
Woodworking machines — Safety —
Part 4:
Vertical panel circular sawing
machines

Machines à bois — Sécurité —

Partie 4: Scies circulaires à panneaux verticales



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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 39, *Machine tools*, Subcommittee SC 4, *Woodworking machines*.

This document is intended to be used in conjunction with ISO 19085-1, which gives requirements common to different machine types.

A list of all parts in the ISO 19085 series can be found on the ISO website.

Introduction

The ISO 19085 series of International Standards provides technical safety requirements for the design and construction of woodworking machinery. It concerns designers, manufacturers, suppliers and importers of the machines specified in the Scope. It also includes a list of informative items to be provided to the user by the manufacturer.

This document is a type-C standard as stated in ISO 12100.

The machinery concerned and the extent to which hazards, hazardous situations or hazardous events are covered are indicated in the Scope.

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

The full set of requirements for a particular type of woodworking machine are those given in the part of ISO 19085 applicable to that type, together with the relevant requirements from ISO 19085-1:2017, to the extent specified in the Scope of the applicable part of ISO 19085.

As far as possible, in parts of ISO 19085 other than ISO 19085-1:2017, safety requirements are referenced to the relevant sections of ISO 19085-1:2017, to avoid repetition and reduce their length. The other parts contain replacements and additions to the common requirements given in ISO 19085-1:2017.

Thus, [Clauses 5, 6, 7 and 8](#) with their subclauses and the annexes of this document can either

- confirm as a whole,
- confirm with additions,
- exclude in total, or
- replace with specific text

the corresponding subclauses or annexes of ISO 19085-1:2017.

This interrelation is indicated in the first paragraph of each subclause or annex right after the title by one of the following possible statements:

- “This subclause of ISO 19085-1:2017 applies.”;
- “This subclause of ISO 19085-1:2017 applies with the following additions.” or “This subclause of ISO 19085-1:2017 applies with the following additions, subdivided into further specific subclauses.”;
- “This subclause of ISO 19085-1:2017 does not apply.”;
- “This subclause of ISO 19085-1:2017 is replaced by the following text.” or “This subclause of ISO 19085-1:2017 is replaced by the following text, subdivided into further specific subclauses.”.

Specific subclauses and annexes in this document without correspondent in ISO 19085-1:2017 are indicated by the introductory sentence: “Subclause (or Annex) specific to this part of ISO 19085.”.

[Clauses 1, 2 and 4](#) replace the correspondent clauses of ISO 19085-1:2017, with no need for indication since they are specific to each part of the series.

NOTE Requirements for tools are given in EN 847-1:2013.

Woodworking machines — Safety —

Part 4: Vertical panel circular sawing machines

1 Scope

This document gives the safety requirements and measures for manually loaded and unloaded stationary vertical panel sawing machines, hereinafter referred to as “machines”.

NOTE 1 In manual loading, the operator puts the work-piece directly onto the work-piece support, with no intermediate loading device to receive and transfer the work-piece from the operator to the cutting position. In manual unloading, the operator removes the work-piece directly from the work-piece support, with no intermediate unloading device to transfer the work-piece from the cutting position to the operator.

It deals with all significant hazards, hazardous situations and events as listed in [Clause 4](#) relevant to machines, when operated, adjusted and maintained as intended and under the conditions foreseen by the manufacturer including reasonably foreseeable misuse. Also, transport, assembly, dismantling, disabling and scrapping phases are taken into account.

NOTE 2 For relevant but not significant hazards, e.g. sharp edges of the machine frame, see ISO 12100:2010.

It is also applicable to machines fitted with one or more of the following devices/additional working units, whose hazards have been dealt with:

- an integrated feed device;
- a device for scoring;
- an angle cutting device;
- a middle support device;
- programmable end stops for parallel vertical cuts;
- a device for grooving with a width of at most 20 mm in one pass by using a milling tool; and
- a panel pusher.

The machines are designed for cutting panels consisting of:

- a) solid wood;
- b) material with similar physical characteristics to wood (see ISO 19085-1:2017, 3.2);
- c) composite materials with core consisting, for example, of polyurethane or mineral material laminated with light alloy;
- d) polymer-matrix composite materials and reinforced thermoplastic/thermoset/elastomeric materials; and
- e) gypsum boards, gypsum bounded fibreboards.

This document does not apply to machines

- with pressure beam and saw unit mounted behind the work-piece support;

- where the guide rails on which the saw unit moves vertically are fixed on the machine frame and the horizontal cut can only be made by manually feeding the panel;
- designed to cut in vertical direction only;
- which are displaceable;
- automatically performing two or more cutting cycles in sequence;
- intended for use in potentially explosive atmosphere; and
- manufactured before the date of its publication.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

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

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

ISO 13849-1:2015, *Safety of machinery — Safety-related parts of control systems — Part 1: General principles for design*

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

ISO 19085-1:2017, *Woodworking machines — Safety — Part 1: Common requirements*

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

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 12100:2010, in ISO 13849-1:2015, in ISO 19085-1:2017 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <https://www.electropedia.org/>

3.1

vertical panel sawing machine

machine designed for cutting panels where the work-piece is supported in a near vertical plane during cutting and where the saw unit is mounted in front of the work-piece support

Note 1 to entry: For example, see [Figure 1](#). The cut takes place either in a single straight vertical line by moving the saw unit along the moving beam or in a single horizontal line by moving the moving beam along the work-piece support. The work-piece is manually loaded and unloaded.

3.2

vertical panel sawing machine with hand feed

machine where the saw unit incorporating the saw blade is manually guided along the moving beam for vertical cuts and together with the moving beam along the work-piece support for horizontal cuts

