International Standard

ISO 19085-9

Second edition
2024-08

# Woodworking machines — Safety —

## Part 9: Circular saw benches (with and without sliding table)

*Machines à bois — Sécurité —*

*Partie 9: Scies circulaires à table de menuisier (avec et sans table mobile)*



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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 19085-9:2019), which has been technically revised. The main changes are as follows:

— the Scope now specifies that machines are capable of continuous production use;

— displaceable machines are not referenced anymore;

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

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

— subclause 6.2 has been updated;

— 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.

# 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 12100:2010.

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, e.g. 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 12100:2010), 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 19085-1:2021, 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 clauses of ISO 19085-1:2021. Each part includes replacements and additions to the common requirements given in ISO 19085-1:2021.

All parts of the ISO 19085 series have the same structure, so that reference to ISO 19085-1:2021 is made always and only from and to the same subclause number.

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:

— confirmed as a whole;

— confirmed with additions;

— excluded in total; or

— replaced with specific text.

This is indicated by one of the following possible statements:

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

— “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.”.

# Woodworking machines — Safety —

# Part 9:
# Circular saw benches (with and without sliding table)

## 1 Scope

This document specifies the safety requirements and measures for circular saw benches with or without sliding table or demountable power feed unit or both and capable of continuous production use, also known as “table saws” (in the USA), hereinafter referred to also as “machines”.

The machines are designed to cut solid wood and material with similar physical characteristics to wood (see ISO 19085-1:2021, 3.2).

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; reasonably foreseeable misuse has been considered too. Transport, assembly, dismantling, disabling and scrapping phases have also been taken into account.

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

— device for the main saw blade and scoring saw blade to be raised and lowered through the table;

— device to tilt the main saw blade and scoring saw blade for angled cutting;

— device for scoring;

— device for grooving with milling tool with a width not exceeding 20 mm in one pass;

— demountable power feed unit;

— additional manually operated sliding table;

— powered workpiece clamping device.

This document does not apply to:

a) machines intended for outdoor use on building sites;

NOTE Building site saws (contractor saws) are covered by the requirements of ISO 19085-10:2018.

b) handheld woodworking machines including any adaptation permitting their use in a different mode, i.e. bench mounting;

c) machines intended for use in a potentially explosive atmosphere;

d) machines 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 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 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**
**circular saw bench**
**table saw**
hand-fed machine fitted with a single main circular saw blade which is fixed in position during the cutting operation and a horizontal table fixed during operation all around the saw blade

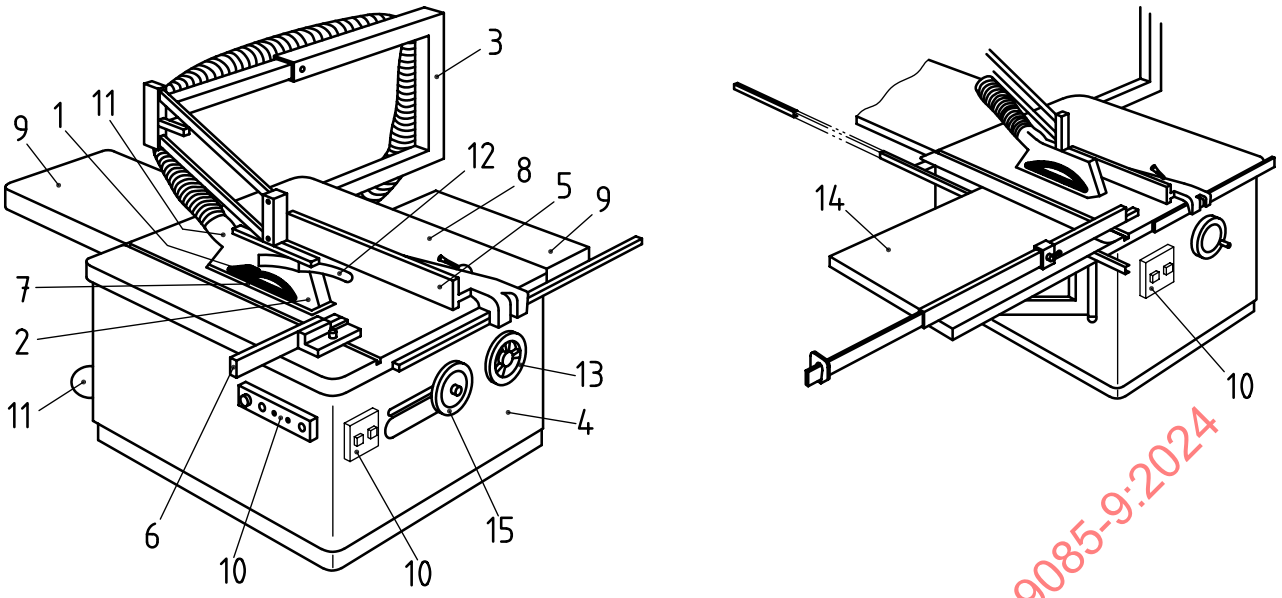
Note 1 to entry: The main parts and their terminology are shown in Figure 1.

Note 2 to entry: The main saw blade is mounted on a spindle below the table.

Note 3 to entry: Circular saw benches are mainly used for ripping, cross cutting, dimensioning and grooving.

**3.2**
**grooving**
making of a cut in the surface of the workpiece not deep enough to pass through, using the saw blade or a milling tool

**3.3**
**initiation control**
control which, after actuation, enables the provision of power to specific machine actuators, for example, by a programmable logic control




**a) Saw bench** **b) Saw bench with sliding table**

**Key**

1 riving knife
2 saw blade guard
3 saw blade guard support
4 fixed guard beneath table
5 rip fence
6 cross-cut fence
7 table insert
8 machine table
9 extension table
10 controls
11 chips and dust outlet
12 push stick in holding position
13 cutting height adjustment
14 sliding table
15 inclination adjustment

**Figure 1 — Examples of a circular saw bench**



## 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

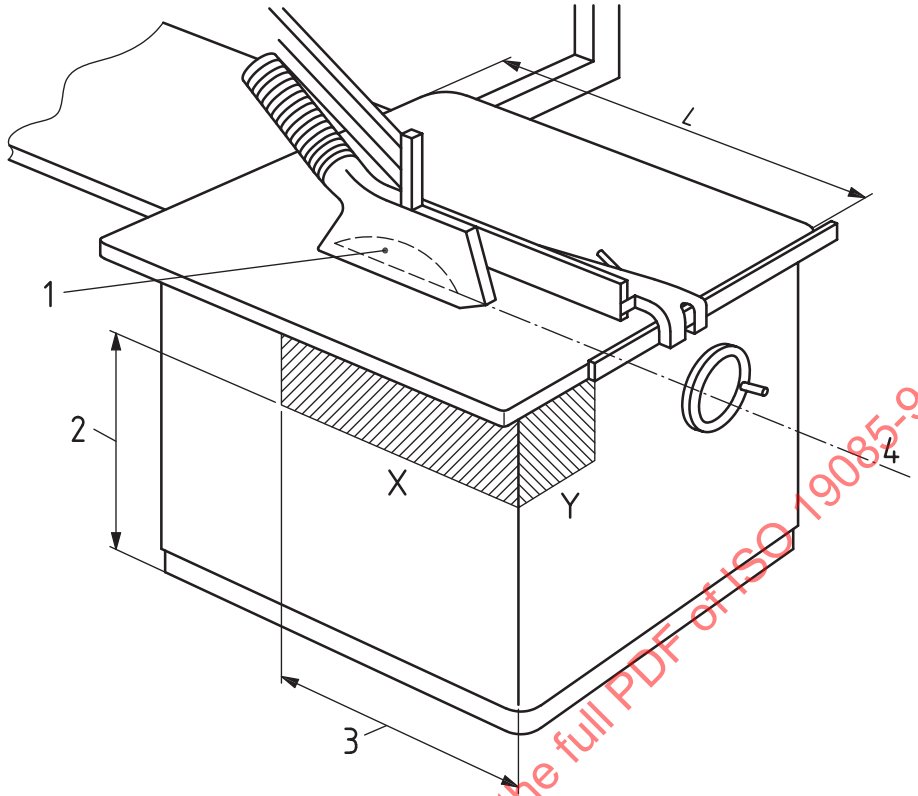
ISO 19085-1:2021, 4.2 applies with the following additions.

The electrical control devices except the main switch shall be located:

a) for machines designed to be used without a sliding table, either
   1) in the shaded area marked X or in the shaded area marked Y in Figure 2, or
   2) on a movable control panel;
b) for machines equipped with a sliding table or where provision is made for the use of a sliding table, either
   1) in the shaded area marked Y in Figure 2, or

2) on a movable control panel.

A normal stop control device shall be located adjacent to each start control device.




