BS EN 1807-1:2013

BSI Standards Publication

Safety of woodworking machines — Band sawing machines

Part 1: Table band saws and band re-saws

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National foreword

This British Standard is the UK implementation of EN 1807-1:2013. Together with BS EN 1807-2:2013, it supersedes BS EN 1807:1999+A1:2009, which is withdrawn.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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Sicherheit von Holzbearbeitungsmaschinen - Bandsägemaschinen - Teil 1: Tischbandsägemaschinen und Trennbandsägemaschinen

This European Standard was approved by CEN on 13 January 2013.

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

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Foreword

This document (EN 1807-1:2013) 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of an identical text or by endorsement, at the latest by September 2013, and conflicting national standards shall be withdrawn at the latest by September 2013.

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

This document, together with EN 1807-2:2013, supersedes EN 1807:1999+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 2006/42/EC.

For relationship with EU Directive 2006/42/EC, see informative Annex ZA which is an integral part of this document.

The following significant technical changes have been made in this new edition:

- for controls, the requirement of Performance Level according to EN ISO 13849-1 instead of categories according to EN 954-1;
- a more complete clause with set of requirements for "Emission of chips and dust";
- reference to PTO driven machines;
- a better definition of dimensional requirements for trip device and AOPD required for "prevention of access to moving parts";
- the stability test is required not only for displaceable machines but also for stationary machines: if not passed, fixing is required;
- requirement for guard-locking on interlocked movable guards to prevent access to moving parts, when the band saw blade run-down time exceeds 10 s.

EN 1807, *Safety of woodworking machines — Band sawing machines* consists of the following parts:

— *Part 1: Table band saws and band re-saws*;

— *Part 2: Log sawing machines*.

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 type C standard take precedence over the provisions of other standards, for machines that have been designed and built according to the provisions of this type C standard.

The requirements of this document are directed to manufacturers and their authorised representatives of table band saws and band re-saws. They are also useful for designers.

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

1 Scope

This European Standard deals with all significant hazards, hazardous situations and events as listed in Clause 4 which are relevant to stationary and displaceable table band saws and band re-saws with manual loading and/or unloading, also when mounted to and powered by a motor tractor, hereinafter together referred to as “machines”, designed to cut solid wood, chipboard, fibreboard, plywood, and also these materials 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.

Machines designed to cut wood based material may also be used to cut rigid plastic materials with similar characteristics as wood.

This European Standard does not apply to:

a) Transportable machines, i.e. machines set up on a bench or a table similar to a bench, which are intended to carry out work in a stationary position, capable of being lifted by one person by hand; the bench can also be an integrated part of the machine if it consists of hinged legs which can be extended down;

NOTE 1 Transportable electrically driven machines are covered by the requirements of EN 61029-1:2009 together with EN 61029-2-5:2011.

b) hand held motor-operated electric tools including any adaptation permitting their use in a different mode, i.e. bench mounting;

NOTE 2 Hand-held motor-operated electric tools are covered by the requirements of EN 60745-1:2009 together with EN 60745-2-20:2009.

c) log band saws.

NOTE 3 Log sawing machines are covered by EN 1807-2.

This European Standard does not deal with the specific hazards related to thermal engine and P.T.O. equipment that may be fitted to the machine.

This European Standard is not applicable to machines manufactured before the date of its publication as EN.

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

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

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 1760-1:1997+A1:2009, *Safety of machinery — Pressure sensitive protective devices — Part 1: General principles for the design and testing of pressure sensitive mats and pressure sensitive floors*

EN 1760-2:2001+A1:2009, *Safety of machinery — Pressure sensitive protection devices — Part 2: General principles for the design and testing of pressure sensitive edges and pressure sensitive bars*

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

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

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

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

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

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 — Electro-sensitive 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 movable sources in reverberant fields — Part 1: Comparison method for hard-walled test rooms (ISO 3743-1:2010)*

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1) This document is impacted by the stand-alone amendment EN 60439-1:1999/A1:2004, *Low-voltage switchgear and controlgear assemblies — Part 1: Type-tested and partially type-tested assemblies (IEC 60439-1:1999/A1:2004)*.

2) This document is impacted by the stand-alone amendment EN 60529:1991/A1:2000, *Degrees of protection provided by enclosures (IP Code) (IEC 60529:1989/A1:2000)*.

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

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

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

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

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

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

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

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

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

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

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

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

EN ISO 13849-1:2008, *Safety of machinery — Safety-related parts of controls 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 13857:2008, *Safety of machinery — Safety distances to prevent hazard zones being reached by the upper and lower limbs (ISO 13857:2008)*

ISO 1940-1:1986, *Mechanical vibration — Balance quality requirements of rigid rotors — Part 1: Determination of permissible residual unbalance*

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

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

3 Terms, definitions and terminology

3.1 Terms and definitions

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

3.1.1
band sawing machine
sawing machine with one or more saw blades in the form of continuous bands each mounted on and running between two or more band wheels

3.1.2
table band saw
hand-fed band sawing machine with a fixed or tilting table (bed) or tilting frame which may have any of the following accessory attachments: firewood support; demountable power feed unit for re-sawing

Note 1 to entry: See Figures 1, 3 and 4.

3.1.3
band re-saw
band sawing machine with integrated feed used for secondary conversion of solid wood

Note 1 to entry: See Figures 2, 5 and 6.

3.1.4
saw blade straining
force exerted on the saw blade to keep it in position on the band wheels during cutting

Note 1 to entry: See Figure 10.

3.1.5
saw blade tensioning
process used to form the cross-section of the saw blade, either by rolling or hammering, in order to ensure that the front and back edges of the saw blade grip the band wheels

3.1.6
saw blade tracking
means used to maintain the position of the saw blade on the band wheels

Note 1 to entry: See Figure 11.

3.1.7
manual control
situation where each process movement is initiated by the operator

3.1.8
machine actuator
power mechanism used to effect motion of the machine

3.1.9
hand feed
manual holding and/or guiding of the workpiece which includes the use of a hand operated carriage on which the workpiece is placed manually or clamped and the use of a demountable power feed unit

3.1.10
demountable power feed unit
feed mechanism which is mounted on a hand fed machine so that it can be moved from its working position without the use of a spanner or similar additional device

3.1.11
integrated feed
feed mechanism for the workpiece or band saw blade which is integrated with the machine and where the workpiece or machine element with incorporated band saw blade are held and controlled mechanically during the machining operation

3.1.12
run-up time
elapsed time from the actuation of the start control device until the driven band wheel reaches the intended speed

3.1.13
run-down time
elapsed time from the actuation of the stop control device until driven band wheel standstill

3.1.14
manual loading of power fed machines
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

3.1.15
manual unloading of power fed machines
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

3.1.16
cutting area
area where the saw blade can be involved in the cutting process

3.1.17
non-cutting area
area where the saw blade is not involved in the cutting process

3.1.18
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

3.1.19
displaceable machine
machine which is located on the floor, stationary during use and equipped with a device, normally wheels, which allows it to be moved between locations

3.1.20
PTO-driven machine
displaceable machine designed to be mounted to a moveable work machine, e.g. tractor, and which is powered by PTO

3.1.21
information of the supplier
statements, sales literature, leaflets or other documents, where the manufacturer (or supplier) declares either the characteristics or the compliance of the material or product to a relevant standard

3.1.22
safety function
function of a machine whose failure can result in an immediate increase of the risk(s)

[SOURCE: EN ISO 12100:2010, 3.30]

3.1.23
safety-related part of a control system
SRP/CS
part of a control system that responds to safety-related input signals and generates safety-related output signals

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

3.1.24
embedded software
SRESW
firmware
system software
software that is part of the system supplied by the control manufacturer and which is not accessible for modification by the user of the machinery

[SOURCE: EN ISO 13849-1:2008, 3.1.37]

Note 1 to entry: Firmware or system software are synonymous with embedded software.

Note 2 to entry: Manufacturer means manufacturer of the system.

Note 3 to entry: For example the operating system of a speed monitoring device.

3.1.25
application software
SRASW
software specific to the application, implemented by the machine manufacturer, and generally containing logic sequences, limits and expressions that control the appropriate inputs, outputs, calculations and decisions necessary to meet the SRP/CS requirements

[SOURCE: EN ISO 13849-1:2008, 3.1.36]

3.1.26
irregular shaped workpiece
workpiece with no even surface for stable guiding on the saw table, e.g. firewood

3.1.27
performance level PL
discrete level used to specify the ability of safety-related parts of control systems to perform a safety function under foreseeable conditions

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

3.2 Terminology

The names of the main parts of the machines are shown in Figures 1 to 6 and Tables 1 and 2.

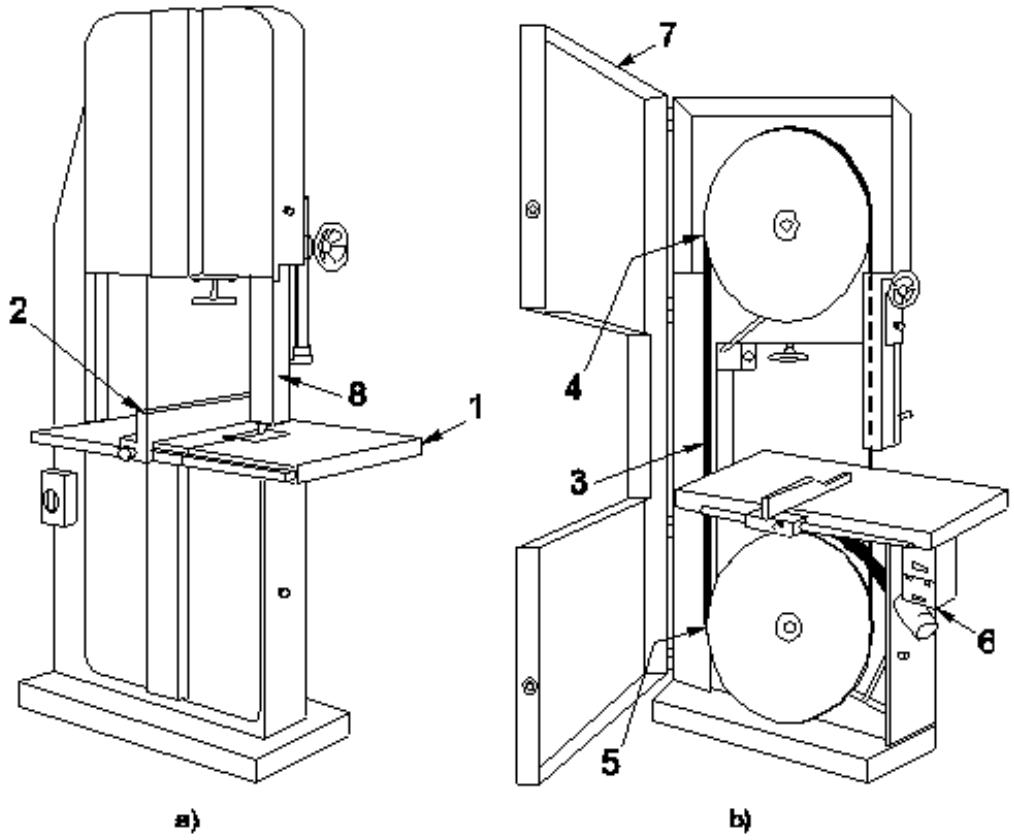


Figure 1 — Example of hand fed table band saw

Table 1 — Terminology for table band saw

1	Table
2	Adjustable fence
3	Band saw blade
4	Top band wheel
5	Bottom band wheel
6	Start and stop controls
7	Band wheel guard
8	Adjustable guard for saw blade