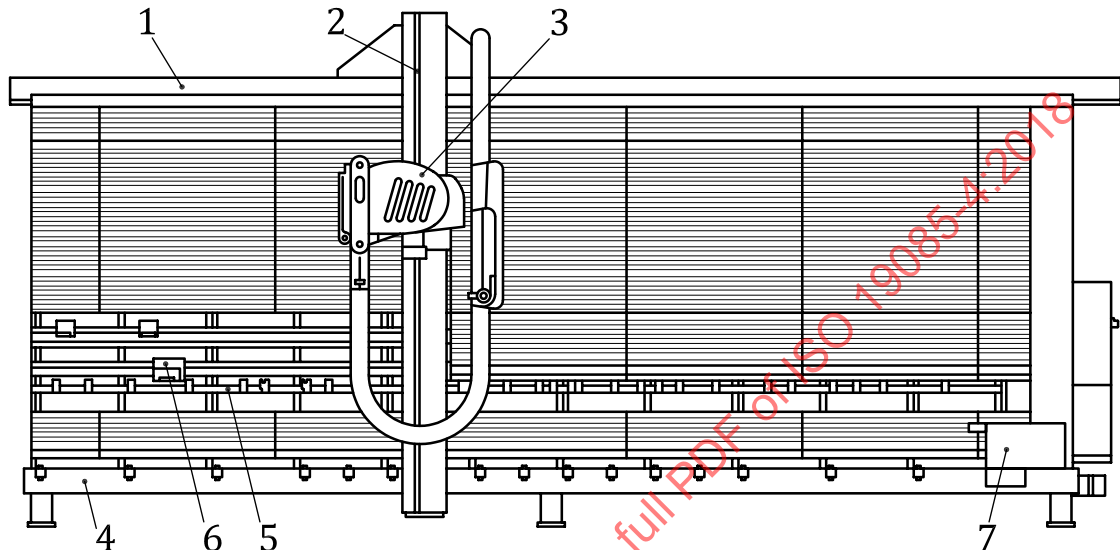
Note 1 to entry: The infeed and outfeed movements can be power driven.

3.3

vertical panel sawing machine with integrated feed

machine where the saw unit incorporating the saw blade has integrated feed for its vertical movement along the moving beam and for its horizontal movement by moving the moving beam along the work-piece support

Note 1 to entry: The infeed and outfeed movements are power driven.



Key

- | | | | |
|---|----------------------------|---|-----------------------------------|
| 1 | frame | 5 | middle support device |
| 2 | moving beam | 6 | programmable end stop |
| 3 | saw unit | 7 | panel pusher with clamping system |
| 4 | base of work-piece support | | |

Figure 1 — Example of a vertical panel sawing machine

3.4

saw unit

supporting unit of the tools, e.g. saw blades, milling tool, which performs the cutting stroke

3.5

main saw blade

circular saw blade used to cut the work-piece into smaller pieces

3.6

saw unit rest position

position from which the saw unit starts a cut with an infeed movement and to which it returns with an outfeed movement at the end of each cut, either power driven or manually

3.7

saw unit pivoting

pivoting

saw unit movement, either manually or power driven, between positions to perform horizontal and vertical cuts

3.8

cutting cycle

on machines with integrated feed, movements of the saw unit incorporating the tool during the machining operation

Note 1 to entry: The cutting cycle comprises:

- a) movement of the saw unit with the tool from its rest position to the cutting position;
- b) movement of the saw unit from its cutting position either along the moving beam (vertical cutting) or together with the moving beam through the cutting stroke (horizontal cutting); and
- c) returning of the saw unit to its rest position.

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

3.9

middle support device

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

3.10

angle cutting device

device fitted to the work-piece support of the machine to position the work-piece in angled orientation

Note 1 to entry: An example of angle cutting device is shown in [Figure 2](#).

3.11

programmable end stop

<vertical cuts> power-driven device fitted to the work-piece support of the machine designed for parallel vertical cuts at predetermined dimensions

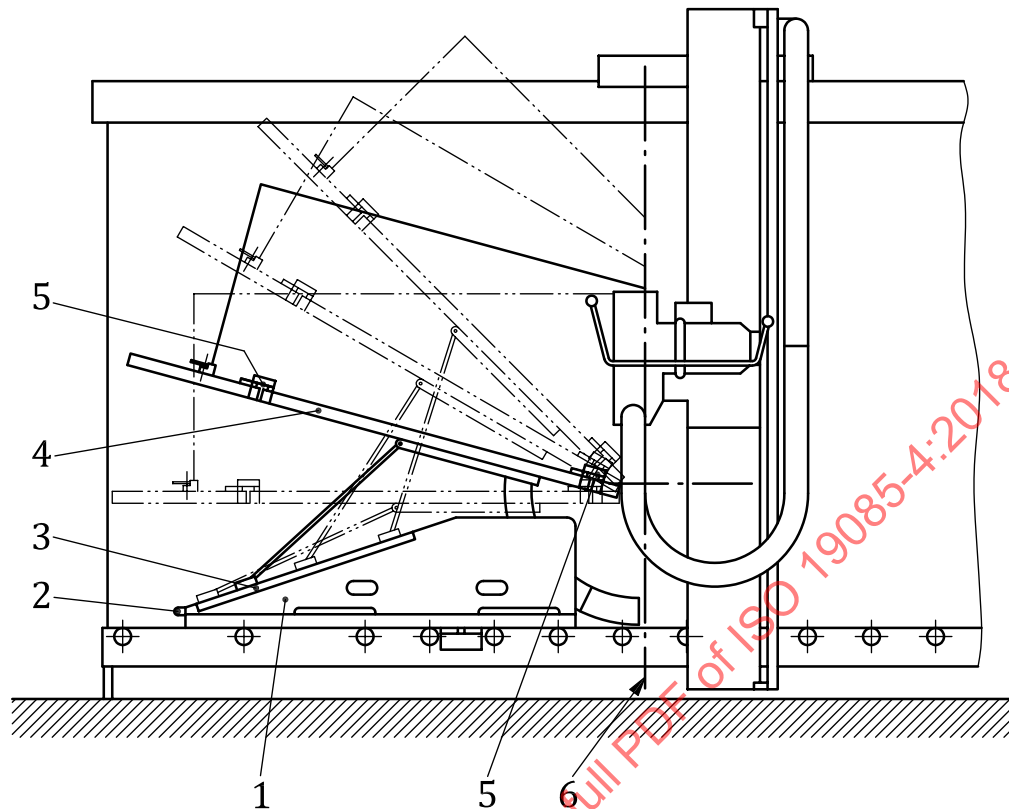
Note 1 to entry: Machines can be provided with one or more programmable end stops.

3.12

panel pusher

power driven movable work-piece guiding device used to move the work-piece along the work-piece support and fitted with clamping devices for holding the work-piece in position

Note 1 to entry: The positioning of the panel pusher can be under NC control.

**Key**

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

Figure 2 — Example of an angle cutting device**4 List of significant hazards**

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

These hazards are listed in [Table 1](#).

