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Second edition
2024-07

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

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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 document 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).

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For an explanation of 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 www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 39, *Machine tools*, Subcommittee SC 4, *Woodworking machines,* in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 142, *Woodworking machines — Safety,* in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This second edition cancels and replaces the first edition (ISO 19085-4:2018), which has been technically revised.

The main changes are as follows:

— the Scope now specifies that machines are intended for continuous production use;

— the main definitions have been improved (machine and cutting cycle) with the addition of defined intermediate terms;

— the list of significant hazards has been moved to a new Annex A;

— the structure has been simplified and modified, in particular in 5.6;

— the panel lowering device and relevant requirements have been added;

— subclause 6.2 has been updated and a new full noise test code has been added in Annex F.

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

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

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Introduction

The ISO 19085 series provides technical safety requirements for the design and construction of woodworking machinery, as well as for the content of the relevant instruction handbook. It concerns designers, manufacturers, suppliers and importers of the machines specified in the Scope.

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

This document is of relevance, in particular, for the following stakeholder groups representing the market players with regard to machinery safety:

— machine manufacturers (small, medium and large enterprises);

— health and safety bodies (e.g. regulators, accident prevention organisations, market surveillance).

Others can be affected by the level of machinery safety achieved with the means of the document by the above-mentioned stakeholder groups:

— machine users/employers (small, medium and large enterprises);

— machine users/employees (e.g. trade unions, organizations for people with special needs);

— service providers, for example, for maintenance (small, medium and large enterprises);

— consumers (in case of machinery intended for use by consumers).

The above-mentioned stakeholder groups have been given the possibility to participate in the drafting process of this document.

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

When requirements of this type-C standard are different from those which are stated in type-A or type-B standards (as defined in ISO 12100), 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 the ISO 19085 series applicable to that type, together with the relevant requirements from ISO 19085-1, to the extent specified in the Scope of the applicable part of the ISO 19085 series.

As far as possible, the safety requirements of parts of the ISO 19085 series refer to the relevant subclauses of ISO 19085-1. Each part includes replacements and additions to the common requirements given in ISO 19085-1.

All parts of the ISO 19085 series have the same structure, so that reference to ISO 19085-1 is made always and only from and to the same subclause number at the last indent level.

Clauses 1 to 3 are specific to each part and, therefore are distinct from ISO 19085-1:2021, Clauses 1 to 3.

For Clauses 4 to 7 and the annexes, each subclause in ISO 19085-1:2021 is cited as either:

— confirmed as a whole;

— confirmed with additions;

— excluded entirely; or

— replaced with specific text.

This is indicated by one of the following possible statements:

— “ISO 19085-1:2021, [subclause/Annex], applies”;

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— “ISO 19085-1:2021, [subclause/Annex], applies with the following additions.” or “ISO 19085-1:2021, [subclause/Annex], applies with the following additions, subdivided into further specific subclauses.”;

— “ISO 19085-1:2021, [subclause/Annex], does not apply.”;

— “ISO 19085-1:2021, [subclause/Annex], is replaced by the following text.” or “ISO 19085-1:2021, [subclause/Annex], is replaced by the following text, subdivided into further specific subclauses.”.

Other subclauses and annexes specific to this document are indicated by the introductory sentence: “Subclause/Annex specific to this document.”.

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Woodworking machines — Safety —

Part 4: Vertical panel circular sawing machines

1 Scope

This document specifies the safety requirements and measures for manually loaded and unloaded vertical panel circular sawing machines (defined in 3.1) capable of continuous production use, with hand feed or integrated feed, hereinafter referred to also as "machines".

This document deals with all significant hazards, hazardous situations and events, as listed in Annex A, relevant to the machines, when operated, adjusted and maintained as intended and under the conditions foreseen by the manufacturer, including reasonably foreseeable misuse. Transport, assembly, dismantling, disabling and scrapping phases are also taken into account.

This document 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 milling tool with a cutting width not exceeding 27 mm;

— a panel pusher;

— a panel lowering device;

— stop devices for workpiece during horizontal cuts.

The machines are designed for cutting panels consisting of:

a) solid wood;

b) material with similar physical characteristics to wood (see ISO 19085-1:2021, 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;

e) gypsum boards, gypsum bounded fibreboards;

f) honeycomb aluminium boards;

g) matrix engineered mineral boards, silicate boards;

h) aluminium light alloy plates;

i) composite boards made from the materials listed above.

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This document does not apply to machines

— with pressure beam and saw unit mounted behind the workpiece 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,

— automatically performing two or more cutting cycles in sequence,

— intended for use in potentially explosive atmosphere, and

— manufactured prior to the publication of this document.

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

ISO 13849-1:2023, *Safety of machinery — Safety-related parts of control systems — Part 1: General principles for design*

ISO 13857:2019, *Safety of machinery — Safety distances to prevent hazard zones being reached by upper and lower limbs*

ISO 19085-1:2021, *Woodworking machines — Safety — Part 1: Common requirements*

EN 847-1:2017, *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, ISO 13849-1:2023, ISO 19085-1:2021 and the following apply.

ISO and IEC maintain terminology 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 circular sawing machine
machine, designed for cutting panels, with a nearly vertical workpiece support, a beam mounted parallel to it and moving horizontally along it, carrying a *saw unit* (3.2) mounted in front of the workpiece support

Note 1 to entry: An example of a vertical panel circular sawing machine is shown in Figure 1. The machine can have a hand feed or an integrated feed (see ISO 19085-1:2021, 3.11 and 3.12).