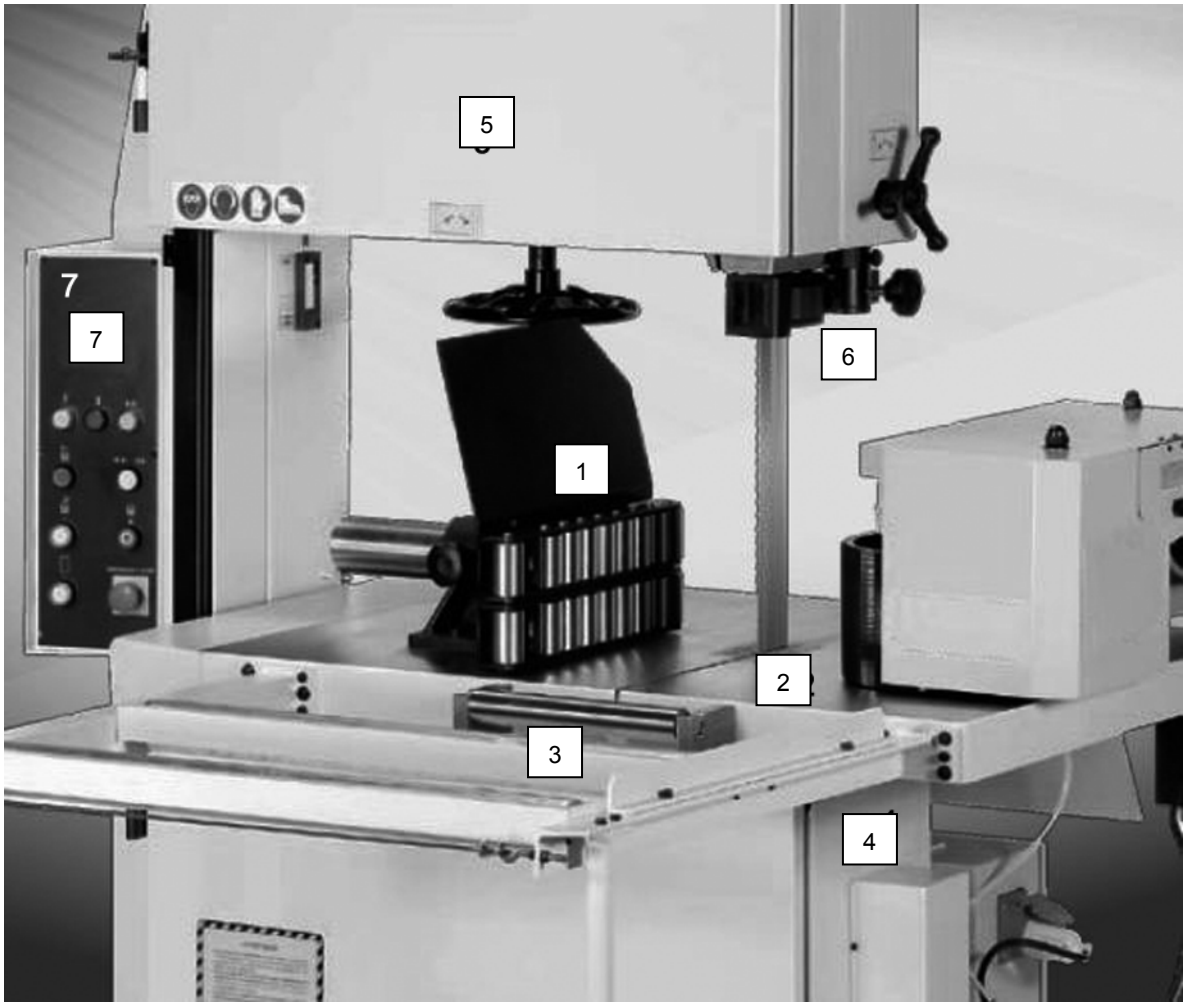


Figure 2 — Example of band re-saw

Table 2 — Terminology for band re-saw

1	Feed roller
2	Workpiece support (table)
3	Infeed table roller
4	guard below the table
5	Band wheel guard
6	Adjustable guard for saw blade
7	Start and stop controls

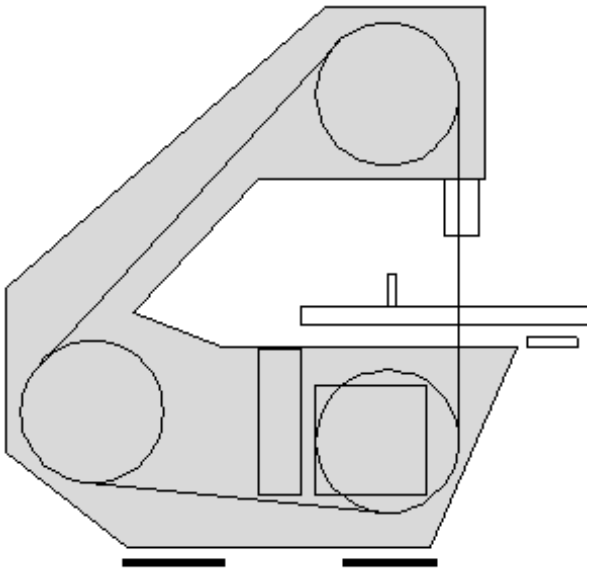


Figure 3 — Example of hand fed table band saw with three band wheels

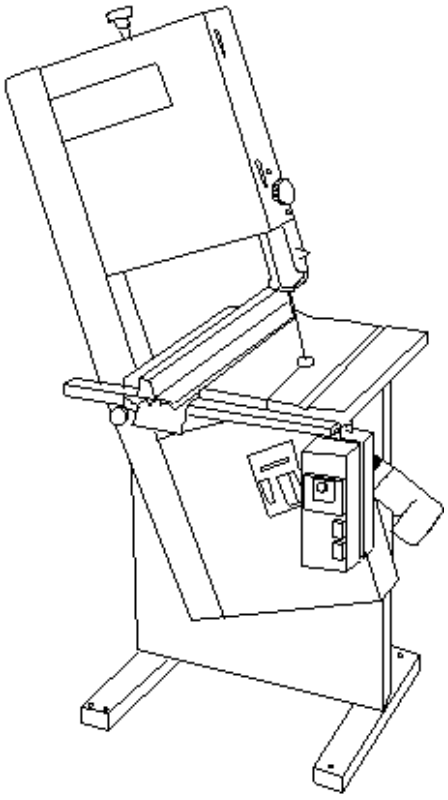


Figure 4 — Example of hand fed table band saw (tilting saw unit)

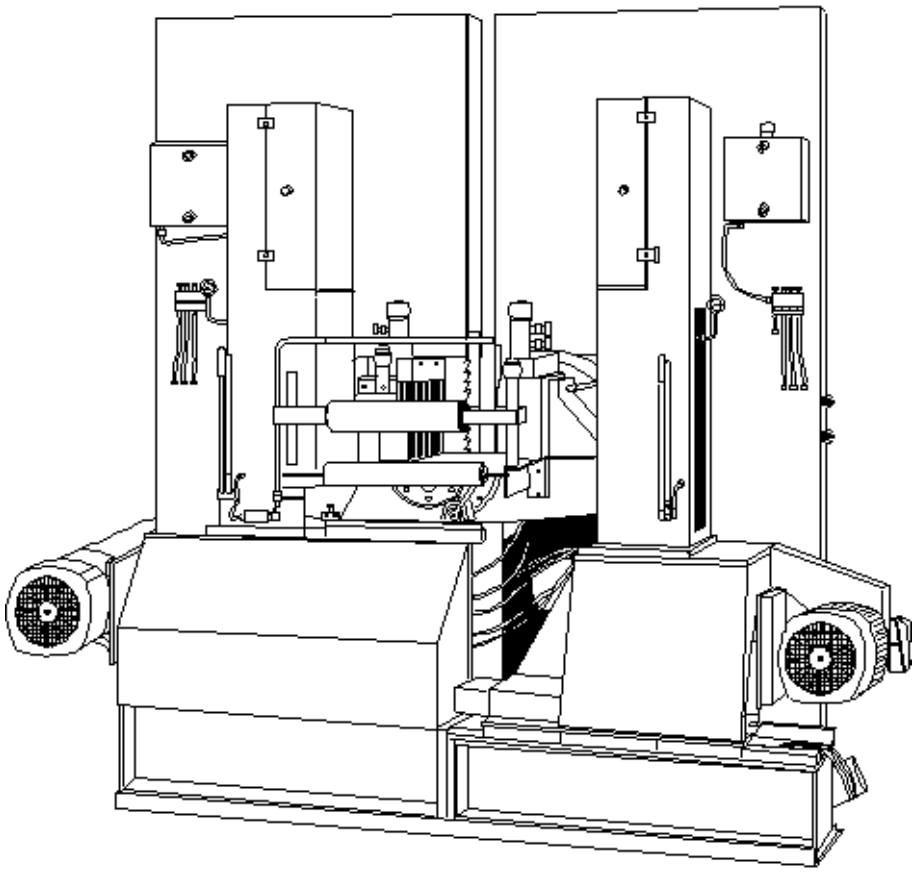


Figure 5 — Example of twin opposed band re-saws

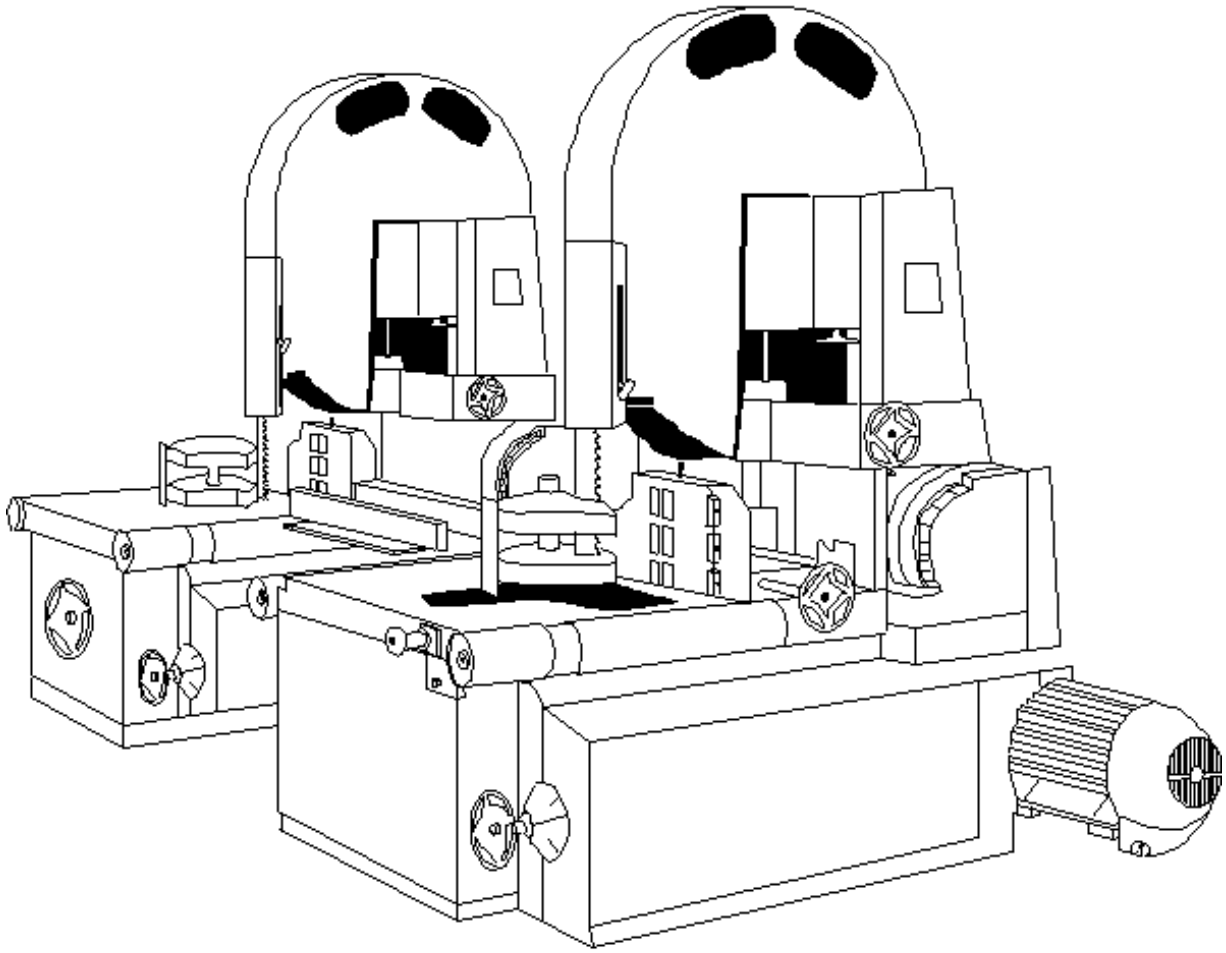


Figure 6 — Example of twin band re-saws in tandem

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 3.

Table 3 — List of significant hazards – Table band saws and band re-saws

No	Hazards, hazardous situations and hazardous events	EN ISO 12100:2010	Relevant subclauses of this document
1	**Mechanical hazards** related to: a) machine parts or workpieces:		
	1) shape	6.2.2.1, 6.2.2.2, 6.3	5.3.2, 5.3.6, 5.3.7.1, 5.3.7.2, 5.4.12
	2) relative location		5.2.2, 5.3.3, 5.3.6, 5.3.7, 5.4.5
	3) mass and stability (potential energy of elements which may move under the effect of gravity)		5.2.10, 5.3.3, 5.4.5, 5.4.12
	4) mass and velocity (kinetic energy of elements in controlled or uncontrolled motion)		5.2.3, 5.2.4, 5.2.8, 5.3.4, 5.3.7, 5.4.5
	5) mechanical strength		5.3.2, 5.3.4, Annex A, Annex D
	b) accumulation of energy inside the machinery:		
	1) liquids and gases under pressure	6.2.10, 6.3.5.4	5.4.6, 5.4.7
1.1 1.2 1.3 1.4 1.5	Crushing hazard Shearing hazard Cutting or severing hazard Entanglement hazard Drawing-in or trapping hazard		5.2.3, 5.2.4, 5.2.5, 5.2.7, 5.2.8, 5.2.9, 5.3.4, 5.3.6, 5.3.7, 5.3.8, 5.4.14, 6.3
1.6	Impact hazard		5.2.3, 5.2.4, 5.2.5, 5.2.7, 5.2.8, 5.2.9, 5.3.4, 5.3.6, 5.3.7, 5.4.14, 6.3
1.8	Friction or abrasion hazard		5.2.3, 5.2.4, 5.2.7, 5.2.9, 5.3.4, 5.3.7, 5.3.8, 5.4.14, 6.3

