6.3.5.2, 6.4	6.4
8.7	Design, location or identification of manual controls	6.2.8.7, 6.2.11.8	5.2.2
8.8	Design or location of visual display units	6.2.8.8, 6.4.2	5.2.2
9	**Combination of hazards**	6.3.2.1	5.2.6, 5.2.7, 5.2.8, 5.3.7.4, 5.4.3, 5.4.4
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	5.2.8, 5.2.9, 5.3.3.1
10.2	Restoration of energy supply after an interruption	6.2.11.4	5.2.8, 5.2.9, 5.3.4, 5.4.7, 5.4.8
10.3	External influences on electrical equipment	6.2.11.11	5.4.4, 5.4.8
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, 6.4
11	**Impossibility of stopping the machine in the best possible conditions**	6.2.11.1, 6.2.11.3, 6.3.5.2	5.2.2, 5.2.4, 5.2.5
13	**Failure of the power supply**	6.2.11.1, 6.2.11.4	5.2.8, 5.4.7, 5.4.8

Table 1 *(continued)*

N°	Hazards, hazardous situations and hazardous events	EN ISO 12100:2010	Relevant sub-clause of this document
14	**Failure of the control circuit**	6.2.11, 6.3.5.4	5.3.1
15	**Errors of fitting**	6.2.7, 6.4.5	5.3.3, 5.4.11, 6.2, 6.4
16	**Break-up during operation**	6.2.3	5.3.2
17	**Falling or ejected objects or fluids**	6.2.3, 6.2.10	5.2.6, 5.3.2, 5.3.3, 5.3.5, 5.3.6, 5.3.8, 5.4.7, 5.4.8, 5.4.12
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 in accordance with the requirements of the principles of EN ISO 12100:2010 for hazards relevant but not significant, which are not dealt with by this document (e.g. sharp edges of the machine frame).

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

5.2 Controls

5.2.1 General

5.2.1.1 Safety and reliability of control systems

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 ISO13849-1:2008:

— Starting and restarting: PL=c (see 5.2.3);

— normal stopping: PL=c (see 5.2.4);

— emergency stop: PL=c (see 5.2.5);

— moveable interlocked guards: PL=c (see 5.2.3, 5.3.7);

— moveable interlocked guards with guard locking: PL=c (see 5.3.7);

— on semi-automatic machines interlocking of the cutting stroke with saw blade rotation and workpiece clamping: PL=c (see 5.2.3);

— the mode selection: PL=c (see 5.2.7);

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

— the two-hand control device: PL=c (see 5.3.7);

— on semi-automatic machines interlocking of self closing power operated guards with the position of the saw unit: PL=c (see 5.3.7.2);

— the active optoelectronic protective devices (light barriers): PL=c (see 5.3.7.4);

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

— the mechanically actuated trip devices (trip bar): PL=c (see 5.3.7.4);

— the workpiece clamping: PL=c (see 5.3.8).

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

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

Verification: By checking the relevant drawings and/or circuit diagrams and inspection 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 Manual machines

The start and stop control required by 5.2.3 and 5.2.4 of this document shall be situated 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 and within 1,0 m of the cutting line when it is at 90° to the fence.

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

5.2.2.2 Semi-automatic machines

The controls for starting the saw blade and for normal stopping shall be located together on the machine either:

a) below the workpiece support; or

b) on a control panel positioned:

1) behind and above the fence, and

2) within 850 mm measured horizontally from the front edge of the workpiece support, and

3) at a maximum height of 1 600 mm from the floor level.

The two-hand control device to control the cutting stroke (also see 5.2.3) shall be situated:

1) at the front of the machine within 1,0 m of the cutting line when it is at 90° to the fence (see Figure 2);

2) below the workpiece support;

3) at a minimum height above floor level of 750 mm.

Where the control for the clamps is separate from the two-hand control device it shall be within 400 mm measured horizontally to the two hand control device.