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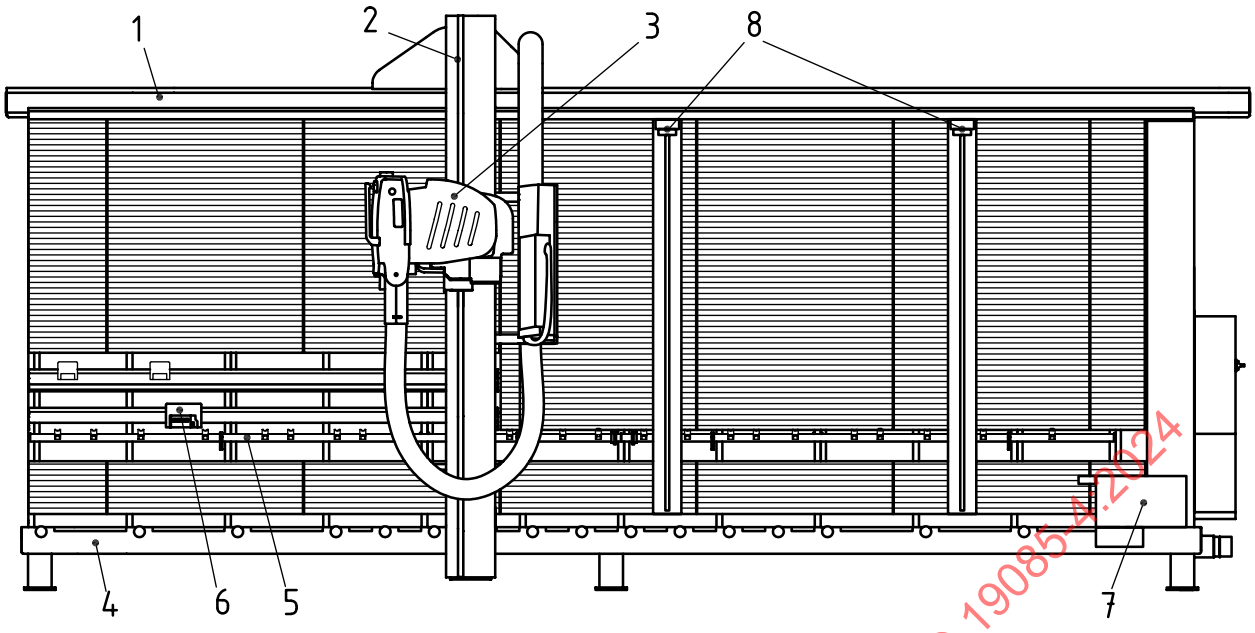

Key

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 workpiece support	8	panel lowering device with clamping system

Figure 1 — Example of a vertical panel circular sawing machine

3.2
saw unit
unit, incorporating and supporting the tools, mounted onto the moving beam

Note 1 to entry: The tools in the saw unit can be saw blades or a milling tool.

Note 2 to entry: The saw unit has two movements in regard to the moving beam: along its whole length for vertical cuts, and perpendicular to it for *infeed* (3.8) and *outfeed* (3.9) movements.

3.3
main saw blade
circular saw blade used to cut the workpiece into smaller pieces

3.4
scoring saw blade
circular saw blade used to pre-cut the workpiece surface, to avoid its damage by the *main saw blade* (3.3)

3.5
rest position
<saw unit> position of the *saw unit* (3.2) most far away from the workpiece support

3.6
pivoting
saw unit rotation, either manual or power driven, between the two perpendicular orientations to perform horizontal or vertical cuts

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3.7
cutting stroke
vertical or horizontal feed from the beginning to the end of a cut

Note 1 to entry: to perform a cutting stroke, either the *saw unit* (3.2) moves along the moving beam, or the moving beam, with the saw unit fixed to it, moves along the workpiece support.

3.8
infeed movement
short movement of the *saw unit* (3.2) perpendicular to the moving beam from the *rest position* (3.5) towards the workpiece support before a *cutting stroke* (3.7)

Note 1 to entry: The infeed movement is power driven on machines with integrated feed and can be power driven or not on machines with manual feed.

3.9
outfeed movement
short movement of the *saw unit* (3.2) perpendicular to the moving beam back to the *rest position* (3.5) after a *cutting stroke* (3.7)

Note 1 to entry: The outfeed movement is power driven on machines with integrated feed and can be power driven or not on machines with manual feed.

3.10
cutting cycle
<machines with integrated feed> single cut operation consisting of a continuous sequence of *infeed movement* (3.8), *cutting stroke* (3.7) and *outfeed movement* (3.9)

Note 1 to entry: A further movement of the saw unit back to its starting position can follow.

3.11
middle support device
device fitted to the workpiece support for supporting a workpiece with small dimensions

3.12
angle cutting device
device fitted to the workpiece support of the machine to position the workpiece in angled orientation

Note 1 to entry: An example of an angle cutting device is shown in Figure 2.

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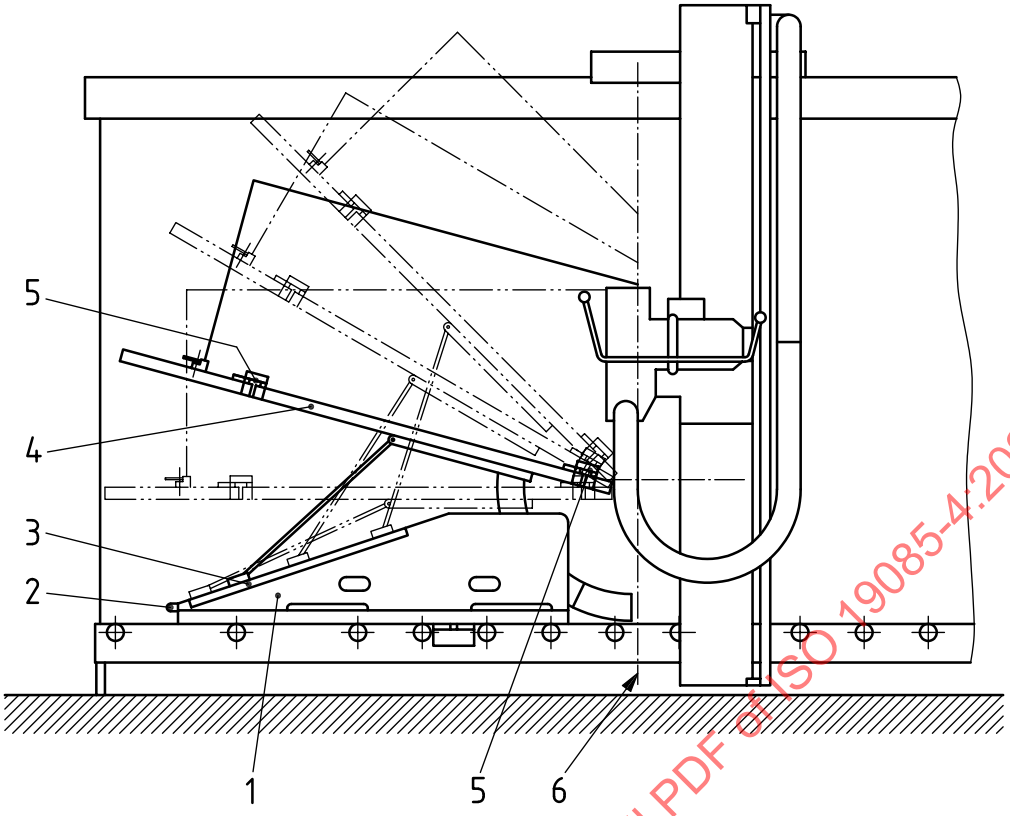

Key

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

Figure 2 — Example of an angle cutting device

3.13
programmable end stop
power-driven device fitted to the workpiece 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.