**Key**

| | | | |
|---|---|---|---|
| X | left side controls area | 3 | ≤½ *L* |
| Y | front side controls area (on the left of cutting line) | 4 | cutting line |
| 1 | saw blade | *L* | length of machine table |
| 2 | ≥600 mm | | |

**Figure 2 — Position of control devices**

The shaded areas X and Y are located below the table at a distance of at least 50 mm from the table top and more than 600 mm above the floor (see Figure 2 Key 1), and:

— on the left side of the machine (area X) and extending not more than half of the table length, *L* (see Figure 2 Key 2);

— on the front side of the machine (area Y) on the left of the cutting line.

The movable control panel fixed to the machine shall be located so that:

— its front face is at a distance from the front edge of the table not exceeding 700 mm;

— its upper edge is at a distance from the floor level not exceeding 1 800 mm.

## 4.3 Start

### 4.3.1 Direct start

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

The scoring saw blade drive shall not be capable of being started before the main saw blade drive.

The safety related parts of the control system (SRP/CS) for interlocking between the scoring saw blade drive and the main saw blade drive 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.

#### 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.

### 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 applies.

#### 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.

### 4.8 Failure of any power supply

ISO 19085-1:2021, 4.8 applies with the following additions.

As an exception, non-return valves are not required on pneumatic cylinders used for workpiece clamping.

### 4.9 Manual reset control

ISO 19085-1:2021, 4.9 does not apply.

## 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.

## 4.12 Time delay

ISO 19085-1:2021, 4.12 applies.

## 4.13 Teleservice

ISO 19085-1:2021, 4.13 does not apply.

## 4.14 Power-operated adjustment of the saw blades and the rip fence

Subclause specific to this document.

### 4.14.1 Risk of contact between the saw blades and the rip fence

Power-operated movements for adjusting the saw blades and the rip fence shall only be possible under pre-set electronic control after actuation of an initiation control device or by hold-to-run control.

The SRP/CS for initiation control shall achieve $PL_r$ = c.

Within a collision area, i.e. where the position of the rip fence is so close to the saw blade that contact between the rip fence and the saw blade is possible, respective approach movements shall only be possible by hold-to-run control, whereby the maximum speed of adjustment shall be 15 mm/s for linear and 5°/s for rotational movements (no PL required for speed monitoring).

The SRP/CS for detection of the position of the rip fence within the collision area shall achieve $PL_r$ = c.

Where power-operated movements are activated by hold-to-run control, no more than one power-operated movement at a time shall be possible.

NOTE The simultaneous adjustment of height and tilt of the saw blade is considered as one single movement.

Saw blade rotation is allowed during power-operated adjustments.

The SRP/CS for limitation of concurrent movements under hold-to-run control shall achieve $PL_r$ = b.

Unexpected start of power-operated movements under pre-set electronic control shall be prevented after the pre-set position has been reached.

The SRP/CS for prevention of unexpected start shall achieve $PL_r$ = c. This can be achieved, for example, by a time delay device which, after actuation of the initiation control for power-operated movements under pre-set electronic control, shall cut power to the actuators with a time delay set to the maximum possible adjustment time.

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

### 4.14.2 Crushing hazard for the body

Crushing hazards for the body between power-operated moving parts of the rip fence and other parts of the machine, for example, the sliding table or machine frame, shall be avoided by either

a) a hold-to-run control for the movement of the rip fence within the crushing area for the body,

b) a mechanically actuated trip device (PSPE), which shall

   1) be located on the other parts of the machine, for example, frame, at maximum 50 mm below table level, and

   2) have a crushing force that shall not exceed 400 N; or

c) reduction of the force of the fence toward the other parts of the machine to a maximum of 400 N.

NOTE Crushing hazards for the body according to ISO 13854:2017 occur if power-operated moving parts go below a safety distance of 500 mm toward fixed parts.

The SRP/CS for detection of the position of the rip fence within the crushing area for the body shall achieve $PL_r$ = c.

The SRP/CS for limiting the power-operated movement force shall achieve $PL_r$ = c.

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

### 4.14.3 Crushing and shearing hazard for the arm, hand or finger

Crushing and shearing hazards for the arm, hand and fingers between power-operated moving parts of the rip fence, and other parts of the machine, for example, the sliding table or machine frame, shall be avoided by either

a) a hold-to-run control device for the movement of the rip fence within the crushing area for the arm/hand/finger, or

b) a mechanically actuated trip device (PSPE), which shall

   1) be located on the other parts of the machine, for example, frame or integrated sliding table at table level, and

   2) whose crushing force shall not exceed 150 N.

NOTE Crushing hazards for arm, hand and finger according to ISO 13854:2017 occur if power-operated moving parts go below a safety distance of 120 mm for arm and hand and 25 mm for finger toward fixed parts.

The SRP/CS for detection of the shearing and crushing area for arm/hand/finger shall achieve $PL_r$ = c.

The SRP/CS for limiting the power-operated movement force shall achieve $PL_r$ = c.

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



# 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 machines shall pass the stability test required in Annex C.

## 5.2 Risk of break-up during operation

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

The machine table slot close to the tool shall be lined with easily machinable material (see ISO 19085-1:2021, 3.3).

## 5.3 Tool and tool fixing design

### 5.3.1 General

ISO 19085-1:2021, 5.3.1 applies.

### 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 with the following additions.

As an exception, the scoring saw blade may be fixed with a nut and without additional flanges.

### 5.3.4 Flange dimension for circular saw blades

ISO 19085-1:2021, 5.3.4 applies.

### 5.3.5 Fixing device for milling tools

Subclause specific to this document.

For machines with a device for grooving with milling tools, milling tool flanges shall be provided.

The outer diameter of the flanges shall be at least 1,4 times the bore diameter of the milling tool.

Loosening of the milling tool shall be prevented, for example, by using a positive connection between the front flange and the spindle.

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

## 5.4 Braking

### 5.4.1 Braking of tools

ISO 19085-1:2021, 5.4.1 applies with the following addition.

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

When conducting the test for braking function on machines with the device for grooving with milling tool, it shall be determined whether the condition with the greatest kinetic energy will be achieved with a saw blade or a milling tool.

### 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.

## 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 Movable guards with interlocking

ISO 19085-1:2021, 5.5.2.2 applies.

##### 5.5.2.3 Movable 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 does not apply.

#### 5.5.6 Pressure-sensitive protective equipment (PSPE)

ISO 19085-1:2021, 5.5.6 applies.

#### 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 applies with the following additions, subdivided into further specific subclauses.

#### 5.6.1 Access to the saw blade part above the machine table

##### 5.6.1.1 Adjustable saw blade guard

An adjustable guard shall reduce the risk of access to the saw blade above the machine table. This guard shall be either manually or automatically adjustable. It shall be fitted to the riving knife (see Figure 4) or to the machine separately from the riving knife. In the latter case, it shall be mounted to the machine with a support not being in line with the riving knife (see Figure 1).

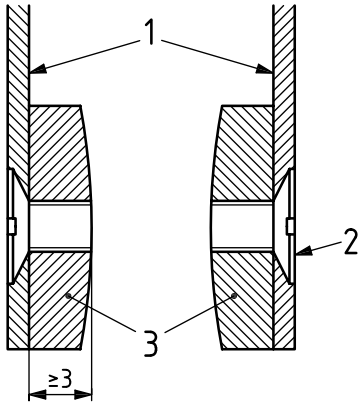
The saw blade guard shall be in accordance with the following requirements.

a) The saw blade guard shall pass the rigidity test in Annex I.

b) On machines designed to be used with saw blade diameters greater than 315 mm, the adjustable saw blade guard shall be mounted separately from the riving knife (see Figure 1).

c) The lower inner edges of the sides of the saw blade guard shall be lined with a rib, made of plastic, light alloy, wood or wood-based materials (see Figure 3). This rib shall be at least 3 mm wide and shall, by design, prevent the saw blade teeth from cutting into the saw blade guard should the saw blade guard be displaced from the line of cut. If the rib is replaceable, the fixing arrangement shall be such that it does not damage the saw blade, for example, with brass screws.

Dimensions in millimetres




**Key**

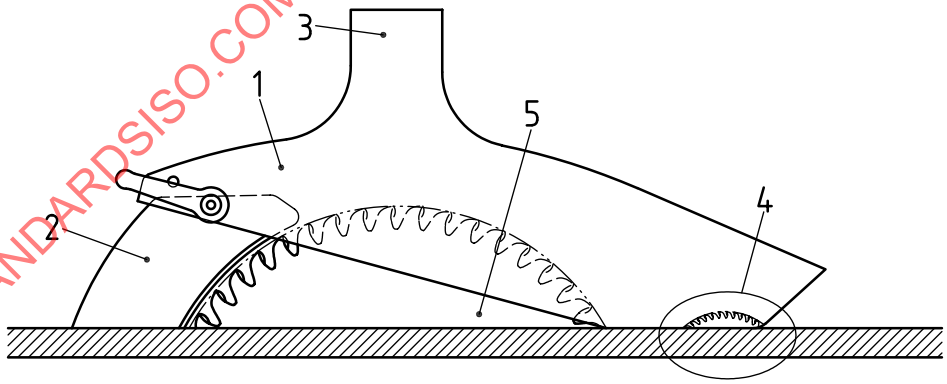
1 side walls
2 fixing screws
3 ribbings

**Figure 3 — Example of replaceable ribs at the underside of saw blade guard side walls**

d) Independent of its pre-set adjusted position, the saw blade guard shall be capable of upward movement during the cutting operation as a function of variations in workpiece thickness and may or may not return to the pre-set adjusted position at the end of the cutting operation.

e) If a manually adjustable saw blade guard is provided, the height adjustment shall be possible without the aid of a tool.

f) On non-transparent saw blade guards, the line of cut shall be indicated, for example, by a groove moulded into the saw blade guard.