According to the size of machine the emergency stop(s) shall be positioned:

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

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

iii) at the main control panel;

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

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

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

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

Dimensions in metres

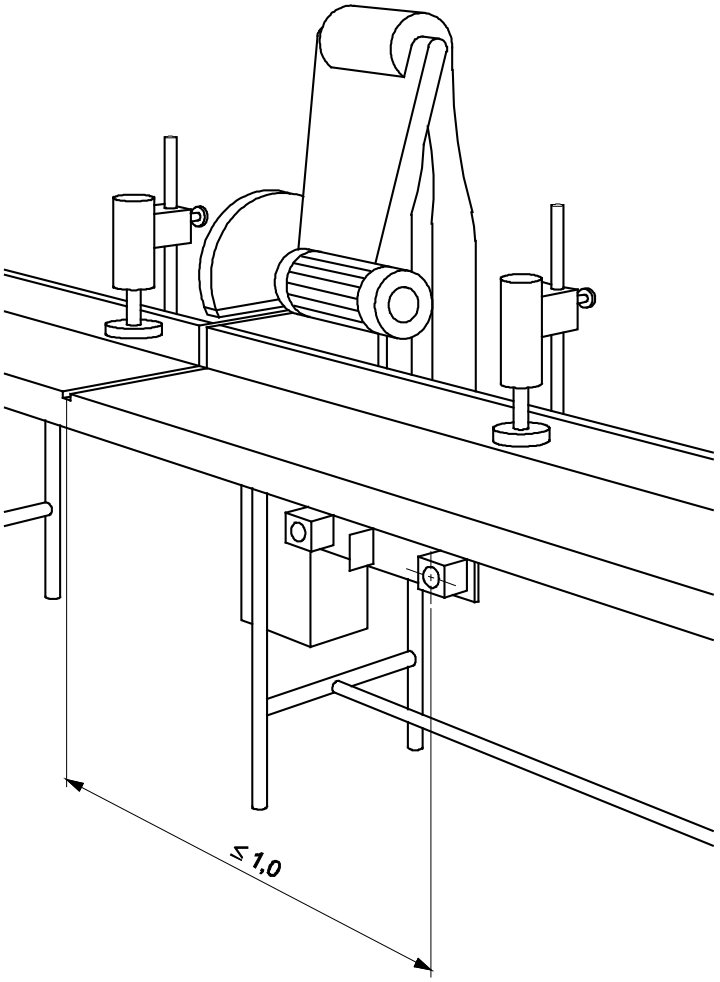


Figure 2 — Position of two hand control device on semi-automatic machines

5.2.3 Starting

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

On semi-automatic machines initiation of the cutting stroke shall only be possible after saw blade rotation and workpiece clamping have been initiated.

For semi-automatic machines the cutting stroke shall be controlled by a two-hand control device of type III B in accordance with the requirements of EN 574:1996+A1:2008. When this control is released the saw unit shall return to the rest position within 1,5 s.

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

For electrically started machines, see EN 60204-1:2006, 9.2.5.2. The exceptions described with regard to EN 60204-1:2006, 9.2.5.2 are not relevant.

The safety related part of the control systems (also see 5.2.1) for starting and the interlocking arrangements shall be 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.

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

5.2.4 Normal stopping

5.2.4.1 General

The machine shall be fitted with a stop control system where by all machine actuators can be stopped and the brake (if fitted) activated. The stopping shall include disconnection from energy supply of the corresponding actuators unless STO in accordance with EN 61800-5-2:2007 is used.

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)".

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 the saw spindle drive motor and actuate the brake;

b) cut power to brake when braking sequence is complete.

The stopping sequence shall be satisfied at the level of the control circuits. If a time delay device is used, time delay shall conform to the requirements in 5.2.1.2 a) 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.

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

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

5.2.4.3 Semi-automatic machines

The stopping sequence for the stop control required in 5.2.4.1 shall:

a) cut power to the saw blade drive, initiate the brake and start the return stroke of the saw unit;

b) cut power to the brake actuator (if electrical) after the saw blade has come to rest.

NOTE After the saw unit has reached its rest position the power to the work piece clamping can be removed automatically.

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 the requirements in 5.2.1.2 a) 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.

The safety related part of the control systems (also see 5.2.1) 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.

5.2.5 Emergency stop

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

Machines with more than one machine actuator shall be fitted with emergency stop control(s), which shall conform to 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)".

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:

a) cut power to the saw blade drive, initiate the brake and start the return stroke of the saw unit;

b) cut power to the brake actuator (if electrical) after the saw blade has come to rest.

NOTE After the saw unit has reached its rest position the power to the work piece clamping can be removed automatically.

The stopping sequence shall be satisfied at the level of the control circuits. If a time delay device is used, time delay shall conform to the requirements in 5.2.1.2 a) 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.

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

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

5.2.6 Workpiece positioning

The work piece positioning device shall only operate when the saw unit is in its rest position.

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

For the integrated feed of the saw unit see 5.2.3.

Verification: By checking 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 as well as a semi-automatic machine as manual machine. All the requirements for each type of machine shall apply when operating in the corresponding mode.

