
Woodworking machines — Safety —
Part 14:
Four-sided moulding machines

Machines à bois — Sécurité —

Partie 14: Machines à moulurer sur quatre faces

STANDARDSISO.COM : Click to view the full PDF of ISO 19085-14:2021



STANDARDSISO.COM : Click to view the full PDF of ISO 19085-14:2021



COPYRIGHT PROTECTED DOCUMENT

© ISO 2021

All rights reserved. Unless otherwise specified, or required in the context of its implementation, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Email: copyright@iso.org
Website: www.iso.org

Published in Switzerland

Contents

	Page
Foreword.....	v
Introduction.....	vi
1 Scope.....	1
2 Normative references.....	2
3 Terms and definitions.....	2
4 Safety requirements and measures for controls.....	6
4.1 Safety and reliability of control systems.....	6
4.2 Control devices.....	6
4.3 Start.....	7
4.3.1 Direct start.....	7
4.3.2 Start via control power-on.....	7
4.3.3 Integrated feed.....	7
4.3.4 Laser marking unit.....	7
4.4 Safe stops.....	7
4.4.1 General.....	7
4.4.2 Normal stop.....	8
4.4.3 Operational stop.....	8
4.4.4 Emergency stop.....	8
4.5 Braking function of tools.....	8
4.6 Mode selection.....	8
4.6.1 MODE 2.....	8
4.6.2 MODE 3.....	8
4.7 Tool speed changing.....	10
4.7.1 Speed changing by shifting the belts on the pulleys.....	10
4.7.2 Speed changing by incremental speed change motor.....	10
4.7.3 Infinitely variable speed by frequency inverter.....	10
4.7.4 Direction of spindle rotation.....	10
4.8 Failure of any power supply.....	11
4.9 Manual reset control.....	11
4.10 Standstill detection and monitoring.....	11
4.11 Machine moving parts speed monitoring.....	11
4.12 Time delay.....	11
4.13 Tele-service.....	11
5 Safety requirements and measures for protection against mechanical hazards.....	12
5.1 Stability.....	12
5.2 Risk of break-up during operation.....	12
5.3 Tool and tool fixing design.....	12
5.3.1 General.....	12
5.3.2 Spindle locking.....	13
5.3.3 Circular saw blade fixing device.....	13
5.3.4 Flange dimensions for circular saw blades.....	13
5.3.5 Spindle rings.....	13
5.4 Braking.....	13
5.4.1 Braking of tools.....	13
5.4.2 Maximum run-down time.....	13
5.4.3 Brake release.....	13
5.5 Safeguards.....	13
5.5.1 Fixed guards.....	13
5.5.2 Interlocking moveable guards.....	13
5.5.3 Hold-to-run control.....	14
5.5.4 Two hand control.....	14
5.5.5 Electro-sensitive protective equipment (ESPE).....	14

5.5.6	Pressure sensitive protective equipment (PSPE)	14
5.5.7	Enabling control	14
5.6	Prevention of access to hazardous moving parts	14
5.6.1	Guarding of tools	14
5.6.2	Guarding of drives	16
5.6.3	Safeguarding of feed mechanisms	17
5.7	Impact hazard	18
5.8	Clamping devices	18
5.9	Measures against ejection	19
5.9.1	General	19
5.9.2	Guards materials and characteristics	19
5.9.3	Devices to minimize the possibility or effect of ejection or kickback	19
5.10	Workpiece support and guides	24
5.10.1	General	24
5.10.2	In-feed hopper	25
5.10.3	Loading magazine	25
5.10.4	Automatic workpiece returner	26
6	Safety requirements and measures for protection against other hazards	26
6.1	Fire	26
6.2	Noise	27
6.2.1	Noise reduction at the design stage	27
6.2.2	Noise emission measurement and declaration	27
6.3	Emission of chips and dust	27
6.4	Electricity	27
6.5	Ergonomics and handling	27
6.6	Lighting	27
6.7	Pneumatics	27
6.8	Hydraulics	27
6.9	Electromagnetic compatibility	28
6.10	Laser	28
6.11	Static electricity	28
6.12	Errors of fitting	28
6.13	Isolation	28
6.14	Maintenance	28
6.15	Relevant but not significant hazards	28
7	Information for use	28
7.1	Warning devices	28
7.2	Marking	28
7.2.1	General	28
7.2.2	Additional markings	28
7.3	Instruction handbook	29
7.3.1	General	29
7.3.2	Additional information	29
	Annex A (informative) List of significant hazards	31
	Annex B (informative) Performance levels required	33
	Annex C (normative) Stability test	35
	Annex D (normative) Tests for braking function	36
	Annex E (normative) Impact test for guards	37
	Annex F (normative) Noise test code	38
	Annex G (normative) Table lip resistance test	42
	Bibliography	45

Foreword

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

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

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

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

For an explanation 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).

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.

This document is intended to be used in conjunction with ISO 19085-1:2021, which gives requirements common to different machine types.

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

Introduction

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

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

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 (regulators, accident prevention organisations, market surveillance etc.)

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 at 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.

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

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

[Clauses 1](#) to [3](#) are specific to each part and, therefore, replace ISO 19085-1:2021, Clauses 1 to 3.

For [Clauses 4](#) to [7](#) and the annexes, ISO 19085-1:2021, Clauses 4 to 7 and Annexes, each subclause can be:

- 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.”.

STANDARDSISO.COM : Click to view the full PDF of ISO 19085-14:2021

STANDARDSISO.COM : Click to view the full PDF of ISO 19085-14:2021

Woodworking machines — Safety —

Part 14: Four-sided moulding machines

1 Scope

This document gives the safety requirements and measures for four-sided moulding machines, capable of continuous production use, with a maximum working width of 350 mm and a maximum speed of the integrated workpiece feed of 200 m/min, hereinafter referred to as “machines” designed to cut solid wood and materials with similar physical characteristics to wood (see ISO 19085-1:2021, 3.2).

It deals with all significant hazards, hazardous situations and events, 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. Also, transport, assembly, dismantling, disabling and scrapping phases are taken into account.

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

- universal spindle;
- glass bead saw unit;
- fixed or movable workpiece support;
- quick tool changing system;
- laser marking unit;
- automatic workpiece returner;
- in-feed hopper;
- loading magazine;
- unloading table.

This document does not deal with any hazards related to:

- a) in-feed devices other than in-feed hopper and loading magazine;

NOTE 1 For mechanical in-feed devices which also prevent access to the in-feed opening, see 6.6.4.

- b) out-feed devices other than unloading table, except for hazards related to ejection from the machine due to climb cutting;
- c) out-feed of workpieces on machines with feed speed higher than 60 m/min;

NOTE 2 Machines with feed speed higher than 60 m/min are usually combined with mechanical unloading and workpiece transfer systems.

- d) machines being used in combination with any other machine (as part of a line).

It is not applicable to machines intended for use in potentially explosive atmosphere and to machines manufactured prior to its publication.

2 Normative references

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

ISO 286-2:2010, *Geometrical product specifications (GPS) — ISO code system for tolerances on linear sizes — Part 2: Tables of standard tolerance classes and limit deviations for holes and shafts*

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

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

ISO 13857:2019, *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*