**Key**

1 saw blade guard
2 riving knife
3 extraction outlet
4 scoring saw blade
5 main saw blade

**Figure 4 — Example of a riving knife mounted saw blade guard**

g) On machines fitted with a device for grooving with milling tools, the saw blade guard shall be mounted separately from the riving knife, independently from the maximum diameter of the saw blades.

On machines with a saw blade guard mounted on the riving knife and having the device to adjust the saw blade height, coverage of the saw blade during grooving shall be made possible by providing mountings for fixing a safety appliance [see 5.11 and 7.3.2 i)].

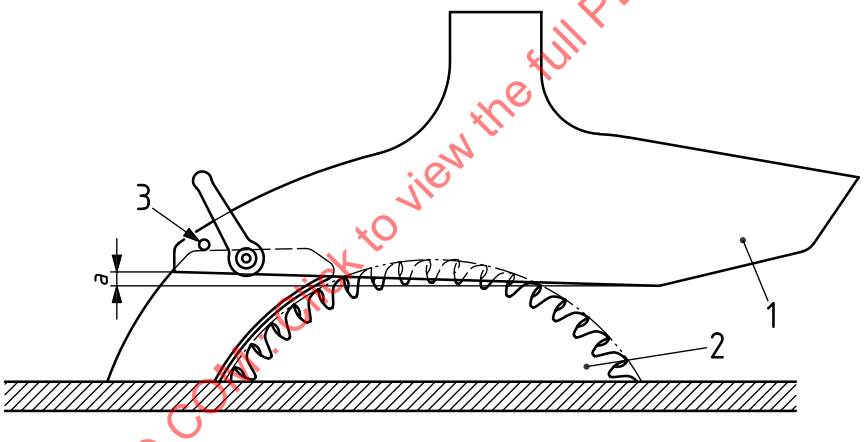
Verification is done by checking relevant drawings, inspection and relevant functional testing of the machine, and performing the saw blade guard rigidity test according to Annex I.

#### 5.6.1.2 Additional requirements for guards mounted on the riving knife

When mounted on the riving knife, the saw blade guard shall be in accordance with the following requirements.

a) Access to the top and sides of the exposed saw teeth shall be prevented from the guard mounting point on the riving knife to the first cutting tooth at the machine table level for all intended saw blade diameters and highest vertical position of the saw blade. The saw blade guard shall, at the same time, prevent access from the top to the scoring saw blade (see Figure 4). If necessary, more than one fixing point on the riving knife shall be provided to achieve these requirements.

b) To avoid jamming of the workpiece during feeding, the rear end of the bottom edge of the saw blade guard shall be higher by at least 2 mm and no more than 4 mm than the front end if the saw blade guard is raised to its highest position (see Figure 5 Key *a*). This requirement shall be fulfilled at all possible vertical positions of the saw blade.




**Key**

| | | | |
|---|---|---|---|
| 1 | saw blade guard adjusted for maximum cutting capacity | 3 | end stop |
| 2 | saw blade | *a* | clearance to avoid workpiece jamming |

**Figure 5 — Riving knife mounted saw blade guard raised to its highest position**

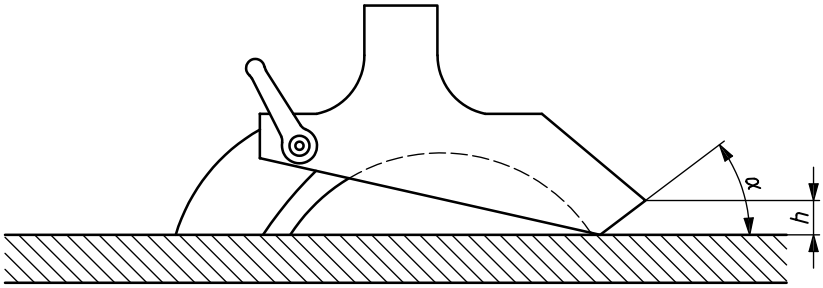
c) The mounting and dismounting of the saw blade guard on the riving knife shall be possible without the aid of a tool.

d) In the area where the saw blade guard can come in contact with the rip fence in the lower position (see Figure 17 Key 2), the maximum width of the saw blade guard shall not exceed 40 mm.

e) The in-feed end of the base of the saw blade guard shall have a lead-in to avoid misfeeding should the saw blade guard be incorrectly set or the workpiece be uneven. If the saw unit is fitted with the maximum saw blade and raised to the maximum cutting depth and the saw blade guard is lowered to the machine table, the lead-in shall be in accordance with the following requirements:

1) the minimum height, *h*, (see Figure 6) shall be such that the saw blade guard can be raised by a workpiece with a thickness of 20 % of the maximum cutting depth for which the machine is designed;

2) the angle, $\alpha$, shall not be more than 45°.




**Key**

$\alpha$ in-feed end lead-in angle

$h$ in-feed end lead-in height

**Figure 6 — Lead-in of riving-knife-mounted saw blade guards**

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

#### 5.6.1.3 Additional requirements for saw blade guards mounted separately from the riving knife

When mounted separately from the riving knife, the saw blade guard shall be in accordance with the following requirements.

a) It shall prevent access to the top and both sides of the saw blades when the saw blades are in the vertical position and adjusted in their highest position.

b) It shall be adjustable in height from the table level up to a maximum height of 5 mm above the uppermost saw teeth when the machine is fitted with the largest saw blade for which it is designed.

c) The means of adjustment shall ensure that the bottom of the saw blade guard always remains parallel to the table (within 1 mm for every 100 mm length).

d) It shall be fitted with a device for easy height adjustment, for example, a handle on the saw blade guard.

e) When it is adjusted to its lowest position, the height of the saw blade shall be visible from the point at which the operator adjusts the saw blade height.

f) In-feed and out-feed ends of its base shall be designed to allow upward vertical movement of the saw blade guard in order to avoid misfeeding should the saw blade guard be incorrectly set or the workpiece be uneven. This can be achieved, for example, by any of the following solutions:

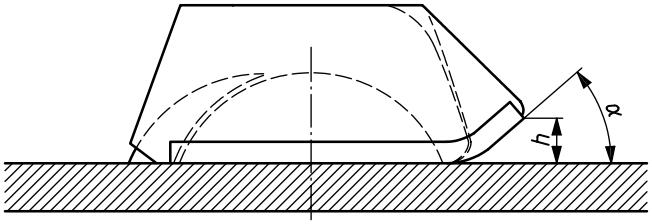
   1) providing lead-ins; the front lead-in shall be in accordance with the following requirements (see Figure 7):

      i) the minimum height, $h$, shall be such that the saw blade guard can be raised by a workpiece with a thickness of 20 % of the maximum cutting depth for which the machine is designed;

      ii) the angle, $\alpha$, shall not be more than 45°;

   2) equipping the saw blade guard with rollers (see Figure 8); the minimum radius, $h$, of the rollers shall be such, that the saw blade guard can be raised by a workpiece with a thickness of 20 % of the maximum cutting depth for which the machine is designed;

   3) providing an automatically adjustable saw blade guard, for example, of the kind with a three-roller climber on the front edge.

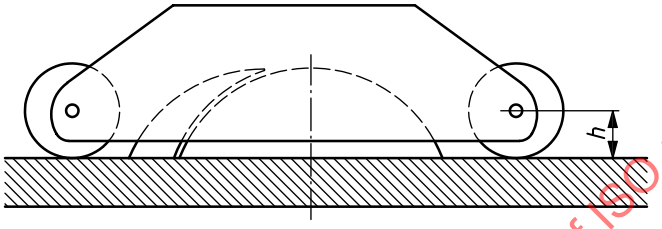



**Key**

$\alpha$ in-feed end lead-in angle

$h$ in-feed end lead-in height

**Figure 7 — Lead-in of saw blade guards mounted separately from the riving knife**




**Key**

$h$ in-feed end lead-in roller radius

**Figure 8 — Lead-in roller of saw blade guards mounted separately from the riving knife**

g) In the area where the saw blade guard can touch the rip fence in its lower position, the maximum width of the saw blade guard shall not exceed 50 mm.

h) When an automatically adjustable saw blade guard is provided, the following requirements shall be fulfilled:

   1) it shall rise when feeding the workpiece for any workpiece height up to maximum cutting capacity;

   2) it shall be possible to be manually pre-adjusted in any height position.