The mode selector shall fulfil the following requirements:

a) the control mode selected shall override all other control systems of the machine with the exception of the emergency stop;

b) it shall be lockable e.g. by a key-operated switch;

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

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

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

5.2.8 Failure of the power supply

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

Where pneumatic or hydraulic workpiece clamping is provided, in the event of loss of pneumatic or hydraulic pressure, clamping of the workpiece shall be maintained until the return stroke of the saw blade is initiated. Where non-return valves are used to meet this requirement, they shall be fitted to the actuating cylinders.

Where the machine is fitted with pneumatic actuators other than for work piece clamping, an under pressure device shall be provided which stops the machine if the pneumatic pressure is less than 80 % of the normal pressure stated.

The automatic restart of the machine shall be prevented after restoration of the pneumatic or hydraulic energy.

The safety related part of the control systems for preventing an automatic restart in the case of a supply interruption 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.

5.2.9 Failure of the control circuits

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

The control circuits shall be designed so that a break in any circuit (e.g. broken wire, ruptured pipe or hose) will not result in the loss of a safety function e.g. involuntary start of the machine or loss of workpiece clamping (if fitted) (also see EN 60204-1:2006, EN ISO 4413:2010 and EN ISO 4414:2010).

Also see 5.2.1.

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

5.3 Protection against mechanical hazards

5.3.1 Stability

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

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

5.3.2 Risk of break up during operation

The guards for the saw 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 in accordance with the requirements of Table 2;

Table 2 — Light alloy saw blade guard thickness and tensile strength

Ultimate tensile strength N mm^{-2}	Minimum 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 given in Annex A;

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, for plastic materials with characteristics other than those of polycarbonate given in c) above by performing the test in Annex A and inspection on the machine.

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

5.3.3 Saw blade fixing and spindle design

5.3.3.1 Saw spindle design

The saw spindle shall be in accordance with the following requirements:

a) it shall be manufactured in steel with an ultimate tensile strength of at least 580 N mm^{-2};

b) the mounting diameter for the saw blade shall be $\geq$ 30 mm;

c) manufactured in accordance with the tolerances given in Annex C.

Verification: By checking the relevant drawings, measurement and inspection on 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/blocking device shall be provided e.g. an integral locking bar inserted through the spindle. When a blocking device is used it shall prevent tool spindle rotation and shall not be deformed after starting the saw blade drive motor, with the blocking device in place.

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

5.3.3.3 Saw blade flanges

For the fixing of the saw blade saw blade flanges shall be provided.

For saw blades up to 450 mm diameter the diameter of both flanges shall be at least *D*/4 (where *D* = the diameter of the largest saw blade for which the machine is designed).

For saw blades greater than 450 mm diameter, the diameter of the flanges shall be at least *D*/6, but not less than 115 mm.

The clamping surface at the outside part of flange shall be at least 5 mm in width and recessed to the centre (see Figure 3).

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, run-down 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

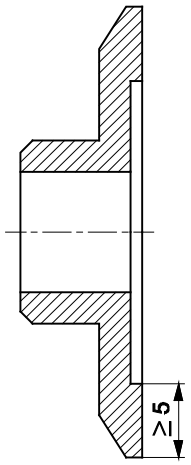


Figure 3 — Saw blade flange detail

5.3.4 Braking

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

The braked run-down time shall be less than 10 s or where the run up time exceeds 10 s be less than the run up time but in no case shall exceed 30 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 6.4).

NOTE 1 Where the machine is designed with a spring operated mechanical brake for this safety function usually category 1 according to EN ISO 13849-1:2008 is applied.

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

As an exception to the third paragraph above, where an electrical brake with electronic control system is fitted, its control system shall be designed, as a minimum, in PL=b in accordance with the requirements of EN ISO 13849-1:2008 and be designed in category 2 in accordance with the requirements of EN ISO 13849-1:2008 with the exception that the test rate requirement of 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 each spindle stop.

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

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

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

As an exception to the third paragraph above, 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 2 Complex electronic components like e.g. microprocessors or PLCs cannot be considered as well tried under the scope of EN ISO 13849-1:2008 and do therefore not fulfil the requirements of category 1.

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 Measures to minimise the possibility or effect of ejection

The direction of the rotation of the saw blade shall be such, that the cutting force is directed against the fence.