Table 1 — List of significant hazards

No.	Hazards, hazardous situations and events	ISO 12100:2010	Relevant clause of ISO 19085-4:2018
1	Mechanical hazards related to — Machine parts or work-pieces due to		
	a) shape	6.2.2.1, 6.2.2.2, 6.3	6.3 , 6.9.2 , 6.10 , 6.6 , 7.3 , 8.2 , 8.3 , Annex F
	b) relative location		5.2 , 6.6 , 8.2
	c) mass and stability (potential energy of elements which may move under the effect of gravity)		6.10
	d) mass and velocity (kinetic energy of elements in controlled or uncontrolled motion)		6.10
	e) mechanical strength		6.2 , 6.10 , 6.6 , Annexes B and C
	— Accumulation of energy inside the machinery by		
	a) elastic elements (springs)	6.2.10, 6.3.5.4	7.5
	b) gases under pressure		7.7 , 7.12 , 8.3
1.1	Crushing hazard		6.10 , 6.6 , 6.6.4
1.2	Shearing hazard		6.6 , 6.6.4
1.3	Cutting or severing hazard		6.6 , 8.1
1.4	Entanglement hazard		6.6 , 6.6.4
1.5	Drawing-in or trapping hazard		6.6 , 6.6.4
1.6	Impact hazard		6.10 , 6.7
2	Electrical hazards due to		
2.1	Contact of persons with live parts (direct contact)	6.2.9, 6.3.5.4	7.4 , 7.12
2.2	Contact of persons with parts which have become live under faulty conditions (indirect contact)	6.2.9	7.4 , 7.12
2.4	Electrostatic phenomena	6.2.9	7.11
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	7.2
4.2	Accidents due to interference with speech communication, acoustic signals	6.2.2.2, 6.3	7.2
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 b), 6.2.4	7.3 , 8.3
7.2	Fire	6.2.4	7.1
8	Hazards generated by neglecting ergonomic principles in machinery design		
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 , 7.5
8.2	Hand-arm or foot-leg anatomy	6.2.8	7.5
8.4	Local lighting	6.2.8	8.3
8.5	Mental overload and underload, stress	6.2.8	8.3
8.6	Human error, human behaviour (see 10.6)	6.2.8, 6.2.11.8, 6.2.11.10, 6.3.5.2, 6.4	7.14 , 8.3
8.7	Design, location or identification of manual controls	6.2.8, 6.2.11.8	5.2
8.8	Design or location of visual display units	6.2.8, 6.4.2	5.2

Table 1 (continued)

No.	Hazards, hazardous situations and events	ISO 12100:2010	Relevant clause of ISO 19085-4:2018
9	Combination of hazards	6.3.2.1	5.3 , 5.4.4 , 5.1 , 6.9.2 , 7.12 , 7.13
10	Unexpected start-up, unexpected overrun/overspeed (or any similar malfunction) from:		
10.1	Failure/disorder of the control system	6.2.11, 6.3.5.4	5.1 , 7.13 , 8.1
10.2	Restoration of energy supply after an interruption	6.2.11.4	5.9 , 7.7
10.3	External influences on electrical equipment	6.2.11.11	5.1 , 7.9
10.4	Other external influences (gravity)	6.2.12.1	6.3 , 6.9.2
10.5	Errors in the software	6.2.11.7	5.1
10.6	Errors made by the operator (due to mismatch of machinery with human characteristics and abilities)	6.2.8, 6.2.11.8, 6.2.11.10, 6.3.5.2, Clause 6	5.2 , 7.5 , 8.3
11	Impossibility of stopping the machine in the best possible conditions	6.2.11.1, 6.2.11.3, 6.3.5.2	5.4.1 , 5.4.4 , 7.12
12	Variations in the rotational speed of tools	6.2.2.2, 6.3.3	5.7
13	Failure of the power supply	6.2.11.1, 6.2.11.4	5.9
14	Failure of the control circuit	6.2.11, 6.3.5.4	5.1
15	Errors of fitting	6.2.7, 6.4.5	7.14
16	Break-up during operation	6.2.3	6.2
17	Falling or ejected objects or fluids	6.2.3, 6.2.10	6.9.2
18	Loss of stability/overturning of machinery	6.3.2.6	6.1

5 Safety requirements and measures for controls

5.1 Safety and reliability of control systems

This subclause of ISO 19085-1:2017 applies.

5.2 Control devices

This subclause of ISO 19085-1:2017 applies with the following additions.

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

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

If an emergency stop control device is required, it shall be positioned on the front side of the main control panel together with the start and normal stop control devices.

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

5.3 Start

This subclause of ISO 19085-1:2017 applies with the following additions.

PL requirements in ISO 19085-1:2017 apply only to unexpected start/restart of the tool spindles and of the saw unit infeed movement, and to the interlocking of pivoting movements of the saw unit with saw unit rest position.

Prevention of pivoting movements of the saw unit when it is not in the rest position may be achieved by mechanical means and need not to be arranged by the control system.

The SRP/CS for the following interlocks, related to powered movements, shall achieve $PL_r = b$:

- infeed movement of the saw unit with moving beam horizontal locking for vertical cuts;
- infeed movement of the saw unit with saw unit vertical clamping for horizontal cuts;
- movement of the programmable end stop with saw unit rest position;
- vertical cutting stroke movement with moving beam horizontal locking;
- horizontal cutting stroke movement with saw unit vertical clamping;
- movement of the panel pusher with saw unit rest position.

The SRP/CS for prevention of unexpected start/restart of the following powered movements, where applicable, shall achieve $PL_r = b$:

- integrated feed;
- pivoting;
- programmable end stop.

Powered infeed movement shall be controlled by hold-to-run. Release of the hold-to-run control device shall cause the immediate return movement of the saw unit to its rest position.

Once the saw unit has reached its position for the cutting stroke, i.e. the infeed movement is finished, the hold-to-run device may be released without interruption of the cutting cycle (see also [3.10](#), Note 1 to entry).

When fitted with a unit for scoring, the scoring saw blade spindle drive motor shall not be capable of being started before the main saw blade drive motor. The SRP/CS for interlocking between starting of the main saw blade drive motor and start of the scoring saw blade spindle drive motor shall achieve $PL_r = c$.

5.4 Safe stops

5.4.1 General

This subclause of ISO 19085-1:2017 applies with the following additions.

When cutting power to the saw spindles on machines with integrated feed, the saw unit feed movement shall be stopped and the saw unit shall be retracted to its rest position.

The SRP/CS for these interlocks shall achieve $PL_r = c$.

5.4.2 Normal stop

This subclause of ISO 19085-1:2017 applies.

5.4.3 Operational stop

This subclause of ISO 19085-1:2017 applies.

5.4.4 Emergency stop

This subclause of ISO 19085-1:2017 applies.

5.5 Braking function of tool spindles

This subclause of ISO 19085-1:2017 applies.

5.6 Mode selection

This subclause of ISO 19085-1:2017 does not apply.