For machines with a facility to tilt the saw blade or with a facility for grooving with milling tools, either one or more auxiliary guards shall be provided, or the saw blade guard shall be provided with one or more extension pieces.

The auxiliary saw blade guard or the extension pieces shall be exchangeable without the aid of a tool and shall be wide enough to avoid contact with the saw blade or milling tool in any possible position.

The support for the saw blade guard shall be designed in such a way that it cannot be dismounted from the machine without the aid of a tool.

If the support for the saw blade guard allows the movement of the saw blade guard away from its position above the saw blade, then this movement shall be

— capable of being carried out without the aid of a tool, and

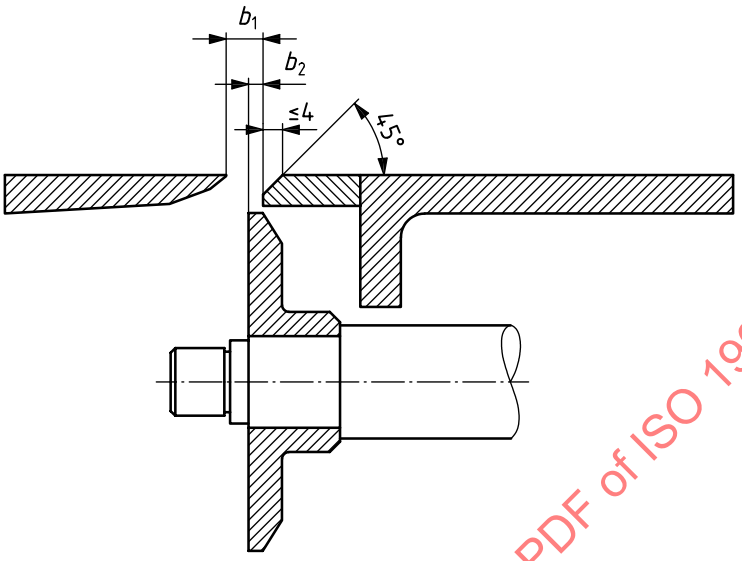
— stopped by providing an end stop such that when the saw blade guard is moved back into position above the saw blade, no further adjustment is necessary.

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

#### 5.6.1.4 Slot for the saw blade/milling tool in the table or in the table slot lining

The total width, $b_1$, of the table slot for the saw blade (see Figure 9) shall not exceed 12 mm. Bevel dimension on table edges shall not exceed 4 mm (where $b_1$ is measured, the table bevel edges are not considered). On the fixed saw blade flange side of the table, the distance, $b_2$, between the fixed saw blade flange and the edge of the table slot shall not exceed 3 mm.

Dimensions in millimetres




**Key**

$b_1$ total width of the table slot for the saw blade

$b_2$ distance between the fixed saw blade flange and the edge of the table slot

**Figure 9 — Width of a table slot and distance between the fixed saw flange and the table slot edge**

As an exception, the width of the slot may exceed the above dimension up to a maximum of 25 mm on machines equipped with a milling tool for grooving. In this case, an additional table insert for grooving shall be provided.

Table inserts shall not be capable of being removed without the aid of a tool.

In cases where the saw blade is changed from above the table, the table insert shall have a minimum width on the non-fixed flange side in accordance with the dimension $b_3$ in Annex H.

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

### 5.6.2 Access to the saw blade part below the machine table

Access to the part of the tools (saw blade, milling tool) below the table shall be prevented either by

— fixed guards, for example a table insert, or

— movable or dismountable guards interlocked with the drives, or

— both of the above options.

Where a dismountable interlocked guard is provided, it shall not be possible to re-mount it in a wrong way.

Any slot in the machine frame required for the adjustment of the saw blades shall be designed in accordance with the safety distances in ISO 13857:2019, Table 4. As an exception, the safety distance from the frame surface to the saw blades in any position may be reduced to:

— 120 mm if the slot width does not exceed 30 mm, or

— 200 mm if the slot width does not exceed 35 mm, or

— 120 mm if the slot width does not exceed 35 mm and straight access to the saw blades is impeded, or

— 200 mm if the slot width does not exceed 45 mm and straight access to the saw blades is impeded.

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

#### 5.6.3 Guarding of drives

A movable or dismountable guard interlocked to the saw blade drive shall be provided if access is required for changing the saw blade's rotational speed by changing the belt position.

Access to the saw blade drives (i.e. belts) through the slots in the machine frame required for the adjustment of tools and for dust extraction pipes shall be impeded, but the requirements of ISO 13857:2019 on fixed guards and distance guards do not apply.

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

### 5.7 Impact hazard

ISO 19085-1:2021, 5.7 is replaced by the following text.

The speed for the power-operated movement of the fences shall not exceed 25 m $min^{-1}$.

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

### 5.8 Clamping devices

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

The full clamping force of each clamping unit shall be at least 700 N over the whole range of adjustment of the clamping device.

Where pneumatic clamping is provided, 6.7 applies.

### 5.9 Measures against ejection

#### 5.9.1 General

ISO 19085-1:2021, 5.9.1 applies.

#### 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.

#### 5.9.2.2 Guards class A

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

#### 5.9.2.3 Guards class B

ISO 19085-1:2021, 5.9.2.3 applies with the following additions.

The guards shall pass the test required in Annex E.

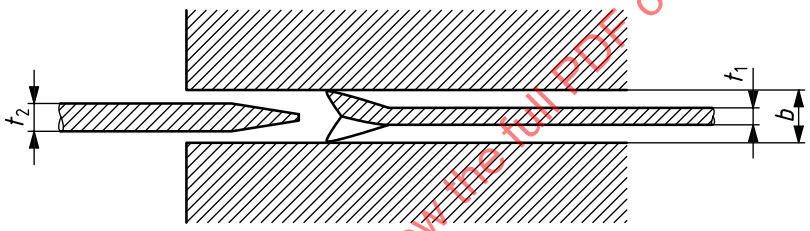
### 5.9.3 Anti-kickback devices

Subclause specific to this document.

To reduce the risk of kickback, the machine shall be supplied with a riving knife mounting arrangement and one or more riving knives to accommodate the range of saw blades, which are intended for use with the machine.

The riving knives shall be in accordance with the following requirements.

a) They shall be manufactured from steel with an ultimate tensile strength of at least 580 N mm$^{-2}$ or of a comparable material, have flat sides (within 0,2 mm per 100 mm) and shall have a thickness, $t_2$, less than the width of cut, *b,* (kerf) and at least 0,2 mm greater than the saw blade plate, $t_1$ (see Figure 10).




**Key**

| | | | |
|---|---|---|---|
| $b$ | kerf (width of saw blade cut) | $t_2$ | riving knife thickness |
| $t_1$ | saw blade plate thickness | | |

**Figure 10 — Riving knife thickness in relation to saw blade dimensions**

b) They shall be of constant thickness (within ±0,1 mm) throughout their working length; their leading edges shall be chamfered to provide a lead-in.

c) They shall be capable of vertical adjustment so that their tip shall reach a level between 0 mm and 2 mm below the highest point on the periphery of the saw blade when set in accordance with the requirements of 5.9.3 d) [see Figure 11 and 7.3.2 f)]. The riving knife designed to carry saw blade guards may reach a level higher than the highest point on the periphery of the saw blade except for grooving with the saw blade (see Figure 5).

Dimensions in millimetres

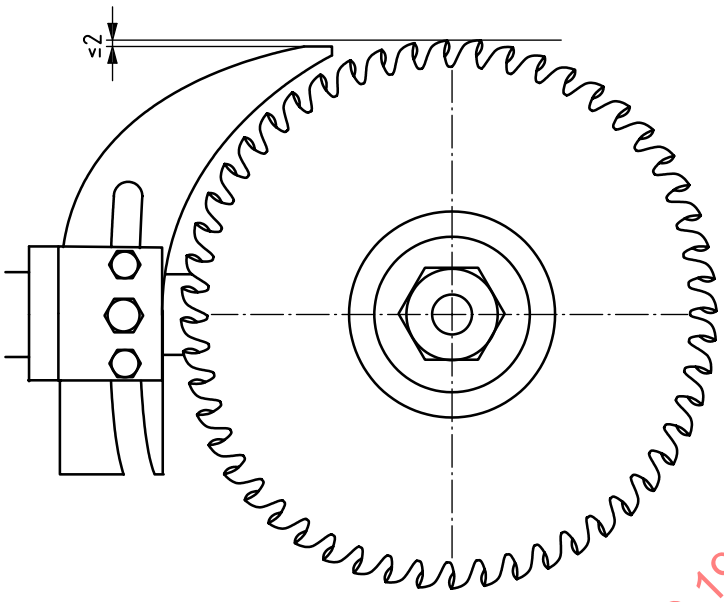



**Figure 11 — Riving knife height adjustment**

d) They shall be designed to be mounted and adjusted so that the gap between them 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 in the area above the table (see Figure 12).