3.14
panel pusher
power driven movable workpiece handling device used to move the workpiece horizontally along the workpiece support and fitted with clamping devices for holding the workpiece in position

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

3.15
panel lowering device
power driven movable workpiece handling device used to move the workpiece vertically along the workpiece support and fitted with at least two clamping devices for holding the workpiece in position

Note 1 to entry: The positioning of the panel lowering device can be under numerical control.

Note 2 to entry: The panel lowering device allows cutting the panel at the bottom or trimming its lower edge.

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4 Safety requirements and measures for controls

4.1 Safety and reliability of control systems

ISO 19085-1:2021, 4.1, applies with the following additions.

Table B.1 summarizes the performance levels required (PL_r) in Clauses 4 and 5 for each safety function.

4.2 Control devices

ISO 19085-1:2021, 4.2, 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, panel lowering device, 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.

4.3 Start

4.3.1 Direct start

ISO 19085-1:2021, 4.3.1, applies with the following additions.

PL requirements stated in ISO 19085-1, 4.3.1, apply only to:

— the prevention of unexpected start of the tool drives;

— the prevention of unexpected start of the saw unit infeed movement;

— the interlocking of pivoting movements, powered or not, of the saw unit with saw unit rest position;

— the interlocking of start of tool drive with safeguards;

— the interlocking of the cutting stroke with tool drive.

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

The safety related part of control system (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;

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— movement of the panel lowering device with saw unit rest position;

— programmed powered vertical movements of the saw unit before cutting cycle with saw unit rest position.

The SRP/CS for prevention of unexpected start of the following powered movements, if fitted, shall achieve PL_r = b:

— integrated feed;

— pivoting;

— vertical programmed powered movements of the saw unit before cutting cycle;

— programmable end stop.

Powered infeed movement shall be controlled by hold-to-run. Release of the hold-to-run control device during infeed movement shall cause the immediate return of the saw unit to its rest position. Hold-to-run control is not required for cutting stroke. A time delay may be used to detect the end of the infeed movement.

If fitted, 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.

4.3.2 Start via control power-on

ISO 19085-1:2021, 4.3.2, does not apply.

4.4 Safe stops

4.4.1 General

ISO 19085-1:2021, 4.4.1, applies with the following additions.

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

The SRP/CS for stopping the cutting stroke and retracting the saw unit to its rest position when cutting power to the saw spindles shall achieve PL_r = c.

4.4.2 Normal stop

ISO 19085-1:2021, 4.4.2, applies.

4.4.3 Operational stop

ISO 19085-1:2021, 4.4.3, does not apply.

4.4.4 Emergency stop

ISO 19085-1:2021, 4.4.4, applies.

4.5 Braking function of tools

ISO 19085-1:2021, 4.5, applies.

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4.6 Mode selection

ISO 19085-1:2021, 4.6, does not apply.

4.7 Tool speed changing

4.7.1 Speed changing by shifting the belts on the pulleys

ISO 19085-1:2021, 4.7.1, does not apply.

4.7.2 Speed changing by incremental speed change motor

ISO 19085-1:2021, 4.7.2, applies.

4.7.3 Infinitely variable speed by frequency inverter

ISO 19085-1:2021, 4.7.3, applies with the following additions.

Requirements on speed monitoring stated in ISO 19085-1:2021, 4.7.3 apply to the maximum rotational speed set by the manufacturer for the saw blade.

For each spindle, the maximum rotational speed set by the manufacturer shall be indicated in a warning label close to the spindle [see 7.2.2 d) and 7.3.2 a) 3)]. The monitoring speed is not required if the requirements in the second paragraph of 5.9.1 are fulfilled. The selected speed shall be indicated.

The SRP/CS for indicating the selected speed shall achieve PL_r = b.

4.8 Failure of any power supply

ISO 19085-1:2021, 4.8, applies.

4.9 Manual reset control

ISO 19085-1:2021, 4.9, applies.

4.10 Standstill detection and monitoring

ISO 19085-1:2021, 4.10, does not apply.

4.11 Machine moving parts speed monitoring

ISO 19085-1:2021, 4.11 applies with the following additions.

The PL requirement stated in ISO 19085-1:2021, 4.11 applies to the speed monitoring of the saw unit, of the moving beam and of the panel lowering device.

The SRP/CS for speed monitoring of the panel pusher shall achieve PL_r = c. As an exception, it may achieve PL_r = b if additional measures against impact like mechanical stops are provided to prevent the workpiece from being moved beyond the workpiece support.

4.12 Time delay

ISO 19085-1:2021, 4.12, applies.

4.13 Teleservice

ISO 19085-1:2021, 4.13, applies.

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5 Safety requirements and measures for protection against mechanical hazards

5.1 Stability

ISO 19085-1:2021, 5.1, applies with the following additions.

The requirements on an integrated device for moving the machine and ISO 19085-1:2021, Annex C, do not apply.

5.2 Risk of break-up during operation

ISO 19085-1:2021, 5.2, applies with the following additions.

The parts of the machine that can be contacted by the rotating saw blade are the rear frame, the workpiece 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.

5.3 Tool holder and tool design

5.3.1 General

ISO 19085-1:2021, 5.3.1, 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 847-1:2017 and shall be suitable for hand fed machines in accordance with EN 847-1:2017, 5.2.1;

b) a device shall be provided to adjust the depth of the groove and to maintain it during machining (see 5.6.2).

5.3.2 Spindle locking

ISO 19085-1:2021, 5.3.2, applies.

5.3.3 Circular saw blade fixing device

ISO 19085-1:2021, 5.3.3, applies.

5.3.4 Flange dimension for circular saw blades

ISO 19085-1:2021, 5.3.4, applies.