5.7 Spindle speed changing**5.7.1 Spindle speed changing by changing belts on the pulleys**

This subclause of ISO 19085-1:2017 does not apply.

5.7.2 Spindle speed changing by incremental speed change motor

This subclause of ISO 19085-1:2017 applies.

5.7.3 Infinitely variable speed by frequency inverter

This subclause of ISO 19085-1:2017 applies with the following additions.

Requirements on speed monitoring stated in ISO 19085-1:2017 apply to the maximum rotational speed set by the manufacturer for each spindle.

For each spindle, the maximum rotational speed set by the manufacturer shall be indicated in a warning label close to the spindle [see [8.2.2](#) d) and also [8.3.2](#) a) 3)];

The speed monitoring is not required if the requirements in the third paragraph of [6.9.1](#) are fulfilled.

The selected speed shall be indicated.

The SRP/CS for indication of selected speed shall achieve $PL_R = b$.

5.8 Failure of any power supply

This subclause of ISO 19085-1:2017 applies.

5.9 Manual reset control

This subclause of ISO 19085-1:2017 applies.

5.10 Enabling control

This subclause of ISO 19085-1:2017 does not apply.

5.11 Machine moving parts speed monitoring

This subclause of ISO 19085-1:2017 applies with the following additions.

PL requirement stated in ISO 19085-1:2017 applies to the panel pusher. As an exception to ISO 19085-1:2017, the SRP/CS for speed monitoring of the saw unit and moving beam shall achieve $PL_R = b$.

5.12 Time delay

This subclause of ISO 19085-1:2017 applies.

6 Safety requirements and measures for protection against mechanical hazards

6.1 Stability

6.1.1 Stationary machines

This subclause of ISO 19085-1:2017 applies.

6.1.2 Displaceable machines

This subclause of ISO 19085-1:2017 does not apply.

6.2 Risk of break-up during operation

This subclause of ISO 19085-1:2017 applies with the following additions.

Parts of the machine that can be contacted by the rotating saw blade are the rear frame, the work-piece support and those parts of an angle cutting device that are close to the cutting line.

The material of the slot lining in the sliding surface (see [Figure 3](#)) of the pressure shoe or the sliding surface itself shall be plastic, e.g. polypropylene, polyamide, polyethylene or other plastics with similar characteristics or light alloy.

6.3 Tool holder and tool design

6.3.1 General

This subclause of ISO 19085-1:2017 applies with the following additions.

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

- a) if the machine is fitted with tools, they shall be in accordance with the requirements of EN 847-1:2013 and shall be suitable for hand fed machines according to EN 847-1:2013, 5.2.1;
- b) a device to adjust the depth of the groove and to maintain it during machining shall be provided (see [6.6.2](#)).

6.3.2 Spindle locking

This subclause of ISO 19085-1:2017 applies.

6.3.3 Circular saw blade fixing device

This subclause of ISO 19085-1:2017 applies.

6.3.4 Flange dimension for circular saw blades

This subclause of ISO 19085-1:2017 applies.

6.4 Braking

6.4.1 Braking of tool spindles

This subclause of ISO 19085-1:2017 applies.

6.4.2 Maximum run-down time

This subclause of ISO 19085-1:2017 applies.

6.4.3 Brake release

This subclause of ISO 19085-1:2017 applies.

6.5 Safeguards

6.5.1 Fixed guards

This subclause of ISO 19085-1:2017 applies.

6.5.2 Interlocking movable guards

6.5.2.1 General

This subclause of ISO 19085-1:2017 applies.

6.5.2.2 Moveable guards with interlocking without guard locking

This subclause of ISO 19085-1:2017 applies.

6.5.2.3 Moveable guards with interlocking and guard locking

This subclause of ISO 19085-1:2017 does not apply.

6.5.3 Hold-to-run control

This subclause of ISO 19085-1:2017 applies with the following additions.

As an exception, the SRP/CS for the hold-to-run control shall achieve at least $PL_R = b$. In this case, an emergency stop control device shall be positioned in the vicinity of the hold-to-run control device.

6.5.4 Two-hand control

This subclause of ISO 19085-1:2017 does not apply.

6.5.5 Electro-sensitive protective equipment (ESPE)

This subclause of ISO 19085-1:2017 applies with the following additions.

If light barriers or light curtains (AOPD) are used, the following requirements apply:

- a) if mounted horizontally:
 - 1) the elements shall be situated at a height equal to or less than 200 mm above the floor level;
 - 2) pitch between two elements shall be equal to or less than 180 mm;

- 3) the horizontal distance between the active part of the AOPD and the machine at the light barrier level shall not exceed 80 mm;
- b) if mounted vertically, light barriers shall have three beams positioned at a height of 300 mm, 700 mm and 1 100 mm above the floor level, and light curtains shall reach from 300 mm up to 1 100 mm above floor level;
- c) a manual reset control device shall be provided;
- d) any support (of AOPD physical elements) shall be designed and positioned to avoid crushing/shearing and to reduce tripping hazards.

6.5.6 Pressure-sensitive protective equipment (PSPE)

This subclause of ISO 19085-1:2017 applies with the following additions.

Among PSPE, only pressure-sensitive mats are permitted. If pressure-sensitive mats are used, the distance between the active part of the mats and the machine shall not exceed 80 mm.

A manual reset control device shall be provided.

6.6 Prevention of access to moving parts

6.6.1 General

This subclause of ISO 19085-1:2017 is replaced by the following specific text.

Access to moving parts (e.g. rotating tools, powered movements of the saw unit or the moving beam) from the rear side of the machine shall be prevented. Any gap in rear guarding system shall be in accordance with the safety distances specified in ISO 13857:2008, 4.2.4.1.