1.9	High pressure fluid injection or ejection hazard	6.2.10	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, 5.4.13
2.2	Contact of persons with parts which have become live under faulty conditions (indirect contact)	6.2.9	5.4.4, 5.4.13
2.4	Electrostatic phenomena	6.2.9	5.4.11
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, Annex B
4.2	Interference with speech communication, acoustic signals.		6.3
6	**Hazards generated by radiation**		
6.5	Lasers	6.3.4.5	5.4.10, 6.3
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, 6.3
7.2	Fire hazard	6.2.4	5.4.1
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
8.2	Hand-arm or foot-leg anatomy	6.2.8.3	5.4.5
8.4	Local lighting	6.2.8.6	6.3
8.5	Mental overload and underload, stress	6.2.8.5	6.3
8.6	Human error, human behaviour	6.2.8, 6.2.11.8, 6.2.11.10, 6.3.5.2, 6.4	6.3
8.7	Design, location or identification of manual controls	6.2.8.f, 6.2.11.8	5.2.2, 5.4.5
8.8	Design or location of visual display units	6.2.8, 6.4.2	5.2.2, 5.4.5

9	**Unexpected start up, unexpected overrun/overspeed** (or any similar malfunction) from:		
9.1	Failure/disorder of the control system	6.2.11, 6.3.5.4	5.2.1, 5.2.11, 5.4.13
9.2	Restoration of energy supply after an interruption	6.2.11.4	5.2.9, 5.4.6, 5.4.7
9.3	External influences on electrical equipment	6.2.11.11	5.4.9
9.5	Errors in the software	6.2.11.7	5.2.1
9.6	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	5.4.5, 6.3
10	**Impossibility of stopping the machine in the best possible conditions**	6.2.11.1, 6.2.11.3, 6.3.5.2	5.2.4, 5.2.5, 5.2.7, 5.4.13
11	**Variations in the rotational speed of tools**	6.2.2.2, 6.2.3	5.2.8
12	**Failure of the power supply**	6.2.11.1, 6.2.11.4	5.2.10
13	**Failure of the control circuit**	6.2.11, 6.3.5.4	5.2.11
14	**Errors of fitting**	6.2.7, 6.4.5	5.4.12
15	**Break-up during operation**	6.2.3	5.3.2
16	**Falling or ejected objects or fluids**	6.2.3, 6.2.10	5.3.2, 5.3.3, 5.3.5, Annex D
17	**Loss of stability / overturning of machinery**	6.3.2.6	5.3.1, Annex C

5 Safety requirements and/or measures

5.1 General

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

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

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

5.2 Controls

5.2.1 Safety and reliability of control systems

5.2.1.1 General

For the purpose of this document, safety related part of a control system means the system from the initial device, e.g. actuator or position detector or sensor up to and including the power control element of the final machine actuator, e.g. motor or brake. Safety related parts of the control system of this machine comprise parts concerning the following functions and they shall fulfil at least the requirements of the PL given in the clauses listed below, in accordance with the requirements of EN ISO 13849-1:2008:

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

— normal stopping: PL = c (see 5.2.4.1 and 5.2.4.2);

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

— stopping powered feed rollers: PL = c (see 5.2.4.1 and 5.2.5);

— speed changing by belt position: PL = c (see 5.2.8);

— speed monitoring: PL = c (see 5.2.8);

— interlocking: PL = c (see 5.2.3, 5.2.8, 5.3.4, 5.3.7.1.2, 5.3.7.2, 5.3.7.3);

— interlocking with guard locking: PL = c (see 5.3.7.1.2, 5.3.7.2, 5.3.7.3);

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

— trip devices (where fitted): PL = c (see 5.3.7.2);

— braking function: PL = c or PL = b (see 5.3.4.1);

— brake release: PL = c (see 5.2.6, 5.3.4.2);

— pressure sensitive devices (where fitted): PL = c (see 5.3.7.2.4);

— opto-electronic devices (where fitted): PL = c (see 5.3.7.2.4).

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

5.2.1.2 Use of protective devices

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

a) magnetic/proximity switches shall be in accordance with the requirements of 6.2 of EN 1088:1995+A2:2008 and the related control system shall conform at least to PL = c in accordance with the requirements of EN ISO 13849-1:2008;

b) if a time delay is used, it shall either be of failsafe technique or shall conform to the requirements of at least PL = c according to EN ISO 13849-1:2008.

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

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

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

5.2.2 Position of controls

5.2.2.1 Table band saws

On table band saws all control devices for the normal operation of the machine (including the emergency stop control if fitted) shall be positioned:

a) on the infeed side;

b) between 600 mm and 1 800 mm above the floor level; and

c) either on a fixed part of the machine or on a moveable control panel or a free-standing control console.

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

5.2.2.2 Re-saws

On re-saws, all control devices for the normal operation of the machine, except the emergency stop control, shall be positioned in accordance with 5.2.2.1. An emergency stop control shall be positioned at any infeed and outfeed position and on any fixed or moveable control panel.

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

5.2.3 Starting

Before starting or restarting the machine all interlocked guards (where fitted as indicated in 5.3.7) shall be in place and functional. This is achieved by the interlocking arrangements described in 5.3.7. For non interlocked guards provisions before starting see 6.3, list entry d), sub-entry 6).

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

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

If fitted, the integrated feed or the demountable power-feed unit shall not be capable to start before the band saw:

a) is running, and

b) has reached its intended cutting speed if the design run-up time is higher than 10s.

The safety related part of the control systems (also see 5.2.1) for starting and the interlocking arrangements as indicated in 5.3.7 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, inspection of the machine and relevant functional testing of the machine.

5.2.4 Normal stopping

The machine shall be fitted with a stop control, whereby the machine and, if fitted, a demountable power feed unit can be stopped. The stopping shall include disconnection from energy supply of all actuators except workpiece clamping, with the exception of Power Drive Systems (PDS according to EN 61800-5-2:2007) with "Safe-Torque-Off" (STO).

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

The machine shall stop directly from each speed.

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

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

Where a category 1 stop control is fitted, the stopping sequence shall be:

a) cut power to all machine actuators and any sockets (if provided, e.g. for demountable power feed device) except workpiece clamping (if fitted) and actuate the brake(s);

b) cut power to the brake(s) (if electrical brakes are fitted) after the driven band saw wheel has come to rest e.g. by using a time delay in accordance with 5.2.1.2, list entry b).

If a time delay device is used the time delay shall conform to 5.2.1.2, list entry b) 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 (see also 5.2.1) for normal stopping shall be at least PL = c in accordance with the requirements of EN ISO 13849-1:2008.

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

5.2.5 Emergency stop

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

Machines with more than one machine actuator or where provision is made for use of a demountable power feed unit shall be fitted with an emergency stop control which cuts power to all machine actuators except workpiece clamping and which complies with the requirements of 9.2.5.4.2 and 10.7 of EN 60204-1:2006. The emergency stop control device shall be at any time of self latching type.

The emergency stop control (if fitted) shall be located in accordance with 5.2.2.

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

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

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

Dangerous movements caused by gravity, pressure, etc. shall be avoided, e.g. by automatic mechanical blocking or clamping devices.

Where a category 1 stop control is fitted, the stopping sequence shall be:

a) cut power to all machine actuators and any sockets (if provided, e.g. for demountable power feed device) except workpiece clamping (if fitted) and actuate the brake;

b) cut power to the brake (if electrical brake is fitted) after the driven band saw wheel has come to rest e.g. by using a time delay in accordance with 5.2.1.2, list entry b).

If a time delay device is used the time delay shall be at least the maximum run-down time. Either the time delay shall be fixed or the time delay adjustment device shall be sealed.

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

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

5.2.6 Tracking mode

The possibility of blade tracking shall be provided, e.g. by a means for adjusting inclination of one of the band wheels (see also 5.3.3.1). Tracking can be made:

— with open guards by rotating the wheels by hand, provided that brake is released according to 5.3.4.2; in this case, it shall not be possible to release the brake until the band wheels are stationary; or

— with closed guards during unbraked run-down; in this case, a mode selector shall be provided according to 5.2.7.

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

5.2.7 Mode selection

Where a mode selection switch is provided to allow tracking during unbraked run-down, in accordance with the principles of 6.2.11.10 of EN ISO 12100:2010, the mode selection switch shall be in accordance with the following requirements:

a) its control system shall override all other control systems except the emergency stop and in any case it shall not be possible to open the guards until the saw blade has come to rest (see 5.3.7.1.2);

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

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

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 of the machine and relevant functional testing of the machine.

5.2.8 Speed control

5.2.8.1 General

Where a machine is designed to operate at more than one saw blade speed, all relevant requirements in 5.2.8.2 to 5.2.8.4 shall be met. The selected saw blade speed shall be clearly indicated or visible at the operator position before starting the saw blade motor.

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

5.2.8.2 Speed changing by changing belts on the pulleys

On machines with varying the band saw speed by changing the belts on the pulleys, the control system for band saw speed indication (if fitted) shall be at least PL = c in accordance with the requirements of EN ISO 13849-1:2008.

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

5.2.8.3 Speed changing by incremental speed change motor

On machines fitted with an incremental speed change motor, e.g. a change pole motor, the selected speed shall be indicated at the control. Speed selection shall be designed to achieve at least PL = c in accordance with the requirements of EN ISO 13849-1:2008.

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

5.2.8.4 Infinitely variable speed by frequency inverter

On machines fitted with an automatic control device for infinitely variable speed (e.g. a frequency inverter) for the band wheel drive motor, the device shall be such that the real speed shall not exceed the selected speed by more than 10%. The selected speed shall be indicated prior to drive motor start. The selected speed value shall be displayed easily to read for the operator (see EN 894-2:1997+A1:2008).

The actual speed of the band wheel shall be compared with the selected speed continuously. If the actual speed exceeds the selected speed by more than 10 % the band wheel shall stop automatically. This stop shall be a category 0 stop according to 9.2.2 of EN 60204-1:2006.

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

For software requirements, see 4.6 of EN ISO 13849-1:2008.

See also 4.2.3.4 "safely-limited speed (SLS)" of EN 61800-5-2:2007.

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

5.2.9 Control duplication

The requirements of EN ISO 12100:2010 shall apply. Where on band re-saw duplicate controls are provided, the control system shall only allow one control to be effective at a given time.

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

5.2.10 Failure of the power supply

In the case of supply interruption for electrically driven machines, automatic restart after the restoration of the supply voltage shall be prevented in accordance with the requirements of paragraphs 1 to 3 of 7.5 of EN 60204-1:2006.

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

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

5.3 Protection against mechanical hazards

5.3.1 Stability

Machines shall be stable during operation.

For stationary machines that do not pass the stability test in Annex C, it shall be possible to fix them to a suitable stable horizontal structure e.g. floor. Facilities for fixing are e.g. fixing holes in the machine frame (see also 6.3, list entry f)).

Any displaceable machines fitted with wheels shall have the facilities to make them stable during cutting. Such facilities are e.g.:

a) brakes for the wheels, or

b) a combination of wheels and stabilisers, or

c) a device to retract the wheels from the floor.

The band wheels shall be individually balanced in accordance with G.6.3 of ISO 1940-1:1986.

Verification: By checking relevant drawings, measurement, inspection of the machine, and relevant functional testing of the machine. For machine stability, the test in Annex C applies.

5.3.2 Risk of break-up during operation

5.3.2.1 Characteristics of guards

Guards fitted to the mainframe of the machine, to enclose the saw blade, shall be manufactured of a material whose ultimate tensile strength (UTS) and corresponding thickness meet, as a minimum, the requirements laid down in Table 4, except that the inner face of the adjustable guard on a table band saw may be manufactured from spring steel of UTS 1 500 N mm^{-2}, and with a thickness of at least 0,5 mm.

Table 4 — Materials for guard manufacture

Band wheel diameter [mm]	Steel of UTS 350 N mm^{-2}	Aluminium of UTS 180 N mm^{-2}	Polycarbonate	Cast iron of UTS 200 N mm^{-2}
	Minimum material thickness [mm].			
≤ 315	1,0	2,5	2,0	5,0
316 - 999	1,5	3,0	3,0	5,0
≥ 1 000	2,0	3,5	5,0	5,0

For other material and/or dimensions, the test in Annex D shall be performed and passed.

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

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

5.3.2.2 Cleaning

Machines intended for use with tensioned saw blades shall be fitted with devices that ensure that the saw blade and band wheels are cleaned during operation, e.g. brushes or scrapers (see Figure 7). Where the cleaning devices are manually adjusted, this shall be without the aid of a tool.

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

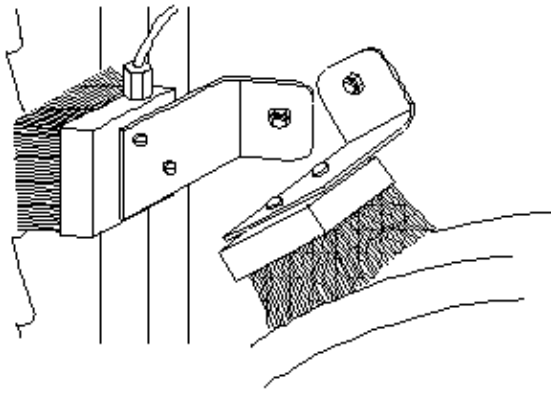
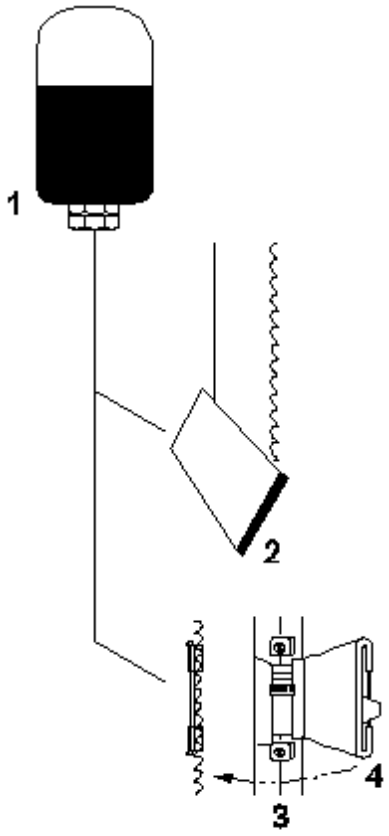


Figure 7 — Blade and wheel cleaning

5.3.2.3 Lubrication

Band re-saws shall be fitted with a system which applies anti adherent fluid to the saw blade and/or band wheels during machine operation (Figure 8). The reservoir of anti-adherent fluid shall be of adequate size for continuous operation of at least four hours with the flow rate foreseen for the lubrication.