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

5.3.6 Workpiece supports and guides

5.3.6.1 Workpiece support

The machine shall be fitted with a workpiece support which complies with the following requirements:

a) for manual and semi-automatic machines the workpiece support shall extend at least 1 m on each side of the cutting line taking account of the ability to rotate the saw unit about a vertical axis for angled cutting (pivoting adjustment area). This workpiece support shall be either a fixed table or a fixed table with extension pieces (see Figure 4);

b) on manual and semi-automatic machines the workpiece support in the cutting area shall extend forward beyond the fence such that the front edge of the largest saw blade for which the machine is designed will not project beyond the workpiece support when the saw unit is at its maximum forward position;

c) outside the cutting area, the width *W* (see Figure 4) of the workpiece support shall be at least 60 % of the maximum cutting width capacity for which the machine is designed;

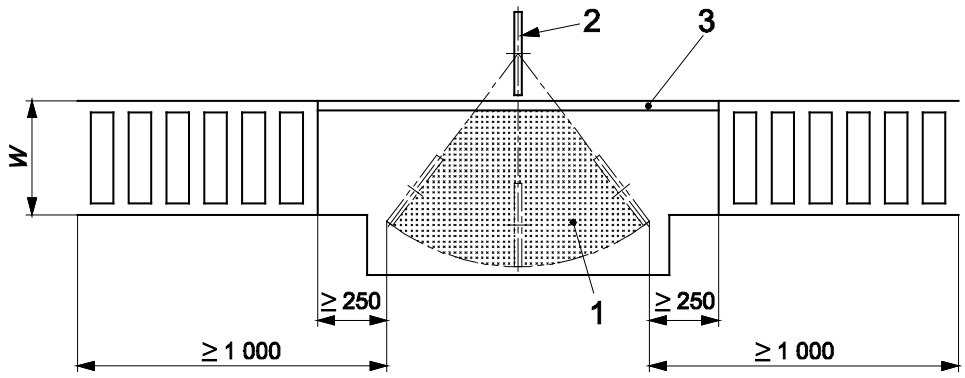
d) the workpiece support in the cutting area (see 3.2.10) shall be made from a material which is easily cut by the saw blade and will minimise the risk of damage in the event of contact between the saw blade and the workpiece support, e.g. plastic, wood, wood based material or light alloy;

e) on manual machines there shall be no table rollers within 250 mm of the cutting line;

f) on machines with clamping there shall be no table rollers beneath the clamps.

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

Dimensions in millimetres



Key

1 area of pivoting adjustment (cutting area)

2 saw blade

3 fence

W minimum width of the workpiece support outside the cutting area

Figure 4 — Workpiece support for manual and semi-automatic machines

5.3.6.2 Workpiece guides

The machine shall be fitted with a cross-cut fence (workpiece guide) on either side of the cutting line, which complies with the following requirements:

a) It shall have a height of at least 60 % of the maximum depth of cut for which the machine is designed, except for an area to allow passage of the saw blade guard. The length of the fence shall extend at least 1 000 mm to the right and to the left of the cutting area;

b) it shall not be capable of adjustment so that the saw blade protrudes beyond the fence when the saw unit is in the rest position;

c) taking account of the ability to rotate the saw unit about a vertical axis for angled cutting, that part of the fence within 10 mm of the cutting line, shall be made of e.g. wood, wood based material, plastic or light alloy;

d) the width of the gap in the fence for the passage of the saw blade and the adjustable guard required in 5.3.7.1 shall be not more than 5 mm wider than the width of the adjustable guard.

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

5.3.7 Prevention of access to moving parts

5.3.7.1 Guarding of the non-cutting area 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 guard is to be demounted by the user e.g. for maintenance, its fixing systems shall remain attached to the guard or to the machinery when the guard is removed, e.g. with un-losable screws, see 6.4 y).

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 and whose fixings shall remain integral with the machine when the guard is removed in accordance with EN 953:1997+A1:2009, 7.2. The guard shall not remain in place without its fixing.

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

5.3.7.2 Guarding of the cutting area of the saw blade on manual machines

Access to the teeth of the cutting area of the saw blade from the operator's position on manual machines during cutting shall be prevented by an adjustable guard which can be adjusted to the work piece height without the aid of a tool and which shall be designed such that the saw blade can be changed without removing it from the machine.

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

5.3.7.3 Guarding of the saw blade in the rest position on manual machines

Access to the saw blade in rest position shall be prevented

a) in the non-cutting area of the saw blade by the measures described above and

b) in the cutting area with a fixed guard. Any openings including the slot for the passage of the saw blade shall be so designed that the safety distances of EN ISO 13857:2008, Table 4 are fulfilled, except the slot of the fixed guard for the passage of the saw blade and the adjustable guard.

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

5.3.7.4 Guarding of the saw blade and saw unit on semi-automatic 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 guard is to be demounted by the user e.g. for maintenance, its fixing systems shall remain attached to the guard or to the machinery when the guard is removed, e.g. with un-losable screws, see 6.4 y).