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

6.6.2 Guarding of tools

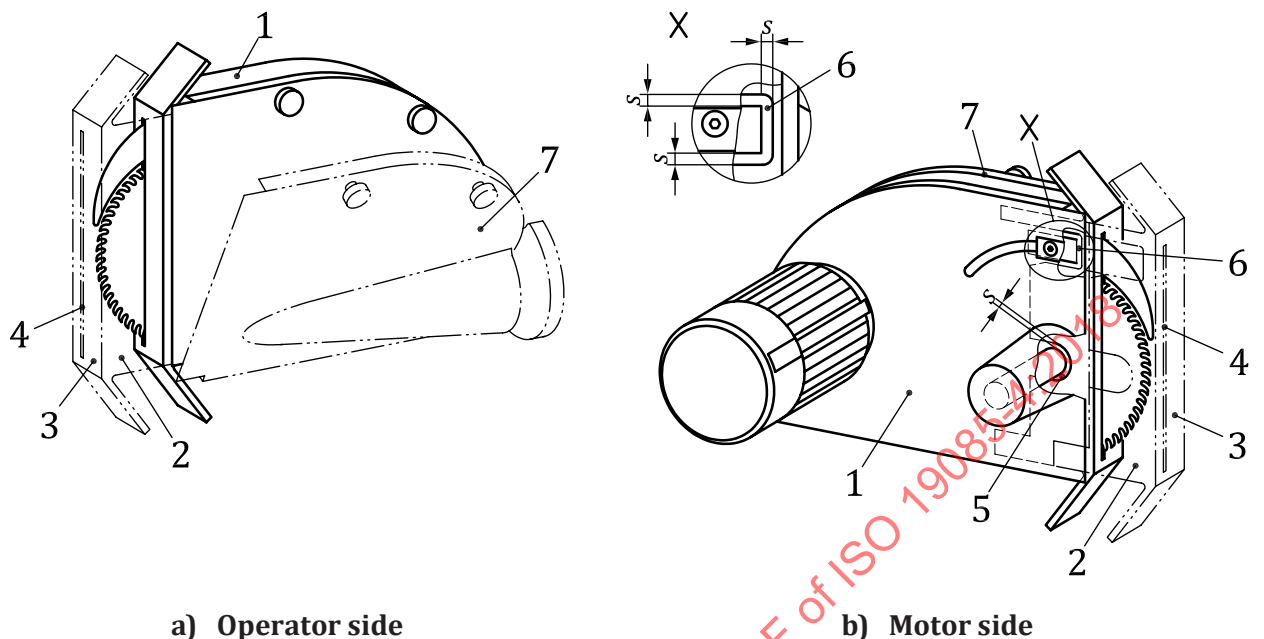
This subclause of ISO 19085-1:2017 is replaced by the following specific text.

Access to the saw blade in front of the work-piece support shall be prevented by means of a combination of a fixed guard and a self-closing adjustable guard, called “pressure shoe”, through which the saw blade projects during cutting and which encloses the saw blade when retracted from the work-piece (see [Figure 3](#)). When the saw unit is in the rest position, the pressure shoe shall be locked in position so as to prevent access to the saw blade.

To allow access to the tool for, e.g. tool change and cleaning, the guarding system shall incorporate a movable guard which is interlocked (without guard locking) with the tool spindle drive and on machines with integrated feed also with the drive of the saw unit and moving beam.

The dimension of the slot for the saw blade in the sliding surface of the pressure shoe through which the saw blade projects during the cutting operation shall be in accordance with the requirements for safety distances in ISO 13857:2008, 4.2.4.1.

The slots in the pressure shoe necessary for the tool spindles and the riving knife supporting guide shall have a clearance of 4 mm maximum (see [Figure 3](#), dimension s).

**Key**

- | | |
|---|---|
| 1 fixed guard preventing access to the saw blades | 5 slot for the tool spindle |
| 2 self-closing adjustable guard "pressure shoe" | 6 slot for the riving knife supporting guide |
| 3 sliding surface | 7 interlocking moveable guard preventing access to saw blades |
| 4 slot for the saw blade | |

Figure 3 — Example of saw blade guarding system preventing access to saw blade

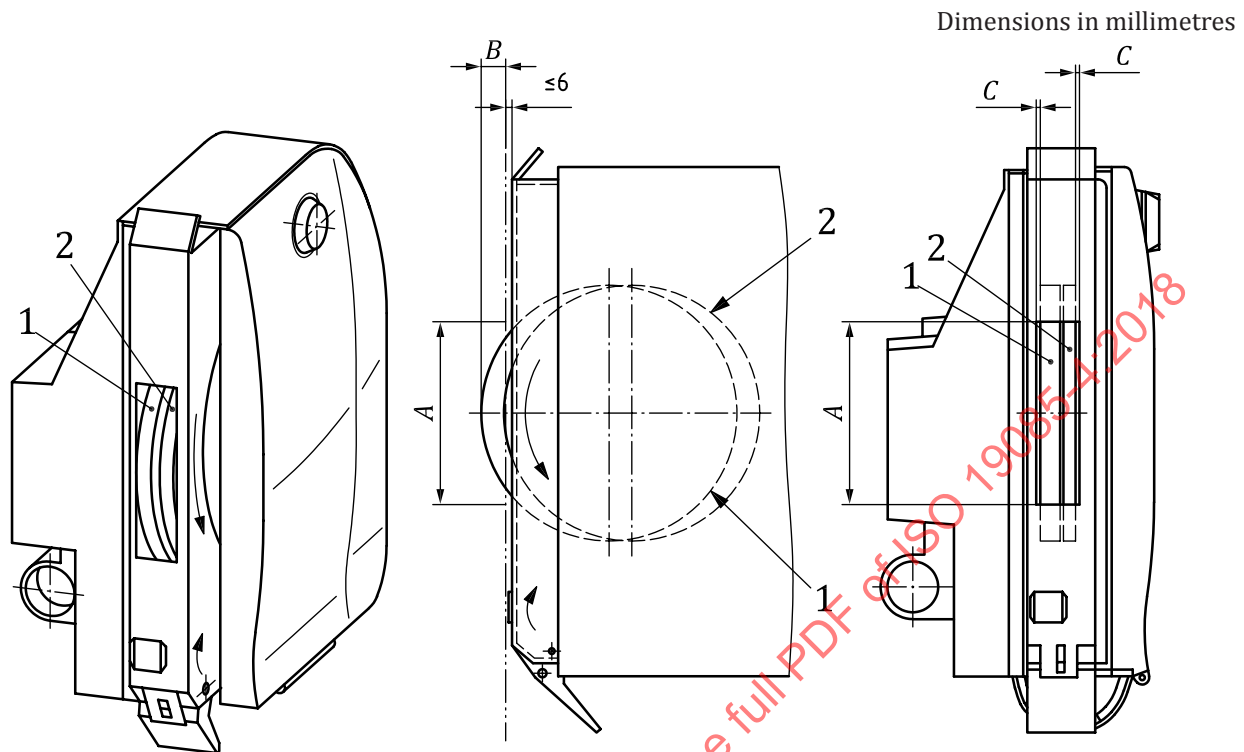
The pressure shoe shall rest on the work-piece during cutting at any time to prevent unintended access to the tool.