5.4 Braking

5.4.1 Braking of tools

ISO 19085-1:2021, 5.4.1, applies.

The braking function shall be tested in accordance with Annex D.

5.4.2 Maximum run-down time

ISO 19085-1:2021, 5.4.2, applies.

5.4.3 Brake release

ISO 19085-1:2021, 5.4.3, applies.

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5.5 Safeguards

5.5.1 Fixed guards

ISO 19085-1:2021, 5.5.1, applies.

5.5.2 Interlocking movable guards

5.5.2.1 General

ISO 19085-1:2021, 5.5.2.1, applies with the following additions.

Additional measures according to ISO 14119:2013, 7.2 are not required.

NOTE The motivation to defeat the interlocking devices in reasonably foreseeable manner does not exist.

5.5.2.2 Moveable guards with interlocking

ISO 19085-1:2021, 5.5.2.2, applies.

5.5.2.3 Moveable guards with interlocking and guard locking

ISO 19085-1:2021, 5.5.2.3, does not apply.

5.5.3 Hold-to-run control

ISO 19085-1:2021, 5.5.3, applies.

5.5.4 Two-hand control

ISO 19085-1:2021, 5.5.4, does not apply.

5.5.5 Electro-sensitive protective equipment (ESPE)

ISO 19085-1:2021, 5.5.5, 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) the pitch between two elements shall be equal to or less than 100 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;

c) a manual reset control device shall be provided;

d) any support (of AOPD physical elements) shall be designed and positioned to avoid crushing and shearing, and to reduce tripping hazards.

5.5.6 Pressure-sensitive protective equipment (PSPE)

ISO 19085-1:2021, 5.5.6, applies with the following additions.

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Among PSPEs, 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.

5.5.7 Enabling control

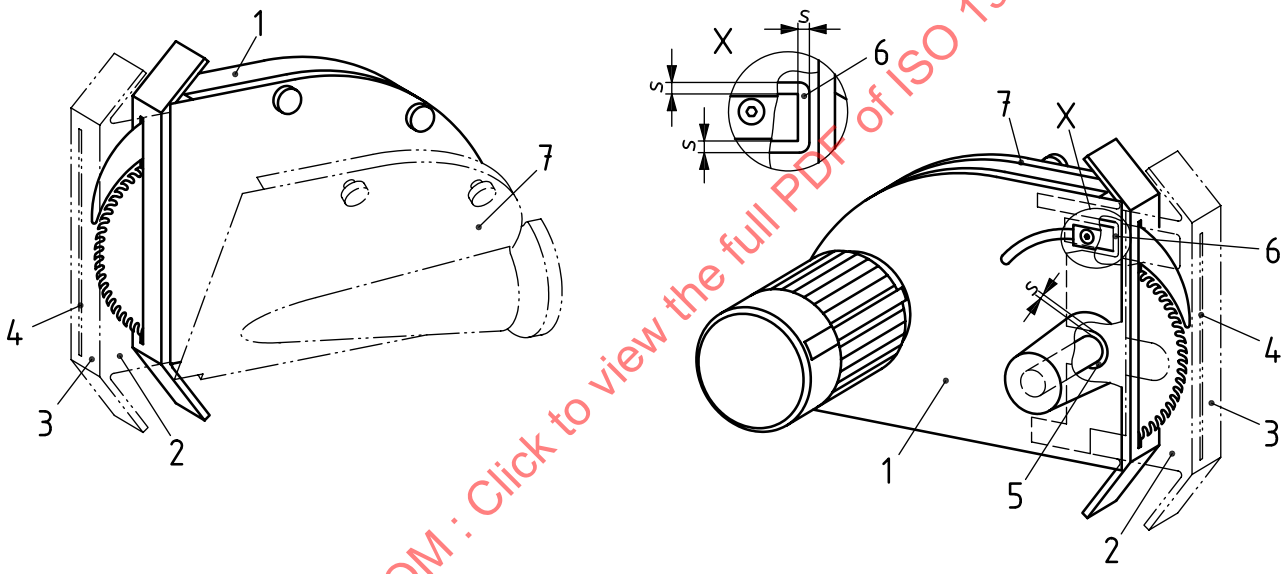
ISO 19085-1:2021, 5.5.7, does not apply.

5.6 Prevention of access to hazardous moving parts

ISO 19085-1:2021, 5.6, is replaced by the following text, subdivided into further specific subclauses.

5.6.1 Guarding of tools

Access to the saw blade in front of the workpiece support shall be prevented by means of a guarding system as shown in Figure 3, made of a fixed guard, an interlocking movable guard and a self-adjustable guard called "pressure shoe".



a) Operator side **b) Motor side**

Key

1	fixed guard	5	slot for the tool spindle
2	self-adjustable guard "pressure shoe"	6	slot for the riving knife supporting guide
3	sliding surface	7	interlocking moveable guard
4	opening for the saw blade	*s*	width of the slot for the riving knife supporting guide

Figure 3 — Example of a saw blade guarding system

To allow access to the tool, for example for 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.

When the saw unit is in its rest position, the pressure shoe shall be locked in its outmost position, so to enclose the saw blade and prevent access to it. The dimension of the opening 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 13857:2019, 4.2.4.1. These distances shall be measured with the saw unit in its rest position (i.e. with the pressure shoe in its outmost position).

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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*). The pressure shoe sliding surface shall brush along the workpiece during the whole cutting stroke to prevent unintended access to the tool.