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 and whose fixings shall remain integral with the machine when the guard is removed in accordance with EN 953:1997+A1:2009, 7.2. The guard shall not remain in place without its fixing.

Except for the gap in the fence necessary for the passage of the saw blade access to the saw blade in the rest position shall be prevented:

a) in the non-cutting area of the saw blade by the measures described above, and

b) in the cutting area of the saw blade by

   1) a fixed guard fitted with un-losable screws if it is to be demounted by the user e.g. for maintenance or cleaning purposes (see 6.4 y)), any openings in which shall be so designed that the safety distances of Table 4 of EN ISO 13857:2008; or

   2) self closing power operated guards; or

   3) a combination of fixed and self closing power operated guards.

Where self closing power operate guards are fitted they shall be interlocked with the position of the saw unit.

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

Direct access from the rear of the machine to any crushing or shearing hazard created by the saw unit return stroke shall be prevented by fixed guards fitted with un-losable screws if they are to be demounted by the user e.g. for maintenance or cleaning purposes see 6.4 y), any openings in which shall be so designed that the safety distances of EN ISO 13857:2008, Table 4 are fulfilled.

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

5.3.7.5 Guarding of workpiece positioning mechanisms

Except in the loading and unloading area, access to the dangerous parts (e.g. crushing or shearing hazards) of the workpiece positioning mechanism shall be prevented either by a fixed guard or by a movable interlocked guard with guard locking.

If the fixed guard is to be demounted by the user e.g. for maintenance, its fixing systems shall remain attached to the guard or to the machinery when the guard is removed, e.g. with un-losable screws, see 6.4 y).

In the loading and unloading area access to points with impact hazard (i.e. feed speed $\geq$ 25 m min^{-1}) and to points with drawing in or shearing hazards shall be avoided by the provision of either:

a) fixed guards which fixing system shall remain fixed to the guard or to the machine when the guard is removed e.g. fitted with un-losable screws if they are to be demounted by the user e.g. for maintenance or cleaning purposes see 6.4 y) or moveable interlocked guards with guard locking and at least unconditional unlocking in accordance with the requirements of EN 1088:1995+A2:2008, Annex N. Any openings in these guards shall be so designed that the safety distances of EN ISO 13857:2008, Table 4 are fulfilled; or

b) pressure sensitive mats in accordance with the requirements of EN ISO 13856-1:2013 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 impact, drawing in or shearing point; or

c) an active optoelectronic protective device (light barrier) in accordance with the requirements of CLC/TS 61496-2:2006 which is interlocked with the dangerous movement and positioned at a distance of at least 1,3 m, measured horizontally to the nearest impact, drawing in or shearing point. It shall have at least two horizontal beams, one at 400 mm from floor level and one at 900 mm from floor level; or

d) a combination of any of these measures.

Access to drawing in or shearing points at the infeed opening of fixed or moveable guards may be prevented by the measures in a) to d) or it shall be prevented by using a trip bar in accordance with the requirements of EN ISO 13856-2:2013.

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 positioning device before a hand resting on the workpiece and moving at the maximum positioning speed for which the machine is designed can reach the impact, 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 shall be adjustable to suit the height of each workpiece. This adjustment may be automatic or manual;

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

The safety related part of the control systems (also see 5.2.1) for sensitive mats, active optoelectronic protective device, trip bar and 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, measurement, inspection and relevant functional testing of the machine.

5.3.7.6 Guarding of powered roller tables

Access to drawing in points between the powered rollers and fixed parts of powered roller tables shall be prevented either by:

a) filling in the drawing-in points in accordance with the dimensions shown in Figure 5; or

b) an active optoelectronic protective device (light beam) in accordance with the requirements of CLC/TS 61496-2:2006 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 two 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 the requirements of EN ISO 13856-1:2013 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 drawing in point and operative over the full length of the powered roller table; or

d) a combination of any of these measures.

The safety related part of the control systems (also see 5.2.1) for sensitive mats, active optoelectronic protective device and interlocking function shall be at least PL=c in accordance with the requirements of EN ISO 13849-1:2008.

Verification: By checking relevant drawings and/or circuit diagrams, inspection, measurement and relevant

functional testing of the machine.

Dimensions in millimetres

Figure 5 — Example of powered roller table guarding

5.3.7.7 Guarding of drives

Access to the saw blade drive and any other drive mechanism shall be prevented either by a fixed guard which fixing system shall remain attached to the guard or to the machine when the guard is removed e.g. fitted with un-losable screws if it is to be demounted by the user e.g. for maintenance or cleaning purposes see 6.4 y) or an interlocked moveable guard or a combination of a fixed guard and an interlocked moveable guard. If fitted with a movable interlocked guard, this guard shall be fitted with guard locking if it is possible to gain access to the revolving saw blade with the guard open.