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



Key

1 drip feed lubricator
2 blade wiper
3 saw cleaning device in open position
4 close when cleaning

Figure 8 — Blade lubrication

5.3.3 Saw blade holder and saw blade design

5.3.3.1 Saw blade straining and tracking

Means shall be provided to adjust the strain of the saw blade. Indication of the strain shall be provided (see also Figure 9 and 6.2, list entry g).

A compensation device shall be provided to maintain the strain in the saw blade during normal operation (see Figure 9).

A means of tilting one band wheel shall be provided to ensure that the saw blade can be tracked (see Figure 10). On machines with a band wheel diameter which is ≤ 900 mm, this adjustment shall be possible without the use of a tool.

For tracking which allows un-braked run-down, see 5.2.6.

Where the machine is designed to be tracked under power with all guards closed or during un-braked run-down, provision shall be made for checking the position of the saw blade, e.g. by means of marks on the machine table or by a scale, or by sighting slots in the guard of the upper band wheel not higher than 1 800 mm.

The position and size of openings shall conform to Tables 2 and 5 of EN ISO 13857:2008.

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

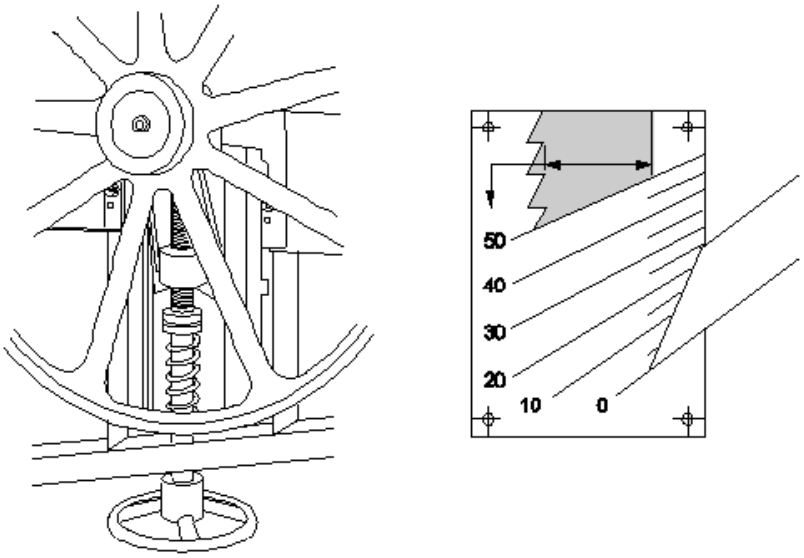
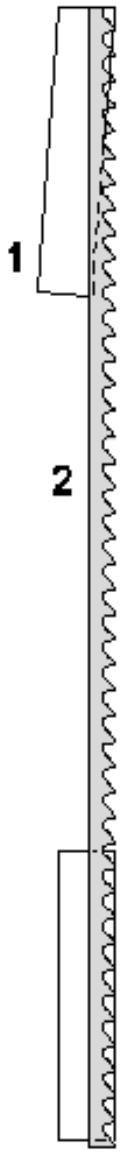


Figure 9 — Example of blade straining system, marking and indication



Key

1 tilting pulley
2 band saw blade

Figure 10 — Blade tracking

5.3.3.2 Saw blade guides

Machines shall be equipped with saw blade guides, which shall conform to the requirements set out in Table 5.

Table 5 — Saw blade guides

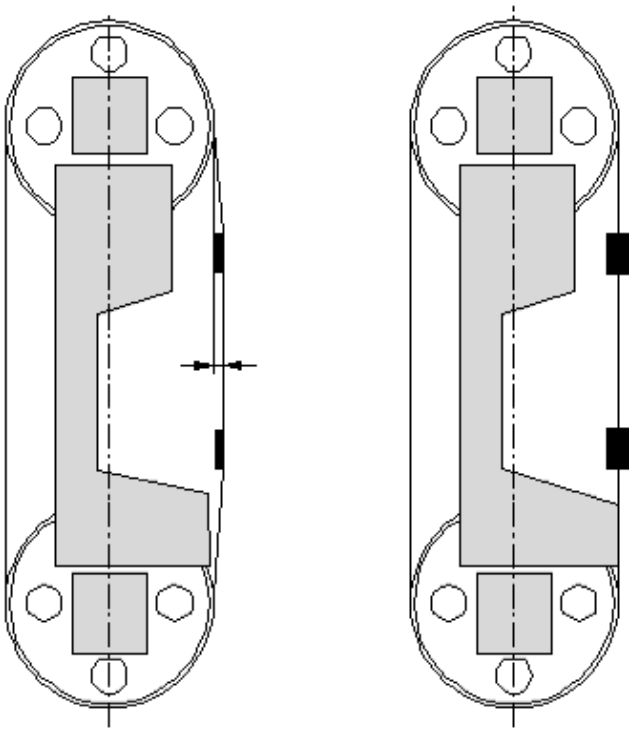
Machine design		**Saw blade guide types**			**Required saw blade guide position**	**Adjustable saw blade guides**
		Roller	**Cheek**	**Pressure**		
Vertical saw blade - band wheel diameter ≤ 315 mm		X	X		(at least) above workpiece	Upper
Vertical saw blade - band wheel diameter > 315 mm	Non-tensioned	X	X		Above and below workpiece	Upper
	Tensioned		X	X		
Horizontal Saw blade	Non-tensioned	X	X		Both sides of workpiece	Closest to non-driven band wheels
	Tensioned		X	X		

Where cheek guides are fitted, one set shall be adjustable, in accordance with Table 5, so that it can be moved towards the workpiece or work support level and be secured in that position (see Figure 11 b).

On machines intended for use with un-tensioned saw blades, a rear guide (thrust wheel) shall be fitted above the workpiece to maintain the saw blade in position when sawing (see Figure 12).

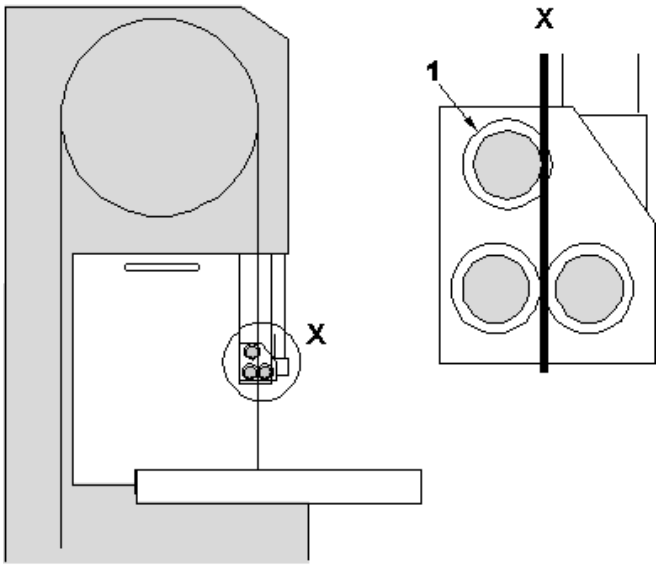
NOTE Cheek and roller guides can be combined when both are allowed; cheek and pressure cannot be so.

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



a) Pressure guides **b) Cheek guides**

Figure 11 — Saw guides - Tensioned blades



Key

1 thrust wheel

Figure 12 — Un-tensioned blade - Rear guide (thrust wheel)

5.3.4 Braking

5.3.4.1 General

An automatic brake, e.g. electrically or mechanically operated, shall be provided for all band saw drive wheels where the un-braked run-down time exceeds 10 s (for measurement of the un-braked run-down time, see Annex F). The braked run-down time shall not exceed 10 s or, where the run-up time exceeds 10 s, shall be less than the run-up time but shall not exceed 30 s (for measurement of the braked run down time, see Annex F).

The braking torque shall not overcharge the saw blade and in any case shall not be applied directly to the saw blade.

For residual risk due to broken band saw blade and drive belt (if fitted) and upper free wheel running, see 6.3.

For residual risk due to lack of braking in case of power supply loss, see 6.3.

At least PL = c for the braking function shall be achieved.

Where a spring operated mechanical brake is fitted the last paragraph of 9.3.4 of EN 60204-1:2006 does not apply.

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

As an exception where an electrical braking system is used and contains electronic components, the control system for braking shall fulfil at least the requirements of PL = b and be designed in category 2 of EN ISO 13849-1:2008 with the exception that the test rate requirement in 4.5.4 of EN ISO 13849-1:2008 is not applicable. The safety related part of the control circuit 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 wheel drive motor or from the measurement of the residual current in the wires powering the motor. The test shall:

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

2) be independent from the intention of the operator;

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

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

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 the run-up time, braked and un-braked run-down time, see the appropriate test given in Annex E.

5.3.4.2 Brake release

Where a control is provided to release the band saw drive wheel brake in order to enable rotation by hand, release of the brake shall only be possible when the drive wheel(s) has stopped turning (e.g. by a time delay in accordance with 5.2.1.2, list entry b) between control actuation and brake release).

It shall not be possible to start the machine before the control for the drive band wheel brake has been reset. Reset of the control for brake shall not initiate a start-up of the machine.

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

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

5.3.5 Devices to minimise the possibility or the effect of ejection

See 5.3.2.1.

5.3.6 Workpiece supports and guides

5.3.6.1 Table band saw table

The minimum size of table shall be in accordance with the requirements of Figure 13 and Table 6 (except for machines designed only for cross cutting of round or irregular shaped pieces).

The opening in the table for the saw blade shall be fitted with a replaceable insert (see the example in Figure 14), made of wood, plastic or light alloy. Mechanical stop shall be provided to prevent the insert from sinking into the table.

The table tilt shall be restricted to a maximum of 45° on both sides.

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

5.3.6.2 Table band saw fence (workpiece guide)

A fence, adjustable and lockable without the aid of a tool, shall be provided for table band saws (except for machines designed only for cross cutting of round or irregular shaped pieces).

On machines with tilting tables, the machine shall be fitted with means for mounting the fence on either side of the saw blade.

The fence dimensions shall be in accordance with Figure 13 and Table 6.

For shallow cuts on flat workpieces like boards/panels, an auxiliary fence or a double position fence or the possibility to fix (e.g. by screws) a specific wooden device (made by the user) to the fence shall be provided having a height from 5 mm to 15 mm close to the workpiece.

It shall be possible to lower down the adjustable guard to the workpiece upper surface for any position of the fence and all workpiece dimensions specified in the instruction handbook (see 6.3, list entry e), sub-entry 11)).