For machines with a device for grooving with milling tools, a pressure shoe for milling tools shall be provided, which shall fulfil the following additional requirements:

- a) when the saw unit is in the rest position, the pressure shoe shall be locked. In this position, the tool shall not protrude from the sliding surface of the pressure shoe. The minimum recess distance between the sliding surface and the tool of maximum diameter for which the machine is designed shall be 15 mm;
- b) the opening in the sliding surface of the pressure shoe shall be limited such that (see [Figure 4](#)):
 - 1) its length, A , does not exceed more than 4 mm the maximum length of the grooving tool with maximum diameter for which the machine is designed, which projects the sliding surface of the pressure shoe when grooving with maximum depth plus 6 mm;
 - 2) its width, C , does not exceed more than 4 mm the maximum width of the limitation disk together with the grooving tool with the maximum width for which the machine is designed;
 - 3) on machines with integrated feed, the opening shall be closed by a self-closing guard when the saw unit is in rest position.

The maximum grooving depth itself shall be limited by a grooving depth limitation device, e.g. limitation disk or ball ring guide.

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



Key

- | | | | |
|---|-----------------|---|--|
| 1 | grooving tool | A | length of the slot in the sliding surface for milling tools for grooving |
| 2 | limitation disk | B | maximum grooving depth |
| | | C | width of the slot in the sliding surface for milling tools for grooving |

Figure 4 — Example of grooving tool guarding system “pressure shoe” preventing access to milling tool for grooving

6.6.3 Guarding of drives

This subclause of ISO 19085-1:2017 applies.

6.6.4 Guarding of shearing and/or crushing zones

This subclause of ISO 19085-1:2017 is replaced by the following specific text.

Crushing/shearing hazards by power driven infeed or outfeed movements of the saw unit shall be avoided by means of design.

Crushing/shearing hazards by power driven pivoting movements of the saw unit not avoided by means of design shall be reduced by use of a hold-to-run control for these movements.

If the machine is fitted with one or more programmable end stops, crushing and shearing hazards between the stop and fixed parts of the machine, e.g. frame, shall be avoided either

- by hold-to-run control for any programmable stop movement; or
- by limiting the maximum force at the shearing or crushing point to 50 N maximum.

Crushing/shearing hazards caused by the panel pusher, if fitted, shall be prevented either by

- a horizontally mounted AOPD or safety mats, extending horizontally at least 850 mm from any crushing/shearing point;
- a vertically mounted AOPD, placed at a horizontal distance of at least 850 mm from any crushing/shearing point.

When AOPD or safety mats are triggered, the panel pusher shall be brought to a safe stop according to [5.4](#) and the closing movement of its clamping device shall not be possible.

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

6.7 Impact hazard

This subclause of ISO 19085-1:2017 applies with the following additions.

The requirement of 25 m·min⁻¹ limited speed applies to the saw unit, moving beam and panel pusher.

6.8 Clamping devices

This subclause of ISO 19085-1:2017 does not apply.

6.9 Measures against ejection

6.9.1 General

This subclause of ISO 19085-1:2017 applies with the following additions.

Anti-splinter devices are not relevant.

If the machine is not equipped with a tool speed monitoring system according to [5.7.3](#), the requirements in [6.9.2](#) apply also to the guards on the rear side of the machine. No gaps in such guards are allowed.

6.9.2 Guards materials and characteristics

6.9.2.1 Choice of class of guards

This subclause of ISO 19085-1:2017 applies with the following additions.

Guards used to prevent ejection shall be of class B.

6.9.2.2 Guards of class A

This subclause of ISO 19085-1:2017 does not apply.

6.9.2.3 Guards of class B

This subclause of ISO 19085-1:2017 applies.

6.9.3 Anti-kickback devices

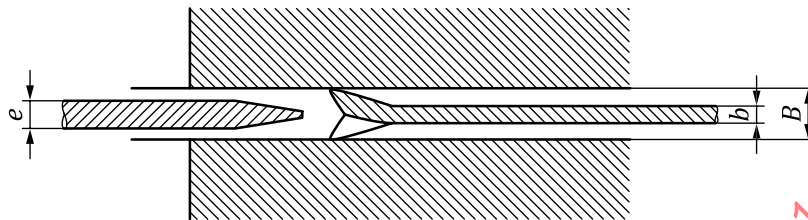
Subclause specific to this part of ISO 19085.

To prevent kickback, the machine shall be equipped with riving knives.

Each riving knife and its mounting arrangement shall be in accordance with the following requirements.

- a) The riving knife shall be capable of being retracted under manual control and held in the retracted position. When the saw blade returns to its rest position, the riving knife shall return to its normal operating position, e.g. by a spring or power driven.
- b) The riving knife shall be manufactured from steel with a minimum tensile strength of 580 N mm⁻², or of a comparable material, have flat sides (within 0,2 mm in 100 mm) and shall have a thickness less than the width of cut (kerf) and at least 0,2 mm greater than the saw blade plate (see [Figure 5](#)).

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

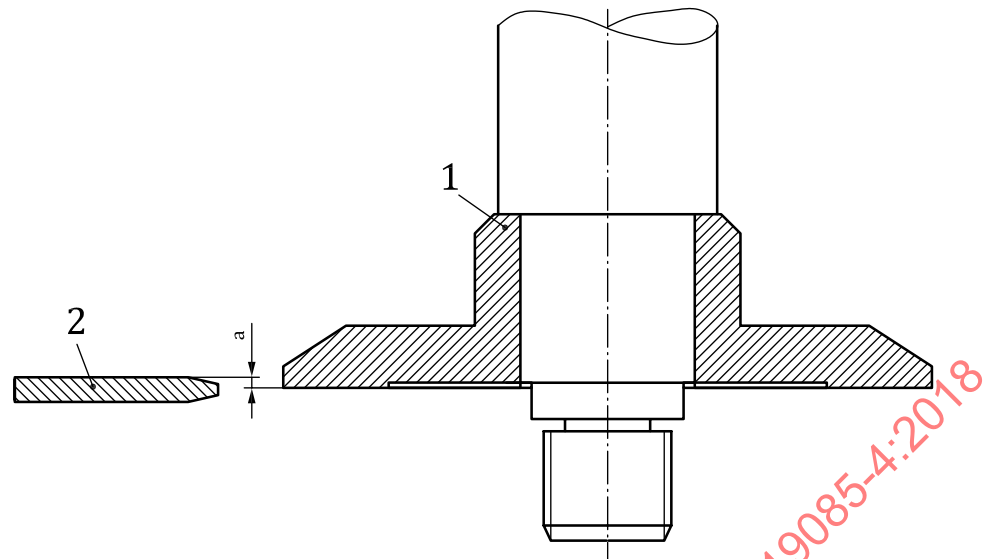


Key

- B* width of saw blade cut (kerf)
b saw blade plate thickness
e riving knife thickness

Figure 5 — Riving knife thickness in relation to saw blade dimensions

- c) The leading edge of the riving knife shall be chamfered to provide a lead in and the riving knife shall be of constant thickness (within $\pm 0,1$ mm) throughout its working length.
- d) The riving knife shall be designed to be mounted and adjusted so that the gap between the riving knife and the saw blade shall be at least 3 mm and shall not exceed 8 mm, measured radially through the centre of the saw spindle.
- e) The riving knife mounting arrangement shall provide a positive offset of the riving knife position to the rear saw flange of not more than 0,5 mm (see Key item 3 in [Figure 6](#)). The relative position of the riving knife and the rear saw blade flange shall be maintained during the infeed/outfeed movement of the saw blade.