The optional device for grooving with milling tools shall fulfil the following requirements (see Figure 4):

a) the maximum grooving depth shall be limited by a grooving depth limitation device, e.g. limitation disk (see Figure 4 Key 2) or ball ring guide;

b) a specific pressure shoe for milling tools shall be provided, with the opening in its sliding surface that shall:

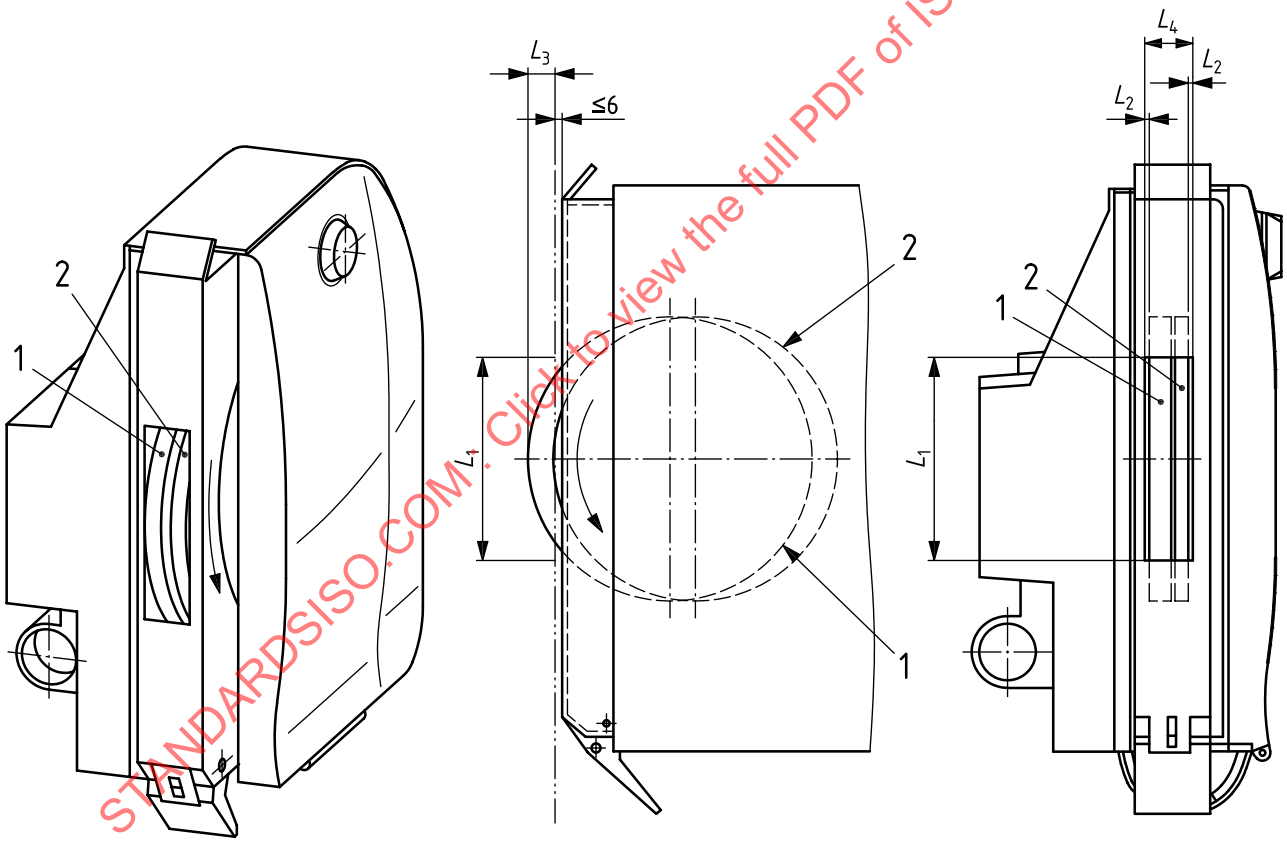
   1) be closed by a self-closing guard when the unit is in its rest position (not shown in Figure 4);

   2) have a maximum length, L_1, such that the clearance to the tool with maximum diameter for which the machine is designed does not exceed 4 mm when the pressure shoe is retracted to the maximum grooving depth, L_3, plus 6 mm;

   3) have a maximum total width, L_4, of 45 mm;

   4) leave a maximum clearance, L_2, of 4 mm to the limitation disk and to the grooving tool with the maximum width for which the machine is designed.

Dimensions in millimetres



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Key

1	grooving tool	L_1	length of the opening in the sliding surface for milling tools for grooving
2	limitation disk	L_2	clearance from the opening edges to the tool or the limitation disc
L_3	maximum grooving depth	L_4	width of the opening in the sliding surface for milling tools for grooving

Figure 4 — Example of a grooving tool guarding system

Verification is done by checking the relevant drawings and circuit diagrams, measurement, inspecting the machine and relevant functional testing of the machine.

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5.6.2 Safeguarding of shearing and crushing zones

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

Crushing and shearing hazards caused 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, for example frame, shall be avoided either by

— hold-to-run control for any programmable stop movement; or

— limiting the force at the shearing or crushing point to 50 N.

Crushing and shearing hazards caused by the panel pusher and the panel lowering device, if fitted, shall be prevented either by

— hold to run control (clamps closing movements excluded); for hazards related with clamps closing movement, 5.8 applies;

— a horizontally mounted AOPD or safety mats, extending horizontally at least 850 mm from any crushing or shearing point; or

— a vertically mounted AOPD, placed at a horizontal distance of at least 850 mm from any crushing or shearing point.

When AOPD or safety mats are triggered, the panel pusher and the panel lowering device shall be brought to a safe stop and the closing movement of its clamping device shall not be possible.

Verification is done by checking the relevant drawings and circuit diagrams, measurement, inspecting the machine and relevant functional testing of the machine.

5.6.3 Guarding of the rear side

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 the rear guarding system shall be in accordance with the safety distances specified in ISO 13857:2019, 4.2.4.1.

Verification is done by checking relevant drawings, inspecting the machine and measurement.

5.6.4 Guarding of drives

Access to hazardous movements of drives for the power-driven movements shall be prevented by fixed guards, and, where access is required more than once a week, also by movable guards with interlocking.

Verification is done by checking relevant drawings, inspecting the machine and measurement.

5.7 Impact hazard

ISO 19085-1:2021, 5.7, applies with the following additions.

The requirement of 25 m min^{-1} limited speed applies to the saw unit, the moving beam, the panel pusher and the panel lowering device.

5.8 Clamping devices

ISO 19085-1:2021, 5.8, applies with the following additions.

The requirements of ISO 19085-1:2021, 5.8, apply to closing movement of clamps of the panel lowering device and of the panel pusher.

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As a further alternative, the clamps closing speed shall be limited to 10 mm s^{-1} or less (no PL required for speed monitoring).

5.9 Measures against ejection

5.9.1 General

ISO 19085-1:2021, 5.9.1, applies with the following additions.

If the machine with infinite variable speed by frequency inverter is not equipped with a tool speed monitoring system according to 4.7.3, the requirements in 5.9.2 apply also to the guards on the rear side of the machine. No gaps in such guards are allowed.