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

Table 6 — Minimum table and fence dimensions

Dimensions in mm

d_1	c	e	a
≤ 320	125	155	≥ 50
320 < d_1 ≤ 440	135	180	90
440 < d_1 ≤ 540	145	225	90
540 < d_1 ≤ 640	200	250	90
640 < d_1 ≤ 740	228	300	90
740 < d_1 ≤ 840	250	355	90
840 < d_1 ≤ 900	300	375	90

Dimensions in mm

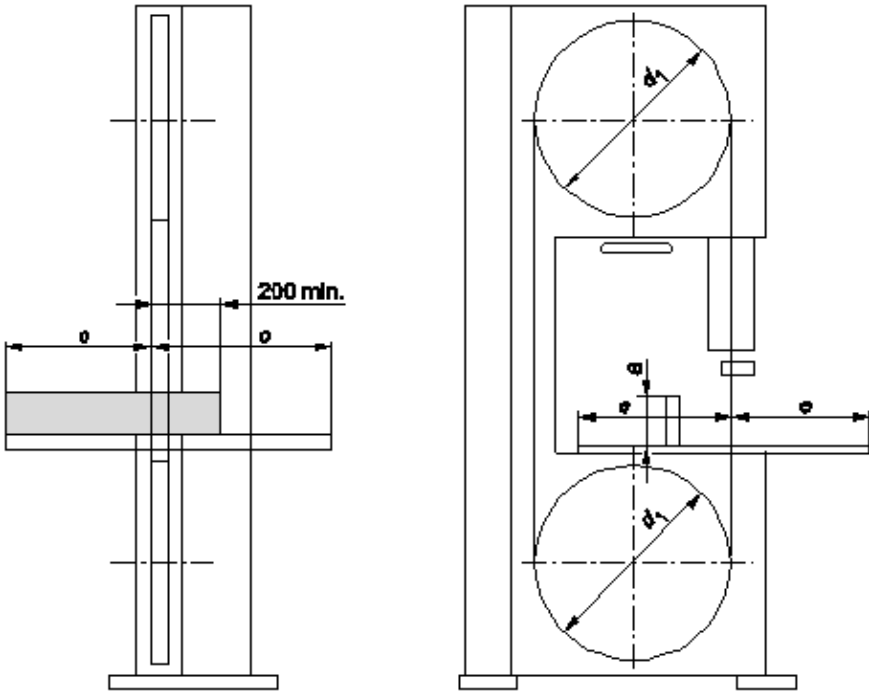


Figure 13 — Minimum table size - Height and length of the fence

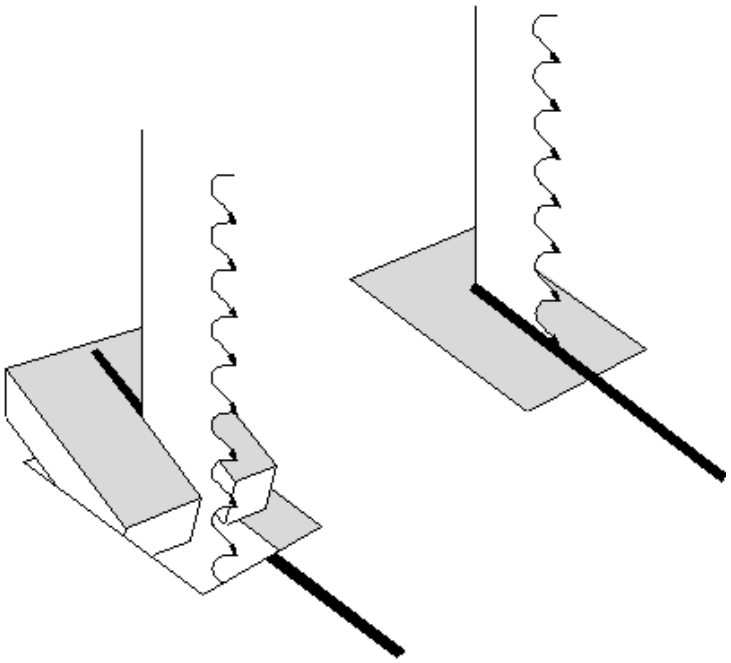


Figure 14 — Example of table insert

5.3.6.3 Support for cross-cutting round or irregular shaped workpieces

Table band saws designed for cross-cutting round or irregular shaped workpieces (e.g. firewood) shall be provided with a feeding device which is used to support and guide the workpieces during cutting. Such device shall either be a moving table equipped with a fence against which to locate the workpieces or shaped to locate the workpieces, or an attachment equipped with a fence which can be fitted on the normal table (see Figure 15).

The movement of the table shall not expose the saw blade below the table or below the cutting area.

The feeding device shall:

— be capable of being locked in the loading position;

— be designed such that the workpiece is capable of being fixed or clamped during cutting, e.g. by spikes, overhead clamp, jig or holder;

— have a width on the side of the saw blade opposed to the machine frame minimum equal to 500 mm (see Figure 15);

— have at least a length half the maximum length of the workpieces for which the machine is designed.

The maximum stroke of the feeding device shall be equal to the dimension of the maximum cutting height capacity of the saw blade plus 20 mm (see Figure 16).

After cutting, the feeding device shall automatically return to the loading position without the workpiece or feeding device touching the back of the saw blade, e.g. by means of an offset return stroke.

A feeding device without an offset return stroke is acceptable if it contains an ergonomic clamping device in order to keep the workpiece during and after cutting in such a stable position that perpendicular moving against the saw blade is prevented.

The clamping system shall work even with irregular shaped workpieces.

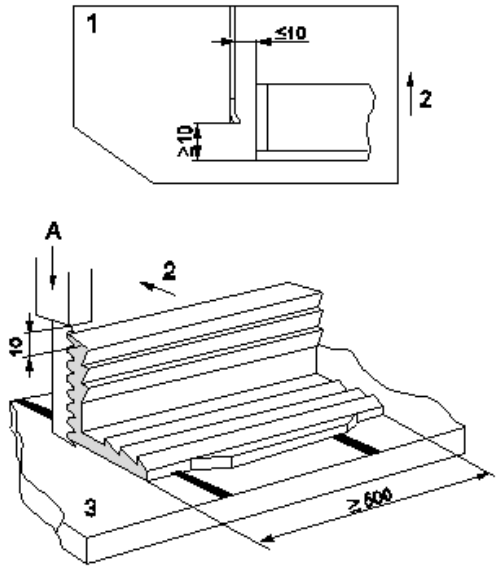
This clamping device shall be interlocked (by control system or mechanically) with the cutting stroke and back stroke in such a way that:

a) the workpiece is clamped during the cutting stroke and the back stroke; and

b) the clamping device opens only when the feeding device is in it's loading position.

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

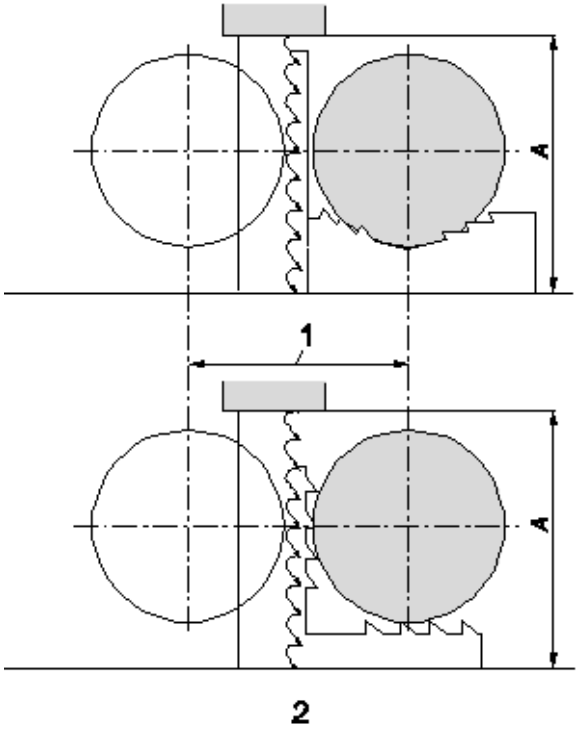
Dimensions in mm



Key

1 view in direction of A (top view)
2 movement for cutting
3 table

Figure 15 — Guarding the cutting area - Cross cutting workpiece



Key

1 maximum stroke = *A* + 20 mm

A maximum cutting height capacity for which the machine is designed

Figure 16 — Cross-cutting workpieces - Maximum stroke

5.3.6.4 Workpiece support on band re-saws

Band re-saws shall be provided with a workpiece support on the infeed and outfeed side, the length of which is minimum half the maximum workpiece length for which the machine is designed. The width of the workpiece support shall be minimum the maximum workpiece width for which the machine is designed.

The support may be e.g. a flat table, a roller table, a belt conveyor.

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

5.3.6.5 Workpiece guiding system on band re-saws

Band re-saws shall be provided with a workpiece guiding system at least on the infeed side, e.g. a fence, rollers. The height of the guiding system shall be at least 60% of maximum height of the workpieces for which the machine is designed. The design of the guiding system shall be such that the workpiece is kept in contact with the workpiece support and the guiding elements, e.g. by pressure / feed rollers or by their inclination, but without closing the saw kerf.

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

5.3.6.6 Power operated workpiece feed on band re-saws

Band re-saws shall be provided with a power operated workpiece feed, e.g. feed rollers, sliding table, chain conveyor. The feed system shall be so designed that the workpiece transport is effective until the workpieces have passed the rear side of the saw blade.

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

5.3.7 Prevention of access to moving parts

5.3.7.1 Safeguarding of table band saws

5.3.7.1.1 General

The fixed guards, which need to be open for maintenance that can be made by the user, shall have fixing systems remaining fixed to the guard or to the machine when the guard is removed e.g. un-losable screws (see.6.3, list entry dd)).

Access to the saw blade or any dangerous area through any dust extraction outlet when the exhaust system is not connected shall be prevented, according to the requirements of EN ISO 13857:2008.

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

5.3.7.1.2 Guarding of the non-cutting area on table band saws

Access to the top and bottom band wheels of the machine and to the whole of the saw blade in the non-cutting area shall be prevented by fixed and interlocked moveable guards (see Figure 1).

Where the run-down time of the band saw blade exceeds 10 s interlocking with guard locking is required in accordance with Annex M of EN 1088:1995+A2:2008.

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

For all machines fitted with tilting tables or a tilting head, access to the part of the saw blade between the table and the lower band wheel guard shall be prevented at all angles of the table or head tilt by a fixed guard (see Figure 17).

Such fixed guard may contain movable elements connected to each other.

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

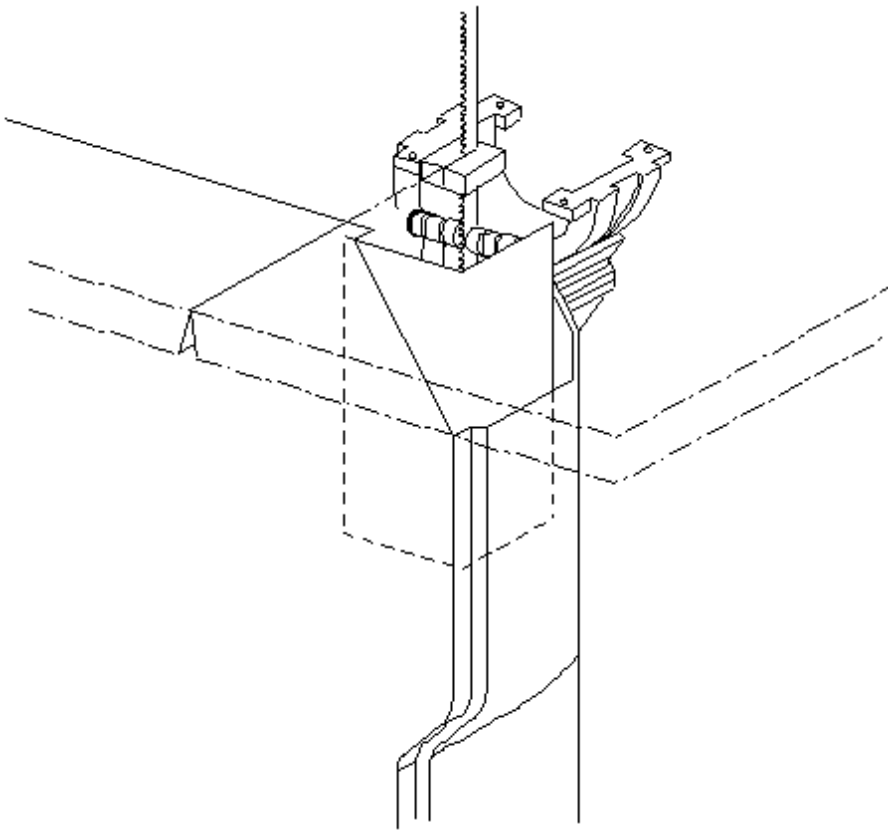


Figure 17 — Guarding below the table

5.3.7.1.3 Guarding of the cutting area on table band saws

For table band saws and band saws for cross-cutting round or irregular shaped workpieces, access to the cutting area of the saw blade shall be prevented by an adjustable guard which shall be designed in such a way that it does not have to be removed from the machine during saw blade changing.

The adjustable guard shall be attached to and move with the top saw blade guide and shall be designed so as to enclose the saw blade on all four sides (see Figure 18).

Adjustments for the adjustable guard shall be either self-locking or capable of being locked in position.

The guard shall have sufficient adjustment to enable movement down to the table.

Uncontrolled vertical movement of the guard caused by gravity shall be limited to 30 mm s^{-1}.

In addition, on machines designed for cross-cutting round or irregular shaped workpieces, the exposed part of the saw blade shall be protected during loading by a deterring/impeding device, e.g. a device fixed to the moving table or the feeding device designed according top view 1 of Figure 15 for distances requirement so to act as a deterring/impeding device. The deterring/impeding device shall be designed so that it permits operation of the adjustable guard, allowing a maximum vertical distance of 10 mm between the deterring/impeding device and the adjustable guard (see Figure15).

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

Dimensions in mm

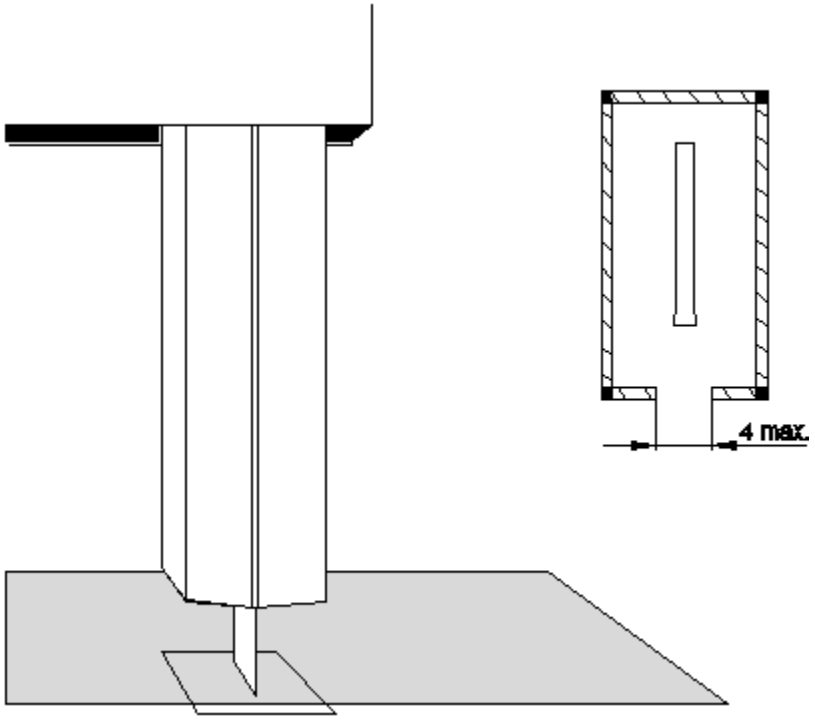


Figure 18 — Adjustable guard - Table band saw

5.3.7.1.4 Demountable power feed

Where a demountable power feed unit is fitted to a table band saw (see Figure 19), the requirements of 5.2.3, 5.2.4 and 5.2.5 shall be fulfilled.