The type of interlocking with guard locking shall be:

a) if the run down time of the saw spindle is less than 10 s an interlocking device with guard locking with manually operated delay device in accordance with the requirements in EN 1088:1995+A2:2008, Annex N;

b) in all other cases an interlocking device with spring applied/power released guard locking device in accordance with the requirements in EN 1088:1995+A2:2008, Annex M.

The safety related part of the control systems (also see 5.2.1) for interlocking and 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 relevant drawings and circuit diagrams, measurement, inspection and relevant functional testing of the machine.

5.3.7.8 Stroke control for manual machines

The saw unit shall be fitted with a handle for moving it along the arm. This handle shall be so designed and positioned that a normal hand clench grip is possible e.g. smooth hand bar in accordance with EN 894-3:2000+A1:2008.

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

The saw unit shall automatically return to its rest position within 3 s e.g. actuated by a spring or weight. The maximum speed of the return movement shall not exceed 1,0 m s-1.

The machine shall be fitted with fixing points for an optional device to prevent the saw unit from accelerating the forward movement during the cutting stroke caused by binding in of the saw blade into the workpiece. This may be realised by fitting a hydraulic or mechanical limiting device e.g. an inertia reel restraint system.

The machine shall be designed so as to prevent the saw unit from lifting up during the cutting stroke caused by binding in of the saw blade into the workpiece.

A stroke limiting device shall be fitted to limit the width cutting capacity (also see 5.3.6.1).

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

5.3.7.9 Stroke control for semi-automatic machines

The machine shall be designed so as to prevent the saw unit from lifting up during the cutting stroke caused by binding in of the saw blade into the workpiece.

A stroke limiting device shall be fitted to limit the width cutting capacity (also see 5.3.6.1).

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

5.3.7.10 Limitations on pivoting the saw unit

The facility to pivot the pendulum system supporting the saw unit about a vertical axis, to vary the direction of stroke, shall be limited to 46° to left and right of a line perpendicular to the workpiece guide (fence).

It shall not be possible for the saw unit to rotate about a vertical axis with respect to the pendulum system supporting the saw unit, except for the purpose of setting the saw blade in the plane of the stroke.

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

5.3.8 Clamping devices

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

Where crushing hazards are not prevented by the means described in 5.3.7.4 above they shall be prevented by e.g.:

a) two stage clamping with a maximum clamping force at the clamping device less than or equal to 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.

Also see 5.2.8.

The safety related part of the control systems for supervision 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 (see 5.2.1).

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

5.4 Protection against non-mechanical hazards

5.4.1 Fire

To minimise fire hazards the requirements in 5.4.3 and 5.4.4 shall be met. See also 6.4.

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

5.4.2 Noise

5.4.2.1 Noise reduction at the design stage

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

5.4.2.2 Noise emission measurement

Operating conditions for noise measurement shall comply with ISO 7960:1995, Annex N.

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, 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.

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 m from the reference surface;

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

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

f) the number of microphone positions shall be 9 in accordance with ISO 7960:1995, Annex N.

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

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

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

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

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

3) the correction of the local environmental factor K_{3A} shall be calculated in accordance with EN ISO 11204:2010, A.2 with the reference restricted to EN ISO 3746:2010 instead of the method given in EN ISO 11202:2010, Annex A, or in accordance with EN ISO 3743-1:2010 or

EN ISO 3743-2:2009 or EN ISO 3744:2010 or EN ISO 3745:2012 where one of these standards has been used as the measuring method.

For noise declaration the requirements in 6.4 t) apply.

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.

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

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

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

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

To ensure that the chips and dust extracted from the point of origin are conveyed to the collection system, the design of the hoods, ducts and baffles shall be based on 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 (moisture content 18 % or above).

Also see 6.4.

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

NOTE 2 A low dust emission can be expected if the air flow rate ≥ 800 m^3 h^{-1} is ensured.

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

- Measure the pressure drop at the chosen air flow rate by measurement under the condition given for noise measurement in this document or ISO 7960:1995.
- Run the machine (without processing a work piece) under the conditions for noise measurement in this document 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 3 For measurement of chip and dust extraction system performance two standardised methods are useful: concentration method (EN 1093-9:1998+A1:2008) and index method (EN 1093-11:2001+A1:2008).