5.9.2 Guards materials and characteristics

5.9.2.1 Choice of class of guards

ISO 19085-1:2021, 5.9.2.1, applies with the following additions.

Guards used to prevent ejection shall be of class B.

An impact test for guards shall be carried out in accordance with Annex E.

5.9.2.2 Guards of class A

ISO 19085-1:2021, 5.9.2.2, does not apply.

5.9.2.3 Guards of class B

ISO 19085-1:2021, 5.9.2.3, applies.

5.9.3 Anti-kickback devices

Subclause specific to this document.

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.

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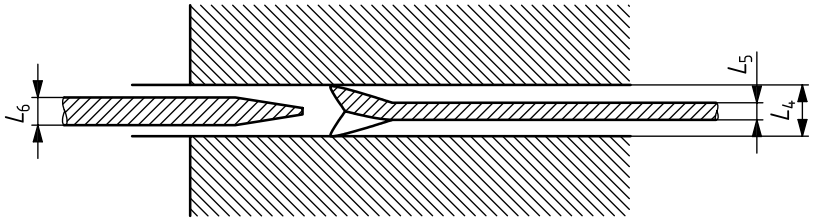


Key

L_4 width of saw blade cut (kerf)

L_5 saw blade plate thickness

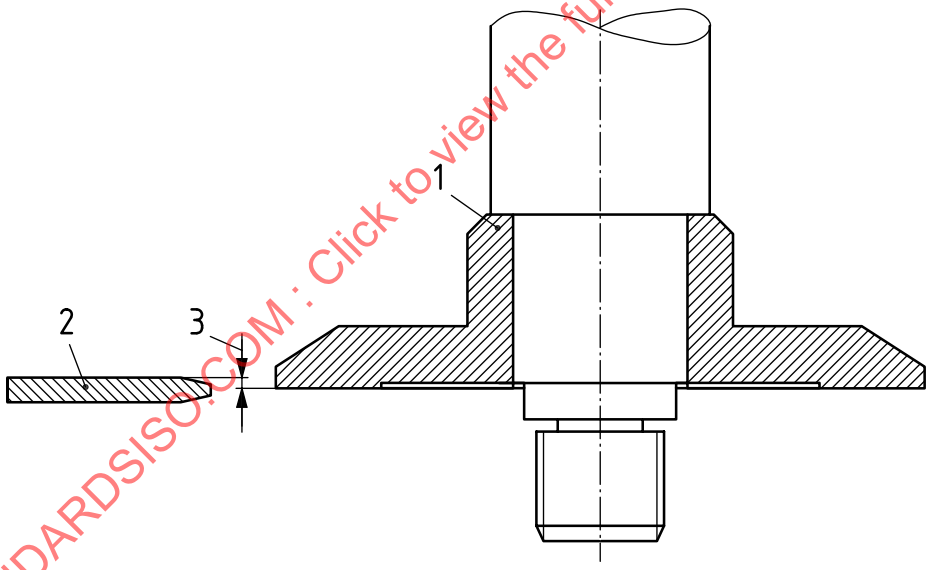
L_6 riving knife thickness

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 ±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 Figure 6 Key 3). 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

3 offset, 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 in Annex G.

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.

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Verification is done by checking relevant drawings, inspecting the machine, measurement and carrying out the test according to Annex G.

5.10 Workpiece supports and guides

ISO 19085-1:2021, 5.10, is replaced by the following text, subdivided into further specific subclauses.

5.10.1 Workpiece support

5.10.1.1 To allow a stable position of the workpiece during operation, the following requirements shall be fulfilled:

a) the workpiece 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 workpiece support.

5.10.1.2 The workpiece shall be held stationary during cutting, by one of the following measures:

a) braking the rollers at the base of workpiece support;

b) retracting the rollers at the base of the workpiece support, and providing fixed workpiece supports;

c) providing mechanical stops to prevent horizontal movements of the workpiece.

5.10.1.3 At the base of the workpiece support, rollers shall be provided to allow easy workpiece 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.

5.10.1.4 Verification is done by checking the relevant drawings, inspection of the machine and measurement.

5.10.2 Middle support device

A middle support device for cutting small workpieces, if provided, 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, for example by fitting a locking device, or be so designed that it is held in the rest position by gravity.

Verification is done by checking relevant drawings, inspecting the machine, measurement and relevant functional testing of the machine.

5.10.3 Angle cutting device

An angle cutting device, if provided, shall be in accordance with the following requirements:

a) it shall be stable during operation;

b) for cutting different angles, its workpiece support shall be adjustable between 0° and 45° to the horizontal cutting line of the saw unit;

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c) it shall be possible to lock the workpiece 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 is done by checking relevant drawings, inspecting the machine, measurement and relevant functional testing of the machine.

6 Safety requirements and measures for protection against other hazards

6.1 Fire

ISO 19085-1:2021, 6.1, 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 5.2.

6.2 Noise

6.2.1 Noise reduction at the design stage

ISO 19085-1:2021, 6.2.1, applies.

6.2.2 Noise emission measurement

ISO 19085-1:2021, 6.2.2, applies with the following additions.

The noise test for the machines shall be carried out in accordance with the code given in Annex F.

6.3 Emission of chips and dust

ISO 19085-1:2021, 6.3, 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 $m^3\ h^{-1}$.

6.4 Electricity

ISO 19085-1:2021, 6.4, applies.

6.5 Ergonomics and handling

ISO 19085-1:2021, 6.5, 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.

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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. This requirement can be fulfilled by:

a) a mechanical system (e.g. see Figure 7); or

b) an electro-mechanical system. For example, a system with a redundant supporting rope, like in Figure 7, where breakage of any rope is detected by a sensor. When a breakage is detected, it shall be indicated at the machine control panel or on the electric cabinet and it shall not be possible to operate the machine until the broken rope is repaired. The SRP/CS for machine blocking (including breakage detection) when a rope breakage in detected shall achieve PL_r = b.

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.