Dimensions in millimetres

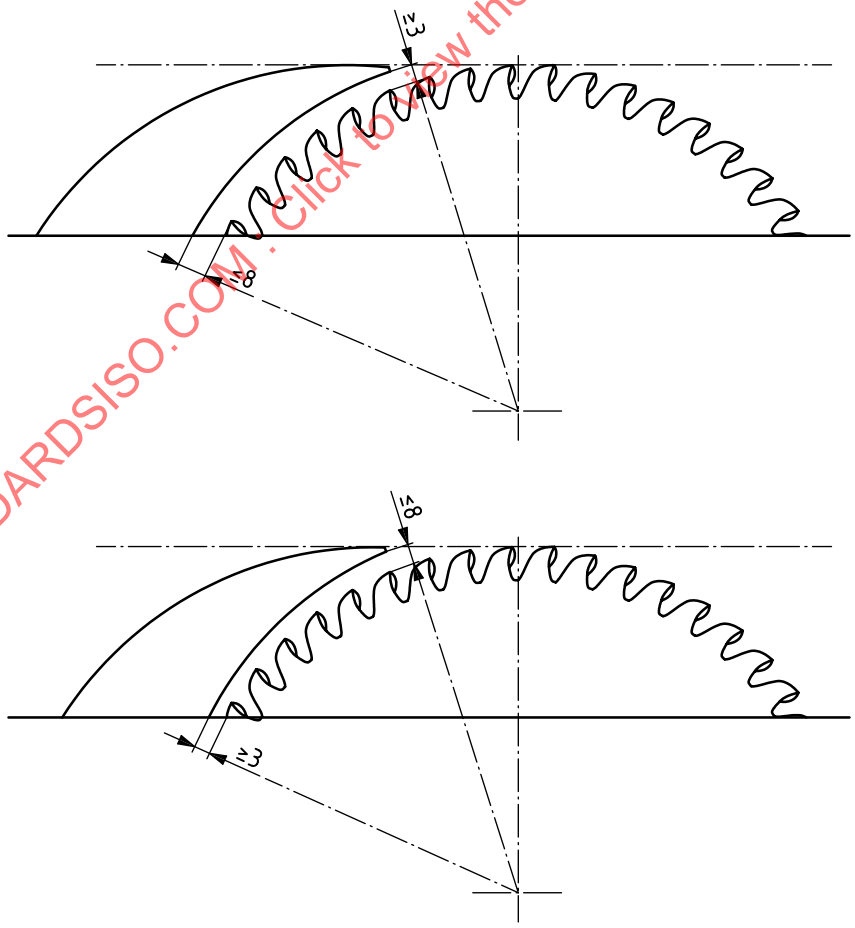
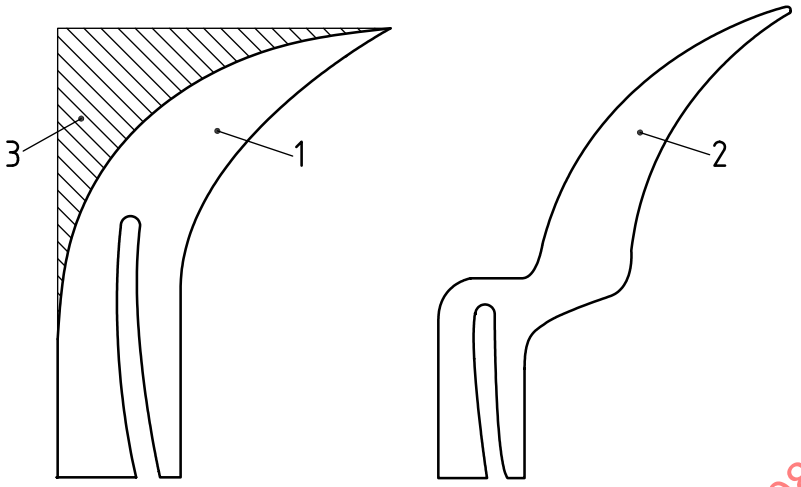



**Figure 12 — Positioning limits for riving knife design**

e) Their front and rear contours shall be continuous curves or straight lines, without any flexure which can weaken it (see Figure 13).

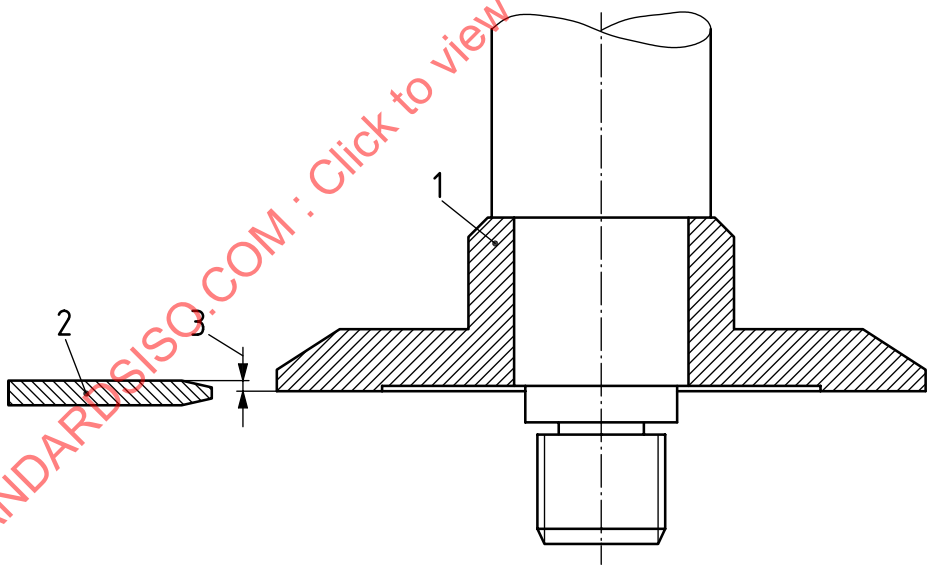



**Key**

1 example of an acceptable riving knife shape
2 example of an unacceptable riving knife shape
3 shape of riving knife for machines with a riving knife mounted saw blade guard

**Figure 13 — Examples of the shapes of riving knife**

f) Their mounting arrangement shall provide a positive offset of their position relative to the rear saw flange of not more than 0,5 mm (see Figure 14 Key 3); this offset shall be maintained with the rise, fall and tilt of the saw blade.



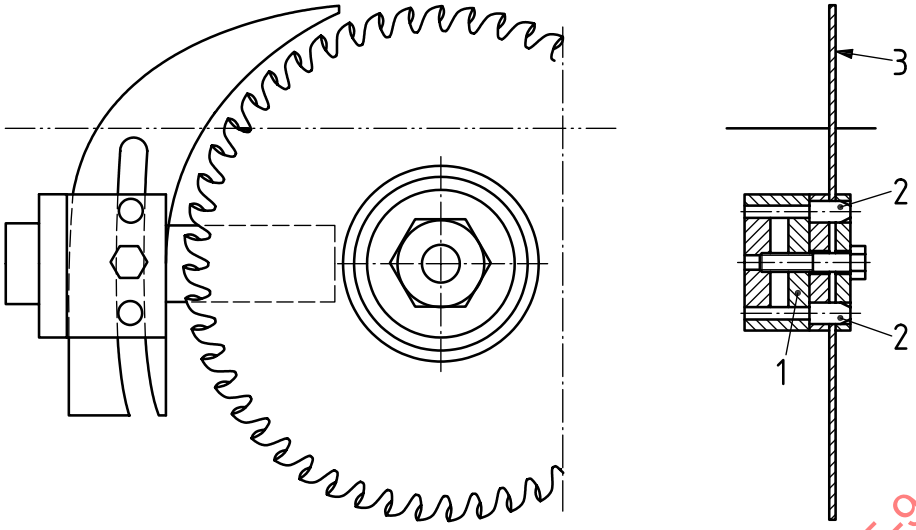

**Key**

1 rear saw flange
2 riving knife
3 0,5 mm maximum

**Figure 14 — Positioning of the riving knife in relation to the fixed saw flange**

g) They and their mounting arrangements shall be longitudinally and laterally rigid in accordance with the tests in Annex G.

h) They shall be held in position by guiding elements, for example, guiding pins (see Figure 15); their fixing slot shall be not more than 0,5 mm wider than the guiding elements.




**Key**

1 riving knife mounting arrangement
2 guiding pins
3 riving knife

**Figure 15 — Example of a riving knife mounting arrangement with guiding pins**

i) Their fixing slots shall be open-ended if it is necessary to change them to accommodate different diameters of saw blade.

Verification is done by checking relevant drawings, measurement, inspection and relevant functional testing of the machine and performing the riving knife rigidity tests given in 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 Rip fence

The machine shall be equipped with a rip fence to allow the cutting of different workpiece widths. The rip fence shall fulfil the following requirements.