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

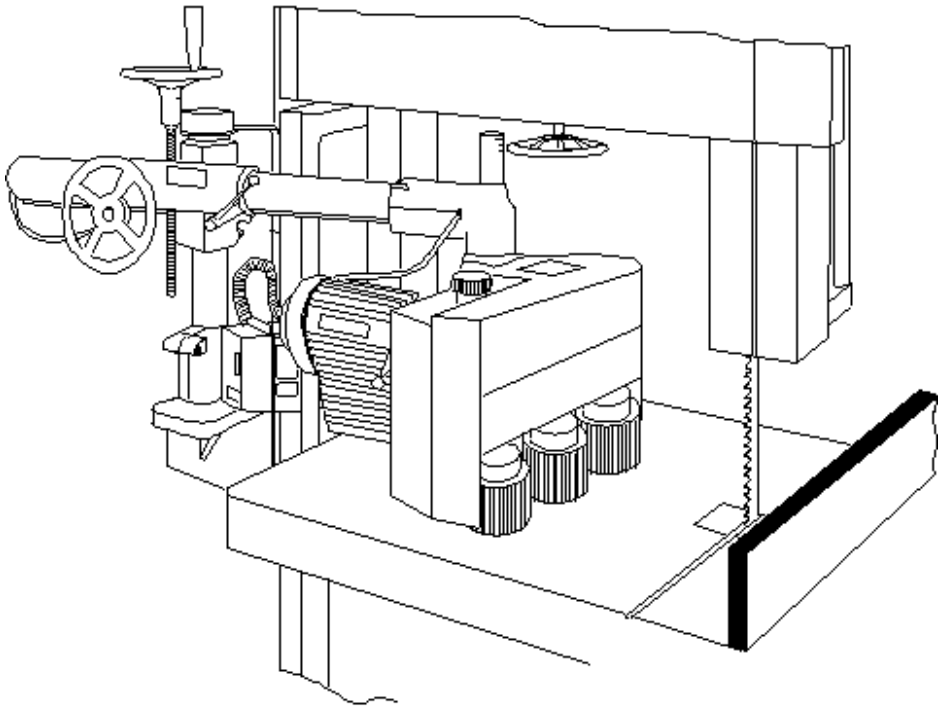


Figure 19 — Table band saw with demountable power feed unit

5.3.7.2 Safeguarding of band re-saws

5.3.7.2.1 Guarding of the non-cutting area of band re-saws

Access to the non-cutting area of band re-saws shall be prevented in accordance with the requirements of 5.3.7.1.2.

For band re-saws where the lower band wheel is located (whole or partly) below the floor / access level, part of fixed guard may consist of building or floor parts, provided that in the instruction hand-book the solution is clearly described. If movable guards need to be fitted to building or floor parts, they and the related interlocking system shall be provided and the instruction for their installation shall be given.

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

5.3.7.2.2 Guarding of the cutting area of band re-saws

Access to the cutting area of the saw blade at band re-saws shall be prevented by an adjustable guard as described in 5.3.7.1.3, except that this guard shall enclose the saw blade on at least three sides, i.e. the cutting edge and at least two other sides, and shall be capable of adjustment down to at least the upper part of the integrated feed.

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

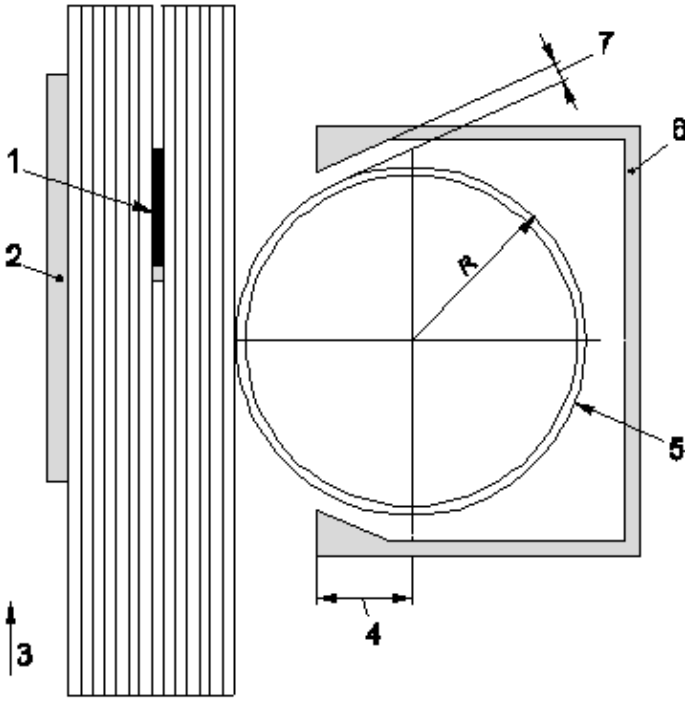
5.3.7.2.3 Feed rollers on band re-saws and on table band saw with demountable power feed

Access to the feed rollers shall be impeded by a guard designed according to:

a) EN ISO 13857:2008, or

b) the dimensions shown in Figure 20, with an additional trip device in accordance with the requirements in EN 1760-2:2001+A1:2009 (see Figure 23). For the control system of the trip device and the interlocking with feed rollers at least PL = c applies. The trip device shall be located in front of and above the feed rollers and shall stop feed roller movement. The trip device shall extend over the whole width of the infeed opening, have a distance in feed direction of at least 250 mm to the infeed rollers and be located so that a gap of maximum 400 mm between work-pieces with the largest square dimensions and the guard remains. When tripped, the work-piece shall be become stationary with a lag of maximum 100 mm.

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



Key

1 saw blade
2 fence
3 feed direction
4 ½R minimum
5 feed roller
6 guard
7 4 mm maximum

Figure 20 — Feed roller guard - Band re-sawing machine

5.3.7.2.4 Roller tables for band re-saws

Access to shearing and crushing points between workpiece and rollers of roller tables sections that are accessible shall be prevented by, for example:

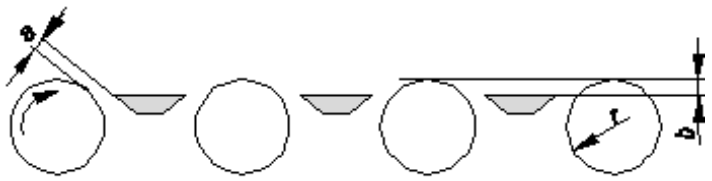
a) in-filling/closing the space between the rollers in accordance with the dimensions shown in Figures 21 and 22; or

b) by using a pressure sensitive device in accordance with EN 1760-1:1997+A1:2009 which shall be operative over a distance of 1 m measured perpendicular to the workpiece support over the full length of the table accessible sections interlocked to stop the dangerous movement. After the device is activated,

the work-piece shall become stationary with a lag of maximum 100 mm. The pressure sensitive device control system and the interlocking function with feed rollers shall be at least PL = c in accordance with EN ISO 13849-1:2008; or

c) an active optoelectronic protective device (light beam) type 2 located over the full length of the table accessible sections, in accordance with the requirements of CLC/TS 61496-2:2006, which shall be interlocked with the dangerous movement and positioned at a distance of at least 1 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. After the device is activated, the work-piece shall be become stationary with a lag of maximum 100 mm. The AOPD control system and the interlocking function with feed rollers shall be at least PL = c in accordance with EN ISO 13849-1:2008.

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



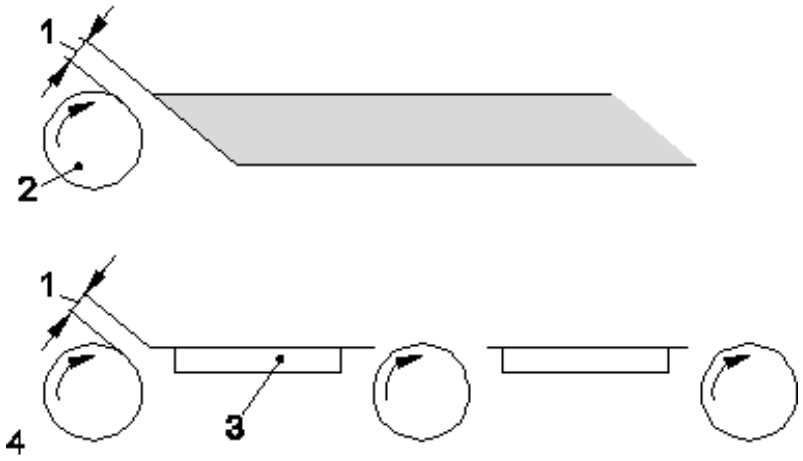
Key

r roller radius

a maximum value: 4 mm

b maximum value: the lower between 0.3·r and 8 mm

Figure 21 — Roller bed for band re-saw



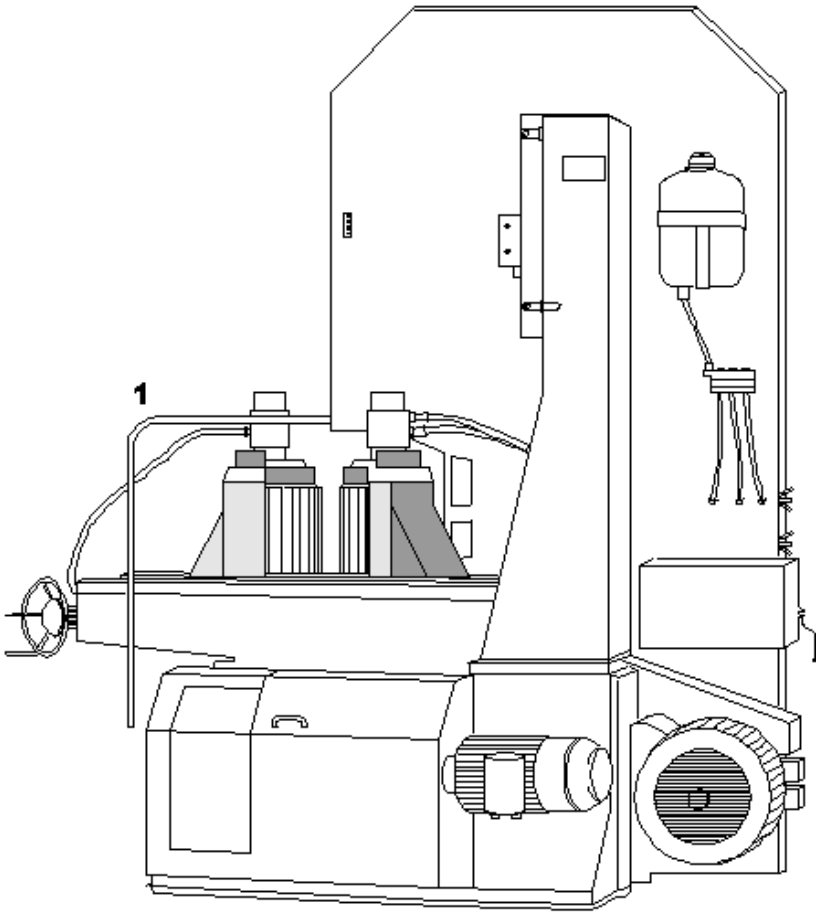
Key

1 maximum value: 4 mm

2 powered rollers

3 in-filling piece

Figure 22 — Table rollers - Maximum clearance



Key
1 trip device

Figure 23 — Band re-saw with trip device to the feed

5.3.7.3 Guarding of drives (band wheels, feed etc.)

Access to the drive mechanism for the driven band wheel and the drive mechanism for the integrated feed shall be prevented either by a fixed guard or a moveable interlocked guard.

Fixed guard that are to be demounted by the user e.g. for maintenance and cleaning purposes shall be fitted with fixing elements remaining attached to the machine or to the guard when the guard is removed e.g. un-losable screws (see 6.3, list entry dd))

When the run-down time of the band saw blade exceeds 10 s, guard locking is required designed in accordance with Annex M of EN 1088:1995+A2:2008.

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

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

5.3.8 Safety appliances for table band saws

A push block handle shall be provided with table band saws, and a facility for storing the push block shall be provided on the infeed side of the machine.

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

5.4 Protection against non-mechanical hazards

5.4.1 Fire

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

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

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

5.4.2 Noise

5.4.2.1 Noise reduction at the design stage

When designing machinery the information and technical measures to control noise at source given in EN ISO 11688-1:2009 shall be taken into account. Also the information given in EN ISO 11688-2:2000 may be taken into account. The most relevant noise source is the rotating band saw blade.