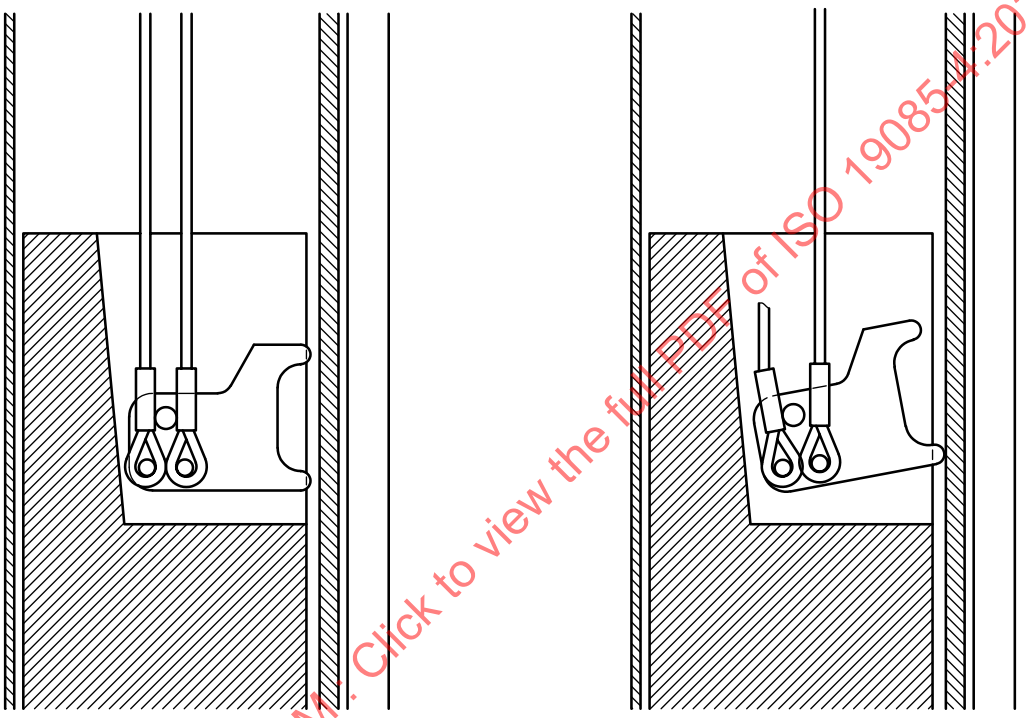

Figure 7 — Example of a counterbalance mounting safe design

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6.6 Lighting

ISO 19085-1:2021, 6.6, does not apply.

6.7 Pneumatics

ISO 19085-1:2021, 6.7, applies.

6.8 Hydraulics

ISO 19085-1:2021, 6.8, does not apply.

6.9 Electromagnetic compatibility

ISO 19085-1:2021, 6.9, applies.

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6.10 Laser

ISO 19085-1:2021, 6.10, applies.

6.11 Static electricity

ISO 19085-1:2021, 6.11, applies.

6.12 Errors of fitting

ISO 19085-1:2021, 6.12, applies.

6.13 Isolation

ISO 19085-1:2021, 6.13, applies with the following additions.

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

6.14 Maintenance

ISO 19085-1:2021, 6.14, applies.

6.15 Relevant but not significant hazards

ISO 19085-1:2021, 6.15, applies.

7 Information for use

7.1 Warning devices

ISO 19085-1:2021, 7.1, applies.

7.2 Marking

7.2.1 General

ISO 19085-1:2021, 7.2.1, applies.

7.2.2 Additional markings

ISO 19085-1:2021, 7.2.2, is replaced by the following text.

The following additional information shall be marked legibly and indelibly throughout the expected life of the machine, either directly on the machine, for example by engraving or etching, or by using labels or plates permanently fixed to the machine, for example 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 and the maximum cutting width;

d) for each spindle requiring speed monitoring in accordance with 4.7.3, 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;

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e) the riving knife shall be marked with:

   1) its thickness;

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

   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 workpiece;

g) the maximum load capacity of the panel lowering device, depending on the number of active clamping devices.

Verification is done by checking relevant drawings and inspecting the machine.

7.3 Instruction handbook

7.3.1 General

ISO 19085-1:2021, 7.3.1, applies.

7.3.2 Additional information

ISO 19085-1:2021, 7.3.2, is replaced by the following 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 monitored rotational speed of the spindle indicated by the corresponding warning label [see 7.2.2 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 847-1:2017, marked with MAN and with a maximum cutting width of 27 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;

g) instructions to keep the workpiece stationary during cutting by activating the devices fitted for this task (see 5.10.1);

h) on machines where movements of the moving beam and of the saw unit along the moving beam are not powered, instructions to lock:

   — vertical movement of the saw unit along the moving beam before performing horizontal cuts,

   — horizontal movement of the moving beam before performing vertical cuts;

i) instruction to stop the machine whilst unattended.

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Annex A
(informative)

List of significant hazards

ISO 19085-1:2021, Annex A, is replaced by the following text.

Table A.1 lists all significant hazards, hazardous situations and events (see ISO 12100:2010), identified by risk assessment as significant for vertical panel circular sawing machines, and which require action to eliminate or reduce the risk.

Table A.1 — List of significant hazards

No.	Hazards, hazardous situations and hazardous events	Subclause of ISO 12100:2010	Subclause of this document
1	Mechanical hazards related to — Machine parts or workpieces due to		
	a) shape	6.2.2.1, 6.2.2.2, 6.3	4.2, 5.3, 5.6, 5.10, 6.15, 7.2, 7.3
	b) relative location		4.2, 4.3, 4.8, 5.6, 7.2
	c) mass and stability (potential energy of elements which may move under the effect of gravity)		4.8, 4.9
	d) mass and velocity (kinetic energy of elements in controlled or uncontrolled motion)		4.3, 4.8, 5.6, 5.10
	e) mechanical strength		5.2
	— Accumulation of energy inside the machinery by		
	f) gases under pressure	6.2.10, 6.3.5.4	4.8, 6.7, 6.13, 7.3
1.1	Crushing hazard		4.3, 4.4, 4.8, 5.4, 5.10, 5.6, 6.12, 6.13
1.2	Shearing hazard		4.3, 4.4, 5.4, 5.10, 5.6, 6.12, 6.13
1.3	Cutting or severing hazard		4.3, 4.4, 4.5, 4.8, 5.4, 5.6, 6.12, 6.13
1.4	Entanglement hazard		4.4, 4.5, 5.6, 6.12, 6.13
1.5	Drawing-in or trapping hazard		4.3, 4.4, 4.5, 5.4, 5.6, 6.12, 6.13
1.6	Impact hazard		4.3, 5.7, 5.10, 6.12
1.9	High pressure fluid injection or ejection hazard	6.2.10	4.4, 6.7, 6.13
2	Electrical hazards due to		
2.1	Contact of persons with live parts (direct contact)	6.2.9, 6.3.5.4	6.4, 6.13
2.2	Contact of persons with parts which have become live under faulty conditions (indirect contact)	6.2.9	6.4, 6.13
2.4	Electrostatic phenomena	6.2.9	6.11
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	6.2, 7.1, 7.3
4.2	Accidents due to interference with speech communication, acoustic signals		
6	Hazards generated by radiation		
6.5	Laser	6.3.4.5	6.10
7	Hazards generated by materials and substances (and their constituent elements) processed or used by the machinery		