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

b) It shall be adjustable so that its out-feed end can be moved forward at least to a point in line with the rear edge of the main saw blade at table level, and rearwards to a point at table level which is in line with the first cutting tooth of the largest main saw blade for which the machine is designed and adjusted to the maximum cutting height.

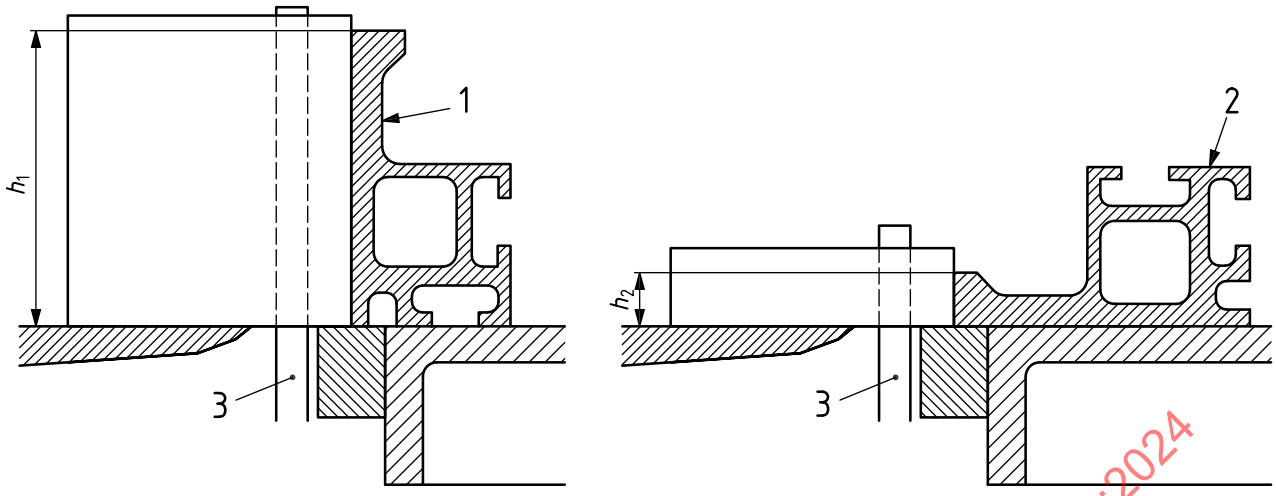
c) It shall be manufactured from a single component, having two guiding surfaces, a higher one with a height, $h_1$, for deep cutting and a lower one with a height, $h_2$, for shallow or angled cutting (see Figure 16). The height $h_2$ shall be between 5 mm and 15 mm and the height $h_1$ shall be at least

   1) 30 mm for machines designed to be used with saw blades of maximum diameter up to 200 mm,

   2) 50 mm for machines designed to be used with saw blades of maximum diameter higher than 200 mm and up to 315 mm, or

   3) 90 mm for machines designed to be used with saw blades of maximum diameter higher than 315 mm.

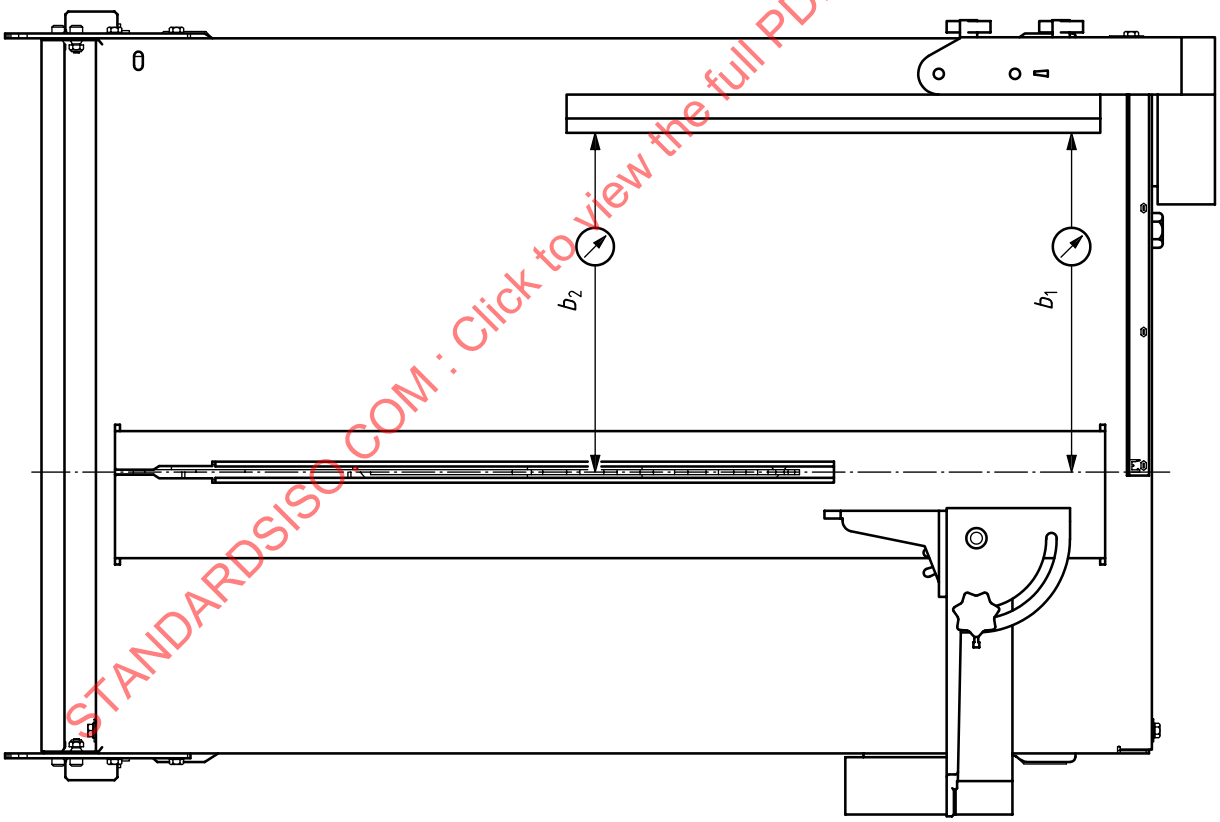
d) After adjustment, its workpiece guiding surface shall remain in a vertical plane and be parallel to the cutting line of the saw blade where a deviation from exact parallelism with $b_2 > b_1$ is necessary to prevent jamming (see Figure 17).




**Key**

| | | | |
|---|---|---|---|
| 1 | rip fence in high position for deep cutting | $h_1$ | height of the higher guiding surface |
| 2 | rip fence in low position for shallow or angled cutting | $h_2$ | height of the lower guiding surface |
| 3 | saw blade | | |

**Figure 16 — Dimensions of the high and low guiding parts of the fence**




**Key**

| | | | |
|---|---|---|---|
| $b_1$ | distance 1 to cutting line | $b_2$ | distance 2 to cutting line |

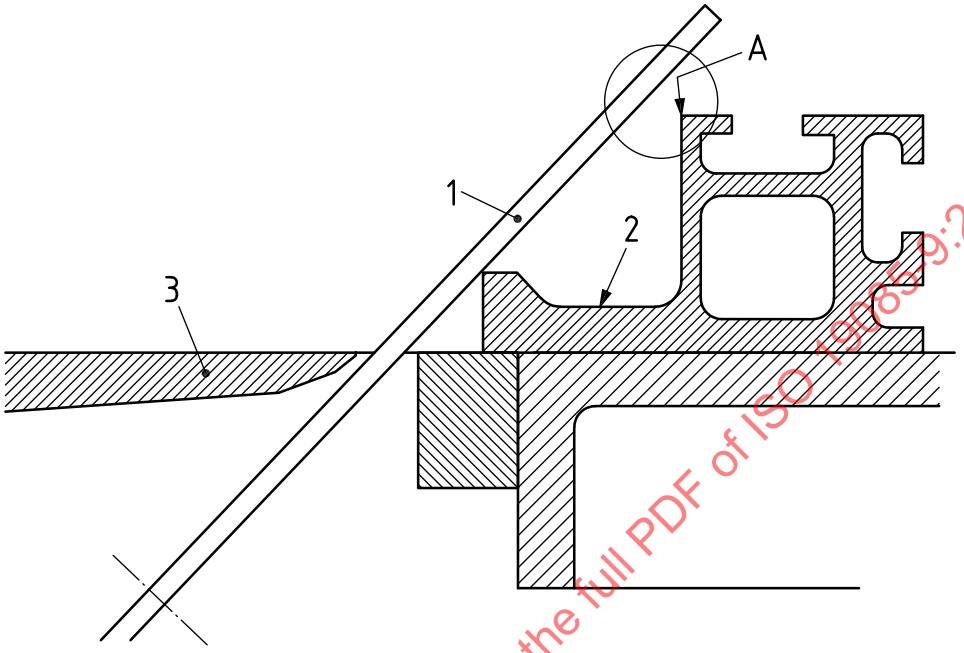
**Figure 17 — Rip fence parallelism adjustment**

e) It shall be made so that the saw blade fully tilted is not capable of touching point A of the rip fence in its low position, as shown in Figure 18.

f) With the rip fence in its low position, it shall be possible to lower the saw blade guard for vertical cuts, i.e. without extension piece, to the height of the workpiece guiding part of the fence.

g) It shall have a minimum length equal to half the minimum machine table length, $l_1$, plus the radius of the biggest saw blade that can be mounted (see Table H.1).

h) Adjustment, switching between high and low guiding surface and fixing of the rip fence position shall be possible without the aid of a tool.