5.4.2.2 Noise emission measurement

5.4.2.2.1 Noise emission measurement for table band saws (except band saws designed for building site use) and band re-saws

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

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.

Emission sound power levels of table band saws and re-saws shall be measured in accordance with the enveloping surface measuring method given 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 8.3.3, Formula (12) of EN ISO 3746:2010;

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 nine in accordance with Annex J of ISO 7960:1995.

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

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

Emission sound pressure 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 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 A.2 of EN ISO 11204:2010 with reference restricted to EN ISO 3746:2010 instead of the method given in Annex A of EN ISO 11202:2010 or in accordance with EN ISO 3743-1:2010, EN ISO 3743-2:2009, EN ISO 3744:2010 or EN ISO 3745:2012 where one of these standards has been used as the measuring method.

For noise declaration, 6.3, list entry y) shall be met.

5.4.2.2.2 Noise emission measurement for table band saws designed to be used on building sites

Emission sound power levels of building site band saws shall be measured as follows:

a) basic noise emission standard EN ISO 3744:2010 shall be used;

b) operating conditions shall comply with J 2 b) in Annex J of ISO 7960:1995;

c) measurement surface, number of microphone positions and measuring distance shall comply with Annex J of ISO 7960:1995;

d) surface sound pressure level shall be determined at least three times. If at least two of the determined values do not differ by more than 1 dB, further measurements will not be necessary; otherwise the measurements shall be continued until two values differing by no more than 1 dB are obtained. The A-weighted surface sound pressure level to be used for calculating the sound power level is the arithmetic mean of the two highest values that do not differ by more than 1 dB.

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

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

2) 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 6.4.1 of EN ISO 11202:2010 accuracy grade 2 (engineering);

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

For noise declaration, 6.3, list entry z) shall be met.

5.4.3 Emission of chips and dust

The part of the saw blade situated below the table shall be enclosed by an exhaust hood, which shall have an extraction outlet – except for band saws designed for external use only, e.g. on building site.

Band saws for cross-cutting round or irregular shaped workpieces designed for outdoor use only do not need provision for extraction outlet connection.

For prevention of the access to dangerous area through any dust extraction outlet, see 5.3.7.1.

When the opening of the capture device can not face the projection, the flow of chips and dust shall be guided efficiently to the opening of the capture device.

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

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

The capture device shall be designed in order to 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 should be based on a conveying velocity of extracted air in the duct of 20 m s^{-1} for dry chips and 28 m s^{-1} for wet chips (moisture content 18 % or above).

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 following features shown in Table 7 are ensured.

Table 7 — Low dust emission design

Wheel Diameter [mm]	Minimum airflow [m³/h]
≤ 500	450
> 500	700

Verification:

— Checking of drawings;

— Visual inspection;

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

— Run the machine (without processing a workpiece) under the conditions for noise measurement in the relevant C-standard or ISO 7960. 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 e.g. 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

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

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

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, 6.3, list entry ee)).

The degree of protection of the enclosures for electrical components and of all electric components out of the enclosures shall be at least IP 54 in accordance with the requirements of EN 60529:1991.

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

a) Clause 7 for protection of equipment;

b) Clause 8 for equipotential bonding;

c) Clause 12 for conductors and cables;

d) Clause 13 for wiring practices;

e) Clause 14 for electrical motors and associated equipment.

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

The power supply cord of displaceable machines shall be at least of type H0 7 in accordance with the requirements of HD 22.4 S4:2004.

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

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

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

5.4.5 Ergonomics and handling

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

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

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

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

The height of the machine table or workpiece support above floor / access level shall be $\geq$ 850 mm and $\leq$ 1 100 mm.

The holders for the safety appliances required in 5.3.8 shall be positioned so that the operator can reach the safety appliances from the normal working position.

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 Table A.1 of EN 61310-1:2008.

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

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

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

5.4.6 Pneumatics

For machines fitted with pneumatic devices (e.g. workpiece clamping), the requirements of EN ISO 4414:2010 shall apply.

See also 5.2.1, 5.2.2, 5.4.12, 5.4.13, 6.2 and 6.3.

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

5.4.7 Hydraulics

For machines fitted with a hydraulic device, the requirements of EN ISO 4413:2010 shall apply.

See also 5.4.13 and 6.3.

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

5.4.8 Vibration

The requirements of 5.3.1 for balance of rotating masses apply.

Verification: By checking the relevant drawings.

5.4.9 Electromagnetic compatibility

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

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

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

5.4.10 Laser

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

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

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

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

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

5.4.11 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.

5.4.12 Errors of fitting

See 5.4.13, 6.2 and 6.3.

5.4.13 Supply disconnection (Isolation)

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

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

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

If the machine is fitted with a DC injection braking system, the electrical supply disconnecting device shall be:

a) equipped with a blocking device. It shall only be possible to switch off the electrical supply disconnecting device after manually overriding the blocking device; or

b) not situated on the same side of the machine as the stop controls.

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 in accordance with 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 in accordance with 5.2 of EN 1037:1995+A1:2008.

Where the machine is connected to an external hydraulic system, isolation of the hydraulic system shall be achieved by a disconnection device, e.g. valve with mechanical locking in the off position (see also EN ISO 4413:2010).

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

5.4.14 Maintenance

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

Where lubrication points are provided they shall be located outside of the band saw blade guarding and easily accessible by the operator when standing on the floor.

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

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

See also 6.3, list entry t).

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

6 Information for use

6.1 General

The principles of 6.4 of EN ISO 12100:2010 shall be observed.

Information on negative test result of braking system shall be displayed.

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

6.2 Marking

The principles of 6.4.4 of EN ISO 12100:2010 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 plates permanently fixed to the machine, e.g. by riveting or stickers:

a) 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, in accordance with 16.4 of EN 60204-1:2006);

f) on machines with a band wheel diameter ≥ 315 mm, where the strain is manually adjusted, the strain required for a given thickness and width of saw blade (see Figure 10);

g) on displaceable machines fitted with three-phase motors or driven by combustion engines, the direction of rotation of the band wheels;

h) on machines where speed changing is achieved by changing the position of the drive belts on the drive pulleys, with a diagram in rpm adjacent to the pulleys or on a door giving access to the belt drive mechanism showing the relevant speed in rpm selected for each combination of pulleys;

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

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

k) on band saws designed for building site use, the guaranteed sound power level determined in accordance with the methods given in 5.4.2.2.2, list entries a) to d) using the single number form of declaration in accordance with EN ISO 4871:2009;

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

m) machines with different band saw speeds shall have the selected speed indicated in rpm;

n) if applicable, marks on machine table for tracking.

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

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

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

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

The scale for indicating the cutting width shall be so designed and positioned that the adjusted cutting width is indicated and easily legible.

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

6.3 Instruction handbook

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

a) a repetition of the markings, pictograms and other instructions on the machine and, if necessary, information about their meaning as required in 6.1 and 6.2;

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

c) maximum and minimum dimensions of the band saw blades for which the machine is designed;

d) warnings regarding residual risks as:

   1) a warning to take precautions to reduce the hazard of inhalation of dusts (e.g. wearing a mask);

   2) a warning to wear ear protection to prevent hearing loss;

   3) a warning against the hazard of being cut when handling saw blades, feeding wood into the machine or doing maintenance. To wear suitable gloves (or other handling aids) whenever saw blades are handled;

   4) a warning to never clean the saw blade or band wheel of a band saw using a hand-held brush or scraper whilst the saw blade is in motion;

   5) a warning to use suitable carrier equipment for transporting tensioned wide saw blades;

   6) a warning not to try using the machine unless all the guards and other safety devices necessary for machining are in good working order;

   7) for machines fitted with electrical brakes, a warning that in case of loss of power supply, the braking function is not operating, and it is necessary to wait for the complete standstill of the machine before opening the guards.

8) a warning that in case of broken band or belt if fitted, the wheels may keep running, and it is necessary to wait for the complete standstill of the machine before opening the guards.

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

1) the principles of machine setting and operation, including the correct use and adjustment of workpiece holding and guiding devices and guards;

2) the safe handling of the workpiece when cutting;

3) limiting dimensions of the workpiece that can be cut, as applicable;

4) for machines designed to cross cut round or irregular shaped pieces, the maximum cutting capacity and the maximum length of the workpiece;

5) a warning not to try removing chips whilst the saw blade is running;

6) when the machine is not in use, for example at the end of a shift, release the saw blade strain and place a notice on the machine to indicate this and to remind the next user to adjust the strain before starting up;

7) Care to be taken to avoid damaging the saw blade. For example when not in use, how untensioned band saw blades should be coiled and secured and stored in a safe, dry place. Before use they should be checked for damaged teeth and cracks;

8) to position the thrust wheel on a table band saw just clear of the back of the saw blade when the saw blade is running free after being strained and tracked to avoid grooving of the thrust wheel which can lead to saw blade failure and to give support to the saw blade when cutting;

9) to adjust the adjustable saw blade guard as close to the workpiece as practicable;

10) to use a fence for straight cutting, to prevent the workpiece rocking or sliding;

11) to use, for shallow cut of flat workpiece, the low part of a fence to allow the adjustable guard to be lowered;

12) when hand feeding against the fence to use a push block for feeding close to the saw blade;

13) possibility to use a demountable power feed device only when a specific socket is provided, to which the power feed device must be connected;

14) on machines with a fixed table to provide a firm support for diagonal cutting by a means of jig when cutting diagonals and to use a push block at the end of the cut;

15) to use a safe method of cutting tenons;

16) when cutting small wedges on a table band saw to use a guide;

17) when cutting curved or irregular work on a table band saw to feed the workpiece forward evenly whilst holding it firmly on the table to ensure effective control during cutting and whilst keeping the hands in a safe position or alternatively to use a template;

For repeated work of curved and irregular shapes, a guide fixed in front of the sawblade can be used in conjunction with a template to improve safety as well as the speed of operation;

18) for disc cutting to use a jig;

19) when replacing the table insert, to take care that the insert upper surface is levelled to the table;

f) if the stationary machines do not pass the stability test, requirements for the need to fix the machine to the floor and how this is to be done;

g) for displaceable machines, information regarding how transportation shall be undertaken and how to make the machine stable during cutting;

h) information concerning the correct method of lifting the machine;

i) for band saws dedicated to building site use, instruction that the machine shall be installed only on stable and even surfaces and that plates shall be used for load balancing if need be;

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

k) instruction that only sharpened band saw blades shall be used;

l) instruction to use push blocks when cutting small workpieces and in circumstances where it is necessary to push the workpiece against the fence;

m) the maximum width and thickness of the workpiece that can be cut;

n) a warning that when cross-cutting round or irregular shaped workpiece it is necessary to secure the workpiece against rotation by using a suitable jig or holder and to use a saw blade suitable for cross cutting;

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

p) if fitted with a laser,

1) 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;

2) a repetition of the laser manufacturer instructions for setting and use of the laser (where appropriate);

q) information regarding the chips 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;

The pressure drop between the inlet of the capture device and the connection to the CADES should be maximum 1 500 Pa (for the nominal air flow rate). If the pressure drop exceeds 1 500 Pa the machine might not be compatible with conventional CADES.

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

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

s) instruction that the dust extraction equipment is to be switched on before commencing machining;

t) information on how to perform maintenance including the life of the mechanical brakes (if fitted) and its adjustment and performance data and that whenever possible maintenance shall be only done if the machine is isolated from all energy sources and involuntary restart is prevented;

u) information on how to perform safe cleaning and that whenever possible safe cleaning shall be only done if the machine is isolated from all energy sources and involuntary restart is prevented;

v) information concerning maintenance and repair of push block including its handle;

w) if fitted with a pneumatic system the method for the safe dissipation of residual energy (see 5.4.14);

x) 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 - 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) interlocked guards with guard locking – by proving an inability to open the guard whilst the machine is running and to start the machine with a guard in the open position;

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

   5) mode selection - by functional testing.

y) for table band saws and band re-saws designed for indoor use 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; 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:

   1) 4 dB when using EN ISO 3746:2010 and EN ISO 11202:2010;

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

   3) 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.

z) for band saws designed for building site use, a declaration of guaranteed sound power level determined in accordance with the methods given in 5.4.2.2.2, list entries a) to d) using the single number form of declaration in accordance with EN ISO 4871:2009;

for example, guaranteed sound power level: L_{WA} = xx dB.

Additionally a declaration concerning sound pressure level at the operator's position, 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 5.4.2.2.2, list entries a) to d). 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.

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.

aa) 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;

bb) 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;

cc) 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);

dd) description of fixed guards which have to be demounted by the user for maintenance and cleaning purposes (guards to be demounted only by the manufacturer or personal charged by the manufacturer are excluded);

ee) 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.