5.4.4 Electricity

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

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

The protection of people against electrical shock due to indirect contacts should be normally ensured by automatic isolation of the electrical power supply of the machine by the operation of a protective device

installed by the user in the line powering the machine (see the information provided by the manufacturer in the instruction handbook (see 6.4 x)).

The degree of protection for electrical components shall be as follows:

a) for electrical controlgear at least IP 65 in accordance with EN 60529:1991 and EN 60529:1991/A1:2000;

b) for three phase motors at least IP 5X in accordance with EN 60529:1991 and EN 60529:1991/A1:2000.

The power supply cord of displaceable machines shall be at least of type H0 7 in accordance with the requirements of HD 22.1 S4:2002.

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, circuit diagrams, inspection and relevant test 1 for the continuity of the protective bonding circuit and functional tests (specified in test 1 of EN 60204-1:2006, 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

See EN 614-1:2006+A1:2009, see also 5.2.2, 5.3.3.1, 6.4 and in addition:

The height of the workpiece support shall be between 850 mm and 950 mm above the floor level.

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, EN 1005-3:2002+A1:2008.

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

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

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

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

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

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

5.4.6 Pneumatics

See 5.2.1, 5.2.5, 5.2.8, 5.2.9, 5.3.7.2, 5.4.12, 5.4.13, 6.2, 6.3, 6.4 and EN ISO 4414:2010.

5.4.7 Hydraulics

See 5.2.1, 5.2.5, 5.2.8, 5.2.9, 5.3.7.2, 5.4.12, 5.4.13, 6.2, 6.3, 6.4 and EN ISO 4413:2010.

5.4.8 Electromagnetic compatibility

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

NOTE Machines which incorporate CE-marked electrical 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.

5.4.9 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.

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

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.

5.4.10 Static electricity

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

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

5.4.11 Errors of Fitting

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

Also see 5.4.12, 6.3 and 6.4.

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

5.4.12 Supply disconnection (Isolation)

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

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

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

Where pneumatic energy is used, a pneumatic isolator shall be provided with a device for locking the isolator in the isolated condition. 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 when the isolated machine (or part of machine) is so small that the disconnected coupling can all the time easily be under the control of the person making some intervention on the machine (also see EN 1037:1995+A1:2008, 5.2).

Where the machine has a hydraulic system, isolation of the hydraulic system shall be achieved either

a) by isolation of the electrical supply to the hydraulic drive motor (see EN 60204-1:2006, 5.3); or

b) by fitting a disconnection device e.g. valve with mechanical locking in the off position (also see EN ISO 4413:2010).

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.

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, instruction handbook, inspection and relevant functional testing of the machine.

6 Information for use

6.1 General

The basic principles of EN ISO 12100:2010, 6.2.15 shall be observed and - if fitted with saw blades - the requirements of EN 847-1:2005+A1:2007, Clause 8 apply and in addition:

6.2 Warning devices

The machine shall be permanently marked:

a) with a pictogram showing the direction of rotation of the saw blade;

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

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

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

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

6.3 Marking

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

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

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

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

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

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

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

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

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

h) where the machine is fitted with hydraulic and/or pneumatic isolators their function, location and operational position(s) e.g. by a label or a pictogram.

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

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

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

6.4 Instruction handbook

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

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

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

c) a warning regarding residual risk;

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) 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);

3) to stop the machine running whilst unattended;

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

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

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

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

8) to ensure that flanges used are suitable for the purpose as stated by the manufacturer (see also 5.3.3.2);

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

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

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

f) that only correctly sharpened saw blades manufactured according to EN 847-1:2005+A1:2007 shall be used;

g) that no saw blade shall be used where the maximum marked speed is lower than the rotational speed of the saw spindle;

h) a warning stating that on manual machines only saw blades with a rake angle between ± 5° shall be used;

i) the maximum width and thickness of the workpiece for which the machine is designed;

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

k) instructions that adequate general or localised lighting shall be provided;

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

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

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

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

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

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

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

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

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

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

q) information about safe cleaning;

r) if fitted with a pneumatic and/or hydraulic system the method for the safe dissipation of residual energy (see 5.4.13);

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

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

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

3) guard locking - by proving an inability to open the guard as long the saw blade is rotating;

4) any safety mats - by functional testing;

5) any light barriers - by functional testing;

6) any trip devices - by functional testing;

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

8) the saw unit restraining latch - by functional test;

9) the saw unit automatic return to rest position device - by functional test;

t) 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.

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

2) 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)
Associated 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 and the other sources of noise etc. i.e. the number of machines and other adjacent processes. Also the permissible exposure level can vary from country to country. This information, however, will enable the user of the machine to make a better evaluation of the hazard and risk."