**Key**

| | | | |
|---|---|---|---|
| 1 | saw blade in maximum tilted position | 3 | machine table |
| 2 | rip fence in low position | A | reference contact point |

**Figure 18 — Design of rip fence in low position**

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

### 5.10.2 Cross-cut fence

The machine shall be equipped with a cross-cut fence (fixed to the sliding table or removable, see, for example, Figure 1 Key 6). The fixing arrangement shall ensure that the fence cannot rise or swing out of position during use. If the cross-cut fence extends beneath the saw blade guard, then the height of that section shall not exceed 15 mm.

If the workpiece guiding part of the cross-cut fence is adjustable in length and if there is a possibility of contact between the cross-cut fence and the saw blade, this part of the fence shall be made of easily machinable material.

Adjustment and fixing of the cross-cut fence position shall be possible without the aid of a tool.

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

### 5.10.3 Machine table

The dimensions of the machine table shall be in accordance with the requirements of Annex H.

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

### 5.10.4 Extension table

Machines where the distance between the centre line of the saw spindle and the far end of the table is less than dimension $l_3$ in Figure H.1 shall be provided with an extension table to fulfil this requirement.

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

## 5.11 Safety appliances

Subclause specific to this document.

A push stick (see Figure 19) and a push block handle (see Figure 20) shall be provided. Provision shall be made for storing the push stick and push block handle on the machine.

Push sticks and push block handles shall be made from plastic, wood or plywood.

The minimum length for push sticks shall be 400 mm and the mouth of the push stick shall be manufactured in accordance with the dimensions given in Figure 19. An example of a push stick profile is shown in Figure 19.

On machines with a riving knife mounted saw blade, guard mounting arrangements for a safety appliance for grooving shall be provided, for example, fastening gibs at the rip fence [see 7.3.2 i) for the design characteristics of such a safety appliance].

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

Dimensions in millimetres

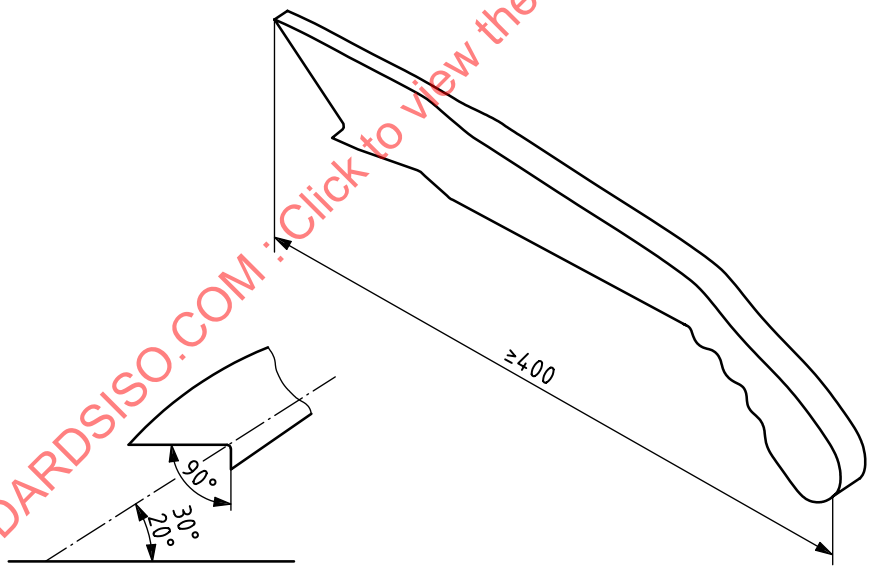
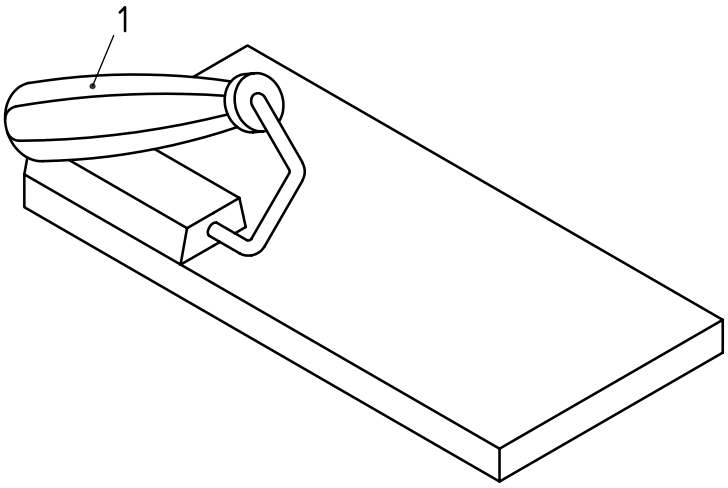



**Figure 19 — Example of a push stick**




**Key**

1 push block handle

**Figure 20 — Example of a push block**

# 6 Safety requirements and measures for protection against other hazards

## 6.1 Fire

ISO 19085-1:2021, 6.1 applies with the following additions.

Also, see 6.12 to avoid contact between the main saw blade and the scoring saw blade and 5.2 to avoid sparks as a result of contact between the saw blade and the machine table slot lining.

## 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 and declaration

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

Annex F shall be applied for noise test and declaration of the circular saw benches or table saws.

## 6.3 Emission of chips and dust

ISO 19085-1:2021, 6.3 applies with the following additions.

The part of the saw blade situated below the table shall be enclosed by a hood, which shall have an extraction outlet.

The saw blade guard shall be provided with an extraction outlet (see Figure 1).

A proper chips and dust extraction can be obtained with the recommended total air flow rates specified in Table 1.

**Table 1 — Relation between the maximum saw blade diameter and total air flow rate**

| Maximum saw blade diameter<br>$d$<br>mm | Minimum airflow<br><br>$m^3h^{-1}$ |
|---|---|
| ≤250 | 550 |
| 250 < $d$ ≤ 315 | 850 |
| 315 < $d$ < 400 | 1 100 |
| ≥400 | 1 400 |

## 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.

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

Provision shall be made for storing the tools necessary for changing the saw blade and for adjusting of the riving knife on the machine.

The holders for the safety appliances required in 5.11 shall be positioned so that the operator can reach the safety appliances from the normal working position. For a possible position of the push sticks on machines with saw blade guard mounted separately from the riving knife, see Figure 1 a) Key 12.

Handles, levers and latches or mechanically adjustable units used for normal operation shall be reachable from the operator's position. No minimum height requirement applies.

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

## 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.

## 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 with the following additions.

When a scoring saw blade is mounted, it shall not be possible to mount a main saw blade that would come in contact with it, taking into account of all height adjustment positions of the saw blades.

### 6.13 Isolation

ISO 19085-1:2021, 6.13 applies.

### 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:

a) the maximum and minimum diameters of the saw blades for which the machine is designed;

b) the bore diameter of the saw blades;

c) on machines with a tiltable saw blade and a saw blade guard mounted separately from the riving knife, a pictogram meaning "Change the guard before tilting the saw blade" or a message on the screen before tilting starts;

d) on machines fitted with a facility for grooving with milling tool, a pictogram meaning the following: "Change the guard before grooving with milling tools";

e) each riving knife shall be permanently marked with:

   1) its thickness;

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

   3) the width of its relevant mounting slot.

Verification is done by checking relevant drawings and inspection of 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 applies with the following additions.