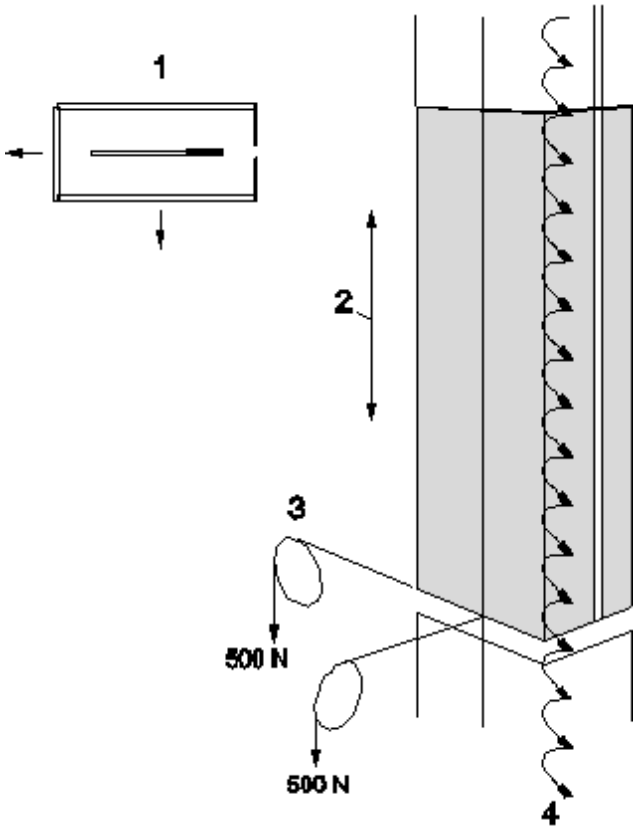
Verification: By checking the instruction handbook and relevant drawings.

Annex A
(normative)

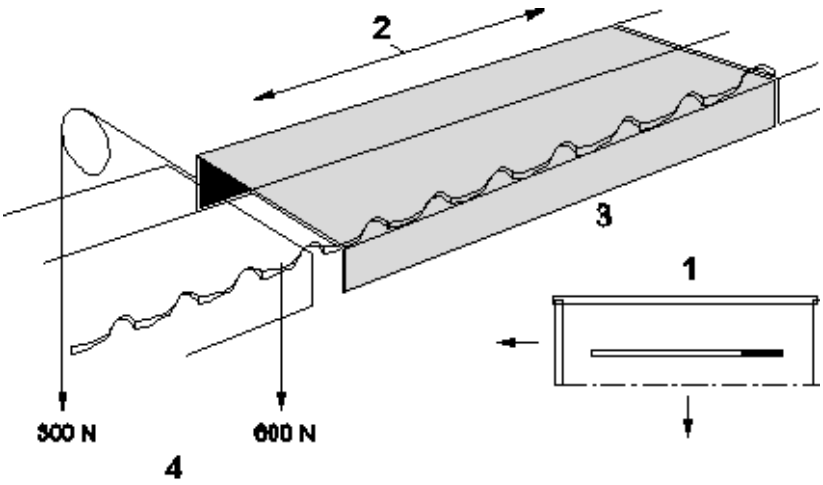
Test for adjustable guard over cutting area of saw blade

The test shall be performed onto the guard at its extreme position, i.e. guarding the whole cutting area (see Figure A.1, key 3).

The maximum deflection with the forces applied as indicated in Figure A.1, key 4 shall not allow the guard to touch the blade.



a) Vertical band saw



b) Horizontal band saw

Key

1 guard cross section
2 adjustment
3 guard position to perform the test
4 test forces values and application mode

Figure A.1 — Test for adjustable guard over cutting area of saw blade

Annex B
(normative)

Operating conditions for noise emission measurement

The operating conditions for the measurement of airborne noise emitted by table band saws and band re-saws shall be as defined in Annex J of ISO 7960:1995 with the following differences:

a) all integral auxiliary units, e.g. power feed, pneumatic clamping, shall be in operation during testing;

b) all relevant guards, safety devices, integral sound enclosures etc. shall be in position during testing;

c) extraction shall be 'on' during testing in the working condition, but the influence of the noise of the extraction plant shall be excluded or reduced as far as possible, e.g. by the use of baffles or taking into account, e.g. background noise correction;

d) where the machine is greater than 7 m in length or width or 3 m in height, instead of the sound power level the equivalent continuous sound pressure level at specified positions around the machine shall be declared, at a distance of 1 m from the surface of the machine, and at a height of 1,6 m from the floor, or access platform;

e) if any condition of the test is impossible to achieve the deviation shall be recorded in the report.

Annex C
(normative)

Stability test

The machine shall be set in its working position on a chipboard fixed on the floor. On displaceable machines the brakes for the wheels shall be activated (where fitted) or the wheels shall be retracted from the floor (if a device for retracting them is fitted) or the stabilisers put in use position.

A horizontal force *F* shall be applied to the table on the cutting line in the feed direction and subsequently against the feed direction.

In both cases the machine shall not move when *F* = F1, nor tilt / tip over when *F* = F2 and sliding is impeded.

— For machines with band wheels diameter bigger than 400 mm, F1 = 200 N, F2 = 500 N.

— For machines with band wheels diameter smaller than or equal to 400 mm, F1 = 120 N, F2 = 300 N.

Annex D
(normative)

Impact test method for guards

D.1 General

This Annex defines tests for guards used on table band saws and band re-saws in order to minimise risks of ejection of parts of saw blade or of workpieces out of the working zone.

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

D.2 Test method

D.2.1 Preliminary remarks

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

D.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 %.

D.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.

D.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.

D.2.5 Test procedure

The impact test shall be executed with projectile indicated in D.2.3 and an impact speed of 70 +/-5 m s^{-1}.

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

D.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.

D.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 D.3.

D.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;

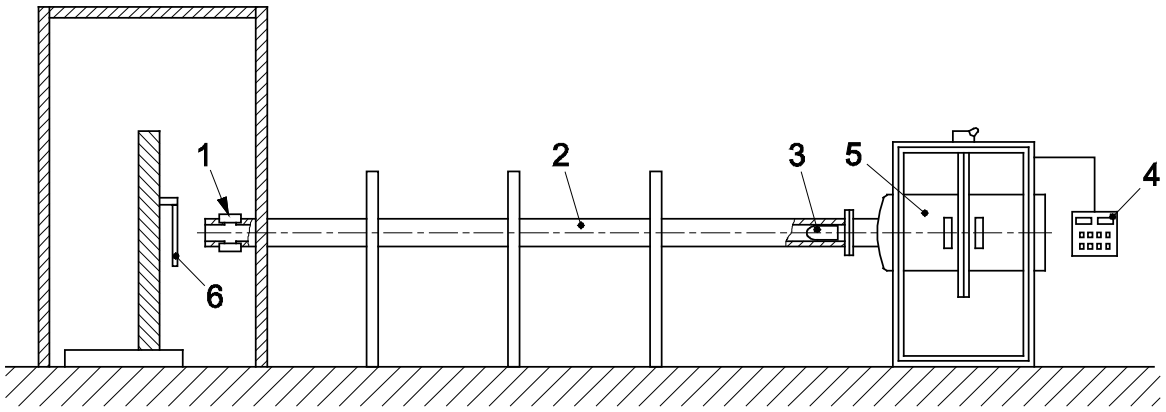
g) test result.

D.6 Test equipment for impact test

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

Annex E
(normative)

Braking tests

E.1 Conditions for all tests

a) The machine shall be set according to the manufacturer's instructions (e.g. belt tension);

b) when selecting the speed and the band saw blades, conditions shall be chosen which create the greatest kinetic energy for which the machine is designed;

c) before beginning the test the machine shall be running for at least 15 min under no load i.e. at idle speed;

d) verify that the actual driven band wheel speed is within ± 10% of the intended speed.

E.2 Tests

E.2.1 Unbraked run-down time

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

a) start the band wheel drive motor and allow it to reach the intended speed;

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

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

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

E.2.2 Run-up time

The run-up time shall be measured as follows:

a) start the band wheel drive motor and measure the run-up time;

b) cut power to the band wheel drive motor and allow the band wheel to come to a complete stop;

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

The result shall be the average of three measurements.

E.2.3 Braked run-down time

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

a) stop the driven band wheel: the braked run-down time starts at the actuation of the stop control and ends at the stopping of the driven band wheel;

b) re-start the driven band wheel after a maximum of $(P/7,5)^2$ min, or 60 min, whichever is the least, where P = motor power (rated input in kW) : the re-start interval shall not be less than 1 min;

c) run idle for a maximum of $(P/7,5)^2$ min, or 60 min, whichever is the least, where P = motor power (rated input in kW): the idle running time shall not be less than 1 min.

For machines with motor power $\leq$ 7,5 kW the following cycle shall be repeated ten times and the result shall be the average of the ten measurements.

For machines with motor power > 7,5 kW the following cycle shall be repeated three times and the result shall be the maximum of the three measurements.

Annex ZA
(informative)

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

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

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

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

Clause(s)/subclause(s) of this EN	Essential Requirements (ERs) of Directive 2006/42/EC
	1.1.2 Principles of safety integration
5.2.1, 5.2.2, 5.2.3, 5.2.4, 5.2.5, 5.2.6, 5.2.7, 5.2.8, 5.2.9, 5.3.6, 5.3.7, 5.3.8, 5.4.13, 6.3	a) fitted for its function
Clause 5 and 6	b) eliminate or reduce the risks, give measures, inform
Clause 5 and 6	c) intended use and reasonably foreseeable misuse
5.4.5, 6.3	d) constraints in use
5.3.1, 5.3.2, 5.3.3.2, 5.3.8, 5.4.10, 6.3	e) equipment
5.3.2, 5.3.3, 5.3.5, 5.3.6, 5.3.7, 5.4.3	1.1.3 Materials and products
6.3	1.1.4 Lighting
5.2.2, 5.2.7, 5.3.7, 5.4.5	1.1.5 Design of machinery to facilitate its handling
5.4.5	1.1.6 Ergonomics
6.3	1.1.7 Operating position
5.2.1, 5.2.6, 5.2.7, 5.2.8, 5.2.9, 5.2.11, 5.3.7, 5.4.9, 5.4.13	1.2.1 Safety and reliability of control systems
5.2.2, 5.2.3, 5.2.4, 5.2.5, 5.2.6, 5.2.7, 5.2.8, 5.2.9, 5.3.7, 6.3	1.2.2 Control devices

5.2.2, 5.2.3, 5.2.6, 5.2.7, 5.2.8, 5.2.9, 5.3.7	1.2.3 Starting
5.2.2, 5.2.4, 5.2.5, 5.2.8, 5.3.7	1.2.4 Stopping
5.2.4	1.2.4.1 Normal stop
5.2.5	1.2.4.3 Emergency stop
5.2.6, 5.2.7, 5.2.8, 5.3.7, 6.3	1.2.5 Selection of control or operating mode
5.2.10, 5.4.6, 5.4.7, 5.4.13	1.2.6 Failure of the power supply
5.3.1, 6.3, Annex C	1.3.1 Risk of loss of stability
5.3.2, 6.3	1.3.2 Risk of break-up during operation
5.3.2, 5.3.3, 5.3.5, Annexe D	1.3.3 Risks due to falling or ejected objects
5.1	1.3.4 Risk due to surfaces, edges or angles
5.2.7, 5.2.8	1.3.6 Risks relating to variations in the operating conditions
5.2.6, 5.2.7, 5.2.8, 5.2.9, 5.3.7	1.3.7 Risks related to moving parts
5.3.7	1.3.8 Choice of protection against risks related to moving parts
5.3.7.3	1.3.8.1 Moving transmission parts
5.3.6, 5.3.7	1.3.8.2 Moving parts involved in the process
5.3.5, 5.3.6, 5.3.7, 5.4.8	1.3.9 Risk of uncontrolled movements
5.2.1.2, 5.3.7	1.4.1 Required characteristics of guards and protective devices - General requirements
5.3.2, 5.3.7, Annex D	1.4.2.1 Fixed guards
5.3.7	1.4.2.2 Interlocking movable guards
5.3.7	1.4.2.3 Adjustable guards restricting access
5.2.1.4, 5.3.7	1.4.3 Special requirements for protective devices
5.2.10, 5.4.4, 5.4.13	1.5.1 Electricity supply
5.4.11	1.5.2 Static electricity
5.2.10, 5.4.6, 5.4.7	1.5.3 Energy supply other than electricity
5.4.12, 6.3	1.5.4 Errors of fitting

5.4.1	1.5.6 Fire
5.4.2	1.5.8 Noise
5.4.9	1.5.11 External radiation
5.4.10	1.5.12 Laser equipment
5.4.3	1.5.13 Emission of hazardous materials and substances
5.3.3, 5.3.7, 6.3	1.5.14 Risk of being trapped in a machine
5.4.14	1.6.1 Machinery maintenance
5.2.2, 5.3.7, 5.4.14	1.6.2 Access to operating position and servicing points
5.4.13	1.6.3 Isolation of energy sources
5.2.2, 5.2.6, 5.2.7, 5.2.8, 5.3.7, 5.4.5, 5.4.14, 6.3	1.6.4 Operator intervention
5.4.3, 6.3	1.6.5 Cleaning of internal parts
5.2.1, 5.3.3, 5.4.5, 6.3	1.7.1 Information and warnings on the machinery
6.1	1.7.2 Warning of residual risks
6.2	1.7.3 Marking of machinery
6.3	1.7.4 Instructions
	2.3 Machinery for working wood and analogous materials
5.3.6, 5.3.7	a) guiding
5.3.5	b) ejection
5.3.4	c) brake
5.3.7, 5.3.8	d) accidental tool contact

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

Bibliography

[1] EN 349:1993+A1:2008, *Safety of machinery — Minimum gaps to avoid crushing of parts of the human body*

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

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

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

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

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

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

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