**Key**

- 1 fixed saw flange
- 2 riving knife
- a Maximum 0,5 mm.

Figure 6 — Riving knife positioning relative to rear saw flange

- f) The riving knife and its mounting arrangement shall conform to the longitudinal and lateral stability test laid down in [Annex F](#).
- g) The riving knife shall be held in position by guiding elements, e.g. guiding pins. The riving knife fixing slot shall be no more than 0,5 mm wider than the guiding elements.

Verification: By checking the relevant drawings, inspection of the machine, measurement and carrying out the test in accordance with [Annex F](#).

6.10 Work-piece supports and guides

This subclause of ISO 19085-1:2017 is replaced by the following text, subdivided into further specific subclauses.

6.10.1 Work-piece support

To allow a stable position of the work-piece during operation, the following requirements shall be fulfilled:

- a) the work-piece support shall be tilted from the vertical by at least 5°;
- b) the support surfaces at the base and the middle support device shall have a perpendicular orientation in respect to the work-piece support.

At the base of the work-piece support, rollers shall be provided to allow easy work-piece adjustment. Arrangements shall be provided to prevent the panel from slipping off these rollers, e.g. by elements protruding radially from the rollers by at least 5 mm.

On machines with integrated feed, the gaps between rollers shall be filled in. Any remaining gap shall not be wider than 30 mm, except in those areas where it is necessary for the saw unit to pass below the level of these rollers.

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

6.10.2 Middle support device

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

- a) it shall be connected to the frame of the machine;
- b) it shall be mechanically locked in the working position and the return movement to the rest position shall only be possible after having released the locking device;
- c) provision shall be made that it cannot fall from its rest position inadvertently into the working position, e.g. by fitting a locking device or be so designed that it is held in the rest position by gravity.

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

6.10.3 Angle cutting device

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

- a) it shall be stable during operation;
- b) for cutting different angles, its work-piece support shall be adjustable between 0° and 45° to the horizontal cutting line of the saw unit;
- c) it shall be possible to lock the work-piece support in the adjusted angle position;
- d) the device shall be fitted with a scale for indicating the adjusted angle, which shall be so designed and positioned that the adjusted angle is indicated directly and easily legible, e.g. by using a magnifying glass.

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

7 Safety requirements and measures for protection against other hazards

7.1 Fire

This subclause of ISO 19085-1:2017 applies with the following additions.

Sparks as a result of contact between the tool and fixed machine parts shall be avoided in accordance with the requirements of [6.2](#).

7.2 Noise

7.2.1 Noise reduction at the design stage

This subclause of ISO 19085-1:2017 applies.

7.2.2 Noise emission measurement

This subclause of ISO 19085-1:2017 applies with the following additions.

The operating conditions for noise measurement shall comply with ISO 7960:1995, Annex P.

7.3 Emission of chips and dust

This subclause of ISO 19085-1:2017 applies with the following additions.

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

NOTE A low dust emission can be expected with a recommended air flow rate in the total extraction connection outlet of at least $1\,450\text{ m}^3\cdot\text{h}^{-1}$.

7.4 Electricity

7.4.1 General

This subclause of ISO 19085-1:2017 applies.

7.4.2 Displaceable machines

This subclause of ISO 19085-1:2017 does not apply.

7.5 Ergonomics and handling

This subclause of ISO 19085-1:2017 applies with the following additions.

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

The saw unit on vertical panel saws with hand feed shall be counterbalanced such that the maximum force required to move the saw unit up and down the moving beam shall be 50 N and the maximum force required to turn the saw unit from its vertical cutting mode to its horizontal cutting mode shall be 120 N measured at the relevant operating handles. The counterbalancing mechanism shall be designed such that a single failure in any of its working parts does not permit the saw unit to drop and that any such failure shall render the machine inoperable until the counterbalancing mechanism is repaired (see [Figure 7](#), for example).

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

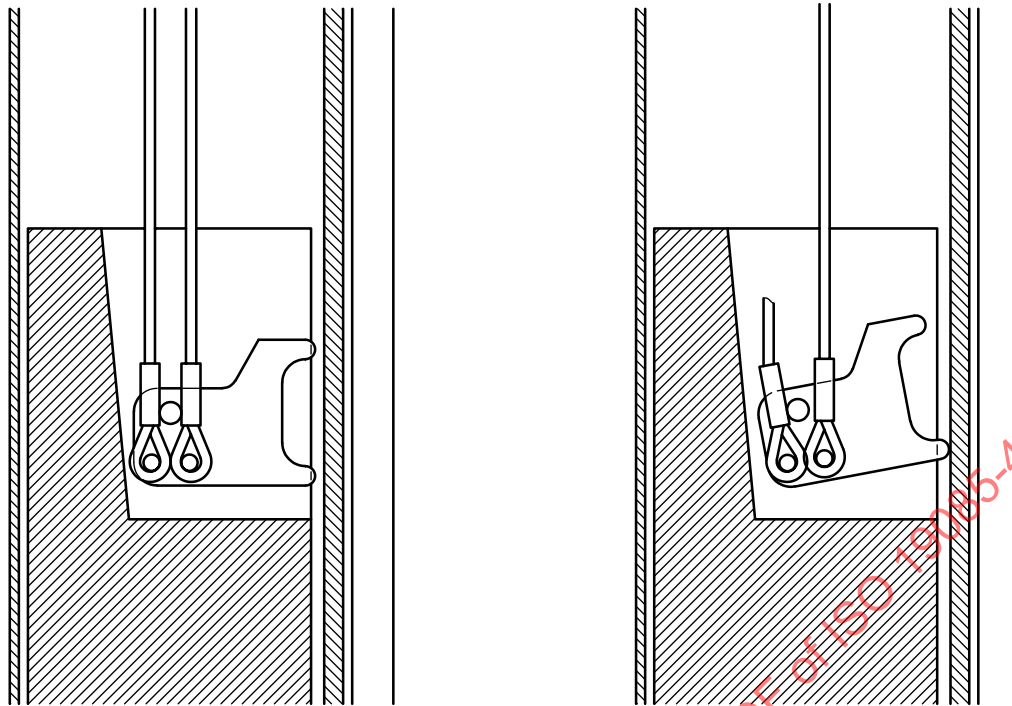


Figure 7 — Example of counterbalance mounting safe design

7.6 Lighting

This subclause of ISO 19085-1:2017 does not apply.