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

a) instruction to refrain from working without the saw blade guard when sawing and to refrain from working with the safety appliance for grooving in the non-protective position when grooving;

b) instruction for safe operations shall also include a description on proper use of:

   1) manually operated tables (if provided);

   2) cross-cut fence;

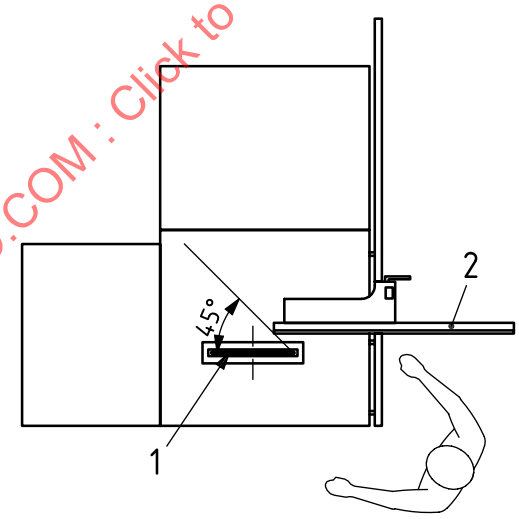
   3) demountable power feed unit;

   4) safety appliances provided in accordance with 5.11;

   5) rip fence to avoid kickback:

      i) during ripping, the front end of the rip fence to be positioned close to an imaginary line at 45° on the table from the front end of the saw blade (see Figure 21), and

      ii) during sawing using cross-cut fence, the front end of the rip fence to be positioned before the front end of the saw blade (see Figure 22) or not in contact with the workpiece (retracted position);




**Key**

1 saw blade

2 rip fence

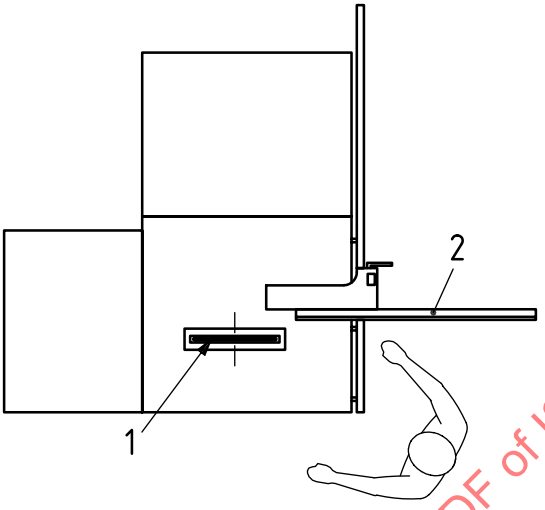
**Figure 21 — Rip fence front end position during ripping**

c) on machines with a facility for grooving with milling tools, instruction to use only milling tools for hand feed with a cutting width of less than or equal to 20 mm, marked MAN in accordance with EN 847-1:2017;

d) on machines with a facility for grooving with milling tools, instructions on how to set the machine for grooving and back to normal sawing operation, with particular attention to the remounting and adjusting of the riving knife;

e) guidance on the selection of the correct riving knife for different saw blade dimensions;

f) instructions 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 not exceed 8 mm;




**Key**

1 saw blade

2 rip fence

**Figure 22 — Rip fence front end position during cross-cutting**

g) instructions that during grooving with the saw blade, the riving knife shall be set so that it reaches a level between 0 mm and 2 mm below the highest point on the periphery of the saw blade;

h) instruction that, after grooving, the saw blade guard shall be remounted to the riving knife on machines with this feature;

i) instruction that push blocks or push sticks shall be used when cutting small workpieces and in circumstances where it is necessary to push the workpiece against the fence;

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

k) design specifications for manufacturing the safeguard for grooving with the saw blade in machines with riving-knife-mounted saw blade guard, including that such a safeguard shall be

   1) adjustable with the rip fence to cover the saw blade,

   2) made of easily machinable material (see ISO 19085-1:2021, 3.3),

   3) of a length of 400 mm, and

   4) of a dimension square to the rip fence of at least 200 mm;

l) on machines with the device for tilting the saw blade, instruction to use the auxiliary guard or the guard with extension pieces before tilting, and to restore the machine with the narrow saw blade guard when it is set for vertical cuts;

m) on machines with a facility for tilting the saw blade, instruction to adjust the rip fence or the cross-cut fence or both to the correct positions, to avoid contact with the tilted saw blade.

# 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 circular saw benches, 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 | 5.3, 5.6, 5.10, 6.15, 7.2, 7.3 |
| | b) relative location | | 4.2, 5.6, 6.5, 7.2 |
| | c) mass and stability (potential energy of elements which may move under effect of gravity) | | 4.9 |
| | d) mass and velocity (kinetic energy of elements in controlled or uncontrolled motion) | | 4.3, 4.8, 5.4, 5.6, 5.10 |
| | e) mechanical strength | | 5.9 |
| | — the accumulation of energy inside the machinery due to liquids and gases under pressure | 6.2.10, 6.3.5.4 | 4.8, 6.7, 6.13 |
| 1.1 | Crushing hazard | — | 4.14, 5.4, 5.6, 5.8, 5.10, 6.13 |
| 1.2 | Shearing hazard | | 4.14, 5.4, 5.6, 5.10, 6.13 |
| 1.3 | Cutting or severing hazard | | 4.3, 4.5, 4.8, 5.3, 5.4, 5.6, 6.13 |
| 1.4 | Entanglement hazard | | 4.4, 4.5, 5.6, 5.10, 6.13 |
| 1.5 | Drawing-in or trapping hazard | | 4.3, 4.4, 4.5, 5.4, 5.6, 5.10, 6.13 |
| 1.6 | Impact hazard | | 4.11, 5.10 |
| 1.9 | High pressure fluid injection or ejection hazard | | 5.9, 6.8, 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 |

**Table A.1** *(continued)*

| No. | Hazards, hazardous situations and hazardous events | Subclause of ISO 12100:2010 | Subclause of this document |
|---|---|---|---|
| 7 | Hazards generated by materials and substances (and their constituent elements) processed or used by the machinery | — | — |
| 7.1 | Hazards from contact with or inhalation of harmful fluids and dusts | 6.2.3, 6.2.4 | 6.3, 7.3 |
| 7.2 | Fire hazard | 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 | 6.2.8.3 | 6.5 |
| 8.4 | Local lighting | 6.2.8.6 | 6.6, 7.3 |
| 8.5 | Mental overload and underload, stress | 6.2.8.5 | 7.3 |
| 8.6 | Human error, human behaviour | 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 f), 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, 4.4, 4.7, 4.8, 5.6, 6.13, 6.14 |
| 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 |
| 10.2 | Restoration of energy supply after an interruption | 6.2.11.4 | 4.8, 6.7 |
| 10.3 | External influences on electrical equipment | 6.2.11.11 | 4.1, 6.9 |
| 10.4 | Other external influences (gravity) | 6.2.12.2 | 5.10 |
| 10.5 | Errors in the software | 6.2.11.7 | 4.1, 4.14 |
| 10.6 | Errors made by the operator (due to a mismatch of machinery with human characteristics and abilities; see 8.6) | 6.2.8, 6.2.11.8, 6.2.11.10, 6.3.5.2, 6.4 | 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, 6.13 |
| 12 | Variation 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 | 4.8 |
| 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 | 5.2, 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 |

# 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. Refer to Clauses 4 and 5 for full requirements.

**Table B.1 — Safety functions and performance level required**

| Area | | Safety functions/devices | $PL_r$ | Subclause of ISO 19085-1:2021 | Subclause in this document |
|---|---|---|---|---|---|
| Start | 1 | Prevention of unexpected start | c | 4.3.1 | |
| | 2 | Interlocking of start with safeguards | c | 4.3.1 | |
| | 3 | Interlocking of powered feed with tool rotation | c | 4.3.1 | |
| | 4 | Interlocking of scoring saw blade drive with main saw blade drive | c | | 4.3.1 |
| Stop | 5 | Normal stop (breaking function excluded) | c | 4.4.2 | |
| | 6 | Emergency stop (breaking function excluded) | c | 4.4.4 | |
| Tool braking | 7 | Activation of the brakes | c | 4.5 | |
| | 8 | Electric braking system (excluding PDS/SR) | b | 4.5 | |
| | 9 | SS1 of PDS/SR | c | 4.5 | |
| | 10 | Interlocking of brake release | c | 5.4.3 | |
| Spindle speed | 11 | Speed indication | b | 4.7.1 | |
| | 12 | Speed selection | c | 4.7.2 | |
| | 13 | Speed monitoring | c | 4.7.3 | |
| Controls | 14 | Speed monitoring of moving parts (except tools) | b | 4.11 | |
| | 15 | Time delay | c | 4.12 | |
| Axes movements | 16 | Initiation control | c | | 4.14.1 |
| | 17 | Detection of the position of the rip fence within the collision area | c | | 4.14.1 |
| | 18 | Limitation of concurrent movements under hold-to-run control | b | | 4.14.1 |
| | 19 | Prevention of unexpected start | c | | 4.14.1 |
| | 20 | Detection of crushing area for the body (500 mm) | c | | 4.14.2 |
| | 21 | limiting the power-operated movement force (400 N) | c | | 4.14.2 |
| | 22 | Detection of shearing/crushing area for arm/hand (120 mm) / finger (25 mm) | c | | 4.14.3 |
| | 23 | limiting the power-operated movement force (150 N) | c | | 4.14.3 |
| Safeguards | 24 | Interlocking of movable guards | c | 5.5.2.2 | |
| | 25 | Hold-to-run | b/c | 5.5.3 | |
| | 26 | Interlocking of dangerous movements with PSPE | c | 5.5.6 | |

# Annex C
(normative)

# Stability test

ISO 19085-1:2021, Annex C applies.

# Annex D
(normative)

# Test for braking function

ISO 19085-1:2021, Annex D applies.

# Annex E
(normative)

# Impact test for guards

ISO 19085-1:2021, Annex E applies.