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

u) 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;

v) 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;

w) 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);

x) 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;

y) 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)

Impact test method for guards

A.1 General

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

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

A.2 Test method

A.2.1 Preliminary remarks

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

A.2.2 Testing equipment

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

A.2.3 Projectile for guards

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

a) tensile strength: R_m = 560 N mm^{-2} to 690 N mm^{-2};

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

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

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

A.2.4 Sampling

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

A.2.5 Test procedure

The impact test shall be executed with projectile indicated in A.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.

A.3 Results

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

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

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

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

d) penetration (projectile penetrating the test object);

e) guard window loosened from its fixing;

f) guard loosened from guard support.

A.4 Assessment

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

A.5 Test report

The test report shall give the following minimum information:

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

b) projectile mass, dimensions, speed;

c) applicant identification;

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

e) clamping or fixing of the test object;

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

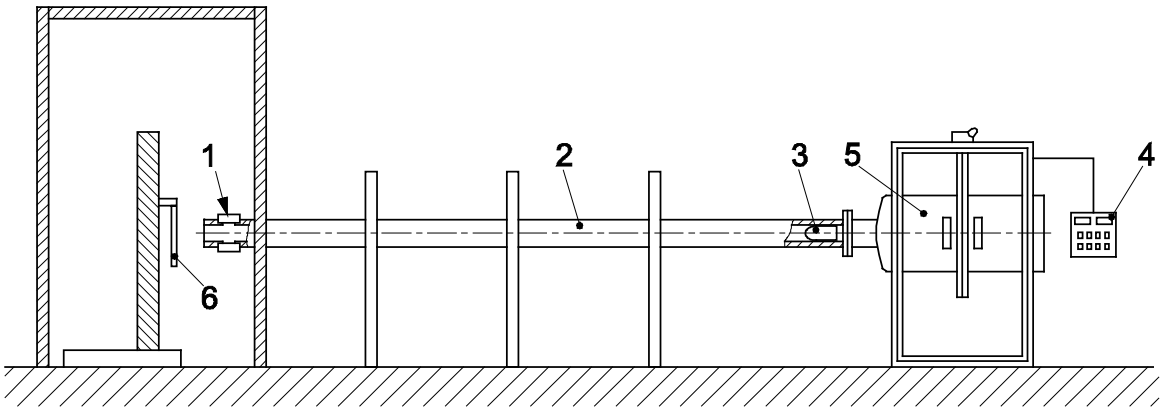
g) test result.

A.6 Test equipment for impact test

The propulsion device consists of a compressed air vessel with flanged gun barrel (see Figure A.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 A.1 — Example of equipment for impact test

Annex B
(normative)

Braking tests

B.1 Conditions for all tests

a) The tests shall be performed with the largest saw blade (diameter and thickness) for which the machine is designed;

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

c) verify that the actual saw spindle speed is within 10 % of the intended speed.

B.2 Tests

B.2.1 Run-up time

The run-up time shall be measured as follows:

a) start the saw spindle drive motor and measure the run-up time (see 3.2.13);

b) cut power to the saw spindle drive motor and allow the spindle to come to a complete stop;

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

The run-up time of the saw spindle is the average of the three measurements taken.

B.2.2 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 the power to the saw spindle drive motor and measure the un-braked run-down time;

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

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

B.2.3 Braked run-down time

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

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

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

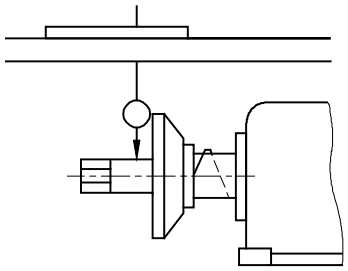
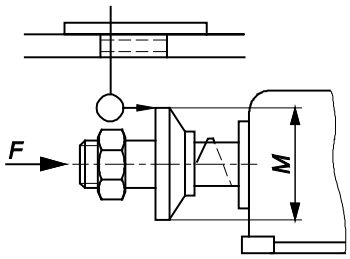
c) allow the saw spindle to remain stationary for 1 min;

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

The braked run-down time of the saw spindle is the average of the ten measurements taken.

Annex C
(normative)

Dimensional tolerances of saw spindles

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

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.

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+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] HD 22.4 S4:2004[3)], *Cables of rated voltages up to and including 450/750 V and having cross-linked insulation — Part 4: Cords and flexible cables*

[3)] HD 22.4 S4:2004 is replaced by EN 50525-2-21:2011.

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