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Table A.1 *(continued)*

No.	Hazards, hazardous situations and hazardous events	Subclause of ISO 12100:2010	Subclause of this document
7.1	Hazards from contact with or inhalation of harmful fluids and dusts	6.2.3 b), 6.2.4	6.3, 7.3
7.2	Fire	6.2.4	6.1
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	4.2, 6.5
8.2	Hand-arm or foot-leg anatomy	6.2.8	6.5
8.4	Local lighting	6.2.8	7.3
8.5	Mental overload and underload, stress	6.2.8	7.3
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	7.3
8.7	Design, location or identification of manual controls	6.2.8, 6.2.11.8	4.2
8.8	Design or location of visual display units	6.2.8, 6.4.2	4.2
9	Combination of hazards	6.3.2.1	4.3, 4.5, 4.7, 4.8, 5.6, 6.12, 6.13
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	4.1, 6.12
10.2	Restoration of energy supply after an interruption	6.2.11.4	4.9, 6.7
10.3	External influences on electrical equipment	6.2.11.11	4.1, 6.9
10.4	Other external influences (gravity)	6.2.12.1	5.10
10.5	Errors in the software	6.2.11.7	4.1
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	4.2, 6.5, 7.3
11	Impossibility of stopping the machine in the best possible conditions	6.2.11.1, 6.2.11.3, 6.3.5.2	4.4, 4.5, 6.12
12	Variations in the rotational speed of tools	6.2.2.2, 6.3.3	4.7
13	Failure of the power supply	6.2.11.1, 6.2.11.4	4.9
14	Failure of the control circuit	6.2.11, 6.3.5.4	4.1
15	Errors of fitting	6.2.7, 6.4.5	6.12
16	Break-up during operation	6.2.3	5.9
17	Falling or ejected objects or fluids	6.2.3, 6.2.10	4.8, 7.3
18	Loss of stability/overturning of machinery	6.3.2.6	5.1

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Annex B
(informative)

Performance level required

ISO 19085-1:2021, Annex B, is replaced by the following text.

Table B.1 summarizes the performance level required for each safety function. Clauses 4, 5 and 6 give the full requirements.

Table B.1 — Safety functions and their PL_r

Area		Safety function/devices	PL_r	Subclause of ISO 19085-1:2021	Subclause of this document
Start	1	Prevention of unexpected start of tool drives	c	4.3.1	4.3.1
	2	Prevention of unexpected start of infeed movement of saw unit	c	4.3.1	4.3.1
	3	Prevention of unexpected start of integrated feed	b		4.3.1
	4	Prevention of unexpected start of pivoting	b		4.3.1
	5	Prevention of unexpected start of vertical programmed powered movements of saw unit before cutting cycle	b		4.3.1
	6	Prevention of unexpected start of programmable end stop	b		4.3.1
	7	Interlocking of pivoting movements of the saw unit with saw unit rest position	c	4.3.1	4.3.1
	8	Interlocking of start of tool drive with safeguards	c	4.3.1	4.3.1
	9	Interlocking of cutting stroke with tool drive	c	4.3.1	4.3.1
	10	Interlocking of infeed movement of the saw unit with moving beam horizontal locking for vertical cuts	b		4.3.1
	11	Interlocking of infeed movement of the saw unit with saw unit vertical clamping for horizontal cuts	b		4.3.1
	12	Interlocking of movement of the programmable end stop with saw unit rest position	b		4.3.1
	13	Interlocking of vertical cutting stroke movement with moving beam horizontal locking	b		4.3.1
	14	Interlocking of horizontal cutting stroke movement with saw unit vertical clamping	b		4.3.1
	15	Interlocking of movement of the panel pusher with saw unit rest position	b		4.3.1
	16	Interlocking of movement of the panel lowering device with saw unit rest position	b		4.3.1
	17	Interlocking of programmed powered vertical movements of the saw unit before cutting cycle with saw unit rest position	b		4.3.1
	18	Interlocking of start of main saw blade drive motor with start of scoring saw blade drive motor	c		4.3.1
Stop	19	Normal stop (braking function excluded)	c	4.4.2	
	20	Emergency stop (braking function excluded)	c	4.4.4	
	21	Stop of cutting stroke and retraction of saw unit to its rest position when cutting power to saw spindles	c		4.4.1
Tool braking	22	Activation of the brakes	c	4.5	
	23	Electric braking systems (excluding PDS/SR)	b	4.5	
	24	SS1 of PDS (SR)	c	4.5	
	25	Interlocking of brake release	c	5.4.3	

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Table B.1 *(continued)*

Area		Safety function/devices	PL_r	Subclause of ISO 19085-1:2021	Subclause of this document
Spindle speed	26	Speed selection	c	4.7.2	
	27	Speed monitoring	c	4.7.3	4.7.3
	28	Indication of the selected speed	b		4.7.3
Controls	29	Manual reset	c	4.9	
	30	Speed monitoring of panel pusher	c/b		4.11
	31	Speed monitoring of saw unit	b	4.11	4.11
	32	Speed monitoring of moving beam	b	4.11	4.11
	33	Speed monitoring of panel lowering device	b	4.11	4.11
	34	Time delay	c	4.12	
	35	Machine blocking (including breakage detection) when a rope breakage in detected	b		6.5
Safeguards	36	Hold-to-run	b/c	5.5.3	
	37	Interlocking of dangerous movements with ESPE	c	5.5.5	
	38	Interlocking of dangerous movements with PSPE	c	5.5.6	
	39	Interlocking of movable guards	c	5.5.2.2	

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Annex C
(informative)

Stability test

ISO 19085-1:2021, Annex C, does not apply.

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