7.7 Pneumatics

This subclause of ISO 19085-1:2017 applies.

7.8 Hydraulics

This subclause of ISO 19085-1:2017 does not apply.

7.9 Electromagnetic compatibility

This subclause of ISO 19085-1:2017 applies.

7.10 Laser

This subclause of ISO 19085-1:2017 applies.

7.11 Static electricity

This subclause of ISO 19085-1:2017 applies.

7.12 Errors of fitting

This subclause of ISO 19085-1:2017 applies.

7.13 Isolation

This subclause of ISO 19085-1:2017 applies with the following additions.

Where pneumatic energy is used, a quick action coupling shall never be used.

7.14 Maintenance

This subclause of ISO 19085-1:2017 applies.

8 Information for use

8.1 Warning devices

This subclause of ISO 19085-1:2017 applies.

8.2 Marking

8.2.1 General

This subclause of ISO 19085-1:2017 applies.

8.2.2 Additional markings

This subclause of ISO 19085-1:2017 is replaced by the following specific text.

The following additional 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) the maximum and minimum diameters of the saw blades and milling tools for grooving for which the machine is designed;
- b) the bore diameters of the saw blades and of milling tools for grooving;
- c) pressure shoes shall be marked with tool maximum diameter for which they are designed. In addition, pressure shoes designed for use with milling tools shall be marked with the maximum grooving depth;
- d) for each spindle requiring speed monitoring according to 5.7.3, a warning label, positioned close to the spindle, stating the minimum $n_{\max}$ (maximum rotational speed) of the tools that are allowed to be mounted;
- e) the riving knife shall be marked with:
 - 1) its thickness;
 - 2) the range of saw blade diameters for which it is intended; and
 - 3) the width of the riving knife mounting slot;
- f) a pictogram to warn users not to put their hands close to the pressure shoe or behind the work-piece.

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

8.3 Instruction handbook

8.3.1 General

This subclause of ISO 19085-1:2017 applies.

8.3.2 Additional information

This subclause of ISO 19085-1:2017 is replaced by the following specific text.

The following additional information shall be provided in the instruction handbook:

- a) instructions for safe use shall include also:
 - 1) the use of the appropriate pressure shoe;
 - 2) that the riving knife shall be used and set so that the gap between the riving knife and the saw blade shall be at least 3 mm and shall not exceed 8 mm measured radially through the centre of the saw spindle;
 - 3) the exclusive use of tools rated for a speed equal to or higher than the maximum rotational speed of the spindle indicated by the corresponding warning label [see [8.2.2 d\)](#)];
- b) the range of saw blade diameters and thickness for which the machine is designed;
- c) if the machine is designed for using milling tools for grooving, the range of tool diameters for which the machine is designed and the recommendation that only milling tools manufactured and marked in accordance with the requirements of EN 847-1:2013, marked with MAN and with a maximum cutting width of 20 mm shall be used;
- d) guidance on the selection of the correct riving knife for particular saw blade dimensions;
- e) before changing any tool, the spindles shall be stopped and the standstill of all tools shall be awaited;
- f) warning regarding residual risk shall also include prohibition to put hands close to the pressure shoe to avoid hand injury.

Annex A (informative)

Performance level required

This annex replaces ISO 19085-1:2017, Annex A and gives a quick-view summary of the performance level required (PL_r) for each safety function (see [Table A.1](#)). However, for full requirements and detailed explanations, refer to [Clauses 5](#) and [6](#).

Table A.1 — Safety functions and Performance Level (PL) required

Area	Safety function/devices		PL _r	Subclause of ISO 19085-1:2017	Subclause of ISO 19085-4:2018
Start	1	Interlocking of start/restart with all safeguards	c	5.3	
	2	Prevention of unexpected start/restart of tool spindle, infeed movement of saw unit	c	5.3	
	3	Prevention of unexpected start/restart of integrated feed, pivoting, programmable end stop	b		5.3
	4	Interlocking of integrated feed with tools running	c	5.3	
	5	Interlocking of pivoting movements of the saw unit with saw unit rest position	c		5.3
	6	Interlocking of infeed movement of the saw unit with moving beam horizontal locking for vertical cuts	b		5.3
	7	Interlocking of infeed movement of the saw unit with saw unit vertical clamping for horizontal cuts	b		5.3
	8	Interlocking of movement of the programmable end stop with saw unit rest position	b		5.3
	9	Interlocking of vertical cutting stroke movement with moving beam horizontal locking	b		5.3
	10	Interlocking of horizontal cutting stroke movement with saw unit vertical clamping	b		5.3
	11	Interlocking of movement of the panel pusher with saw unit rest position	b		5.3
	12	Interlocking of start of main saw blade drive motor with start of scoring saw blade drive motor	c		5.3
Stop	13	Normal stop (braking function excluded)	c	5.4.2	
	14	Monitoring of the stand-still condition	c	5.4.3	
	15	Emergency stop (braking function excluded)	c	5.4.4	
	16	Interlocking of saw unit feed movement stop and retraction to rest position with power cut to saw spindle on machines with integrated feed	c		5.4.1
Braking	17	Braking function	b/c	5.5	
	18	Interlocking of brake release	c	6.4.3	
Spindle speed	19	Incremental speed changing	c	5.7.2	
	20	Infinitely variable speed monitoring	c	5.7.3	5.7.3
	21	Speed indication	b		5.7.3

Table A.1 (continued)

Area	Safety function/devices		PL _r	Subclause of ISO 19085-1:2017	Subclause of ISO 19085-4:2018
Controls	22	Manual reset	c	5.9	
	23	Speed monitoring of panel pusher	c	5.11	
	24	Speed monitoring of saw unit and moving beam	b		5.11
	25	Time delay	c	5.12	
Safeguards	26	Hold-to-run	c	6.5.3	
	27	Hold-to-run in combination with emergency stop device	b		6.5.3
	28	Interlocking with ESPE	c	6.5.5	
	29	Interlocking with PSPE	c	6.5.6	
	30	Interlocking of movable guards	c	6.5.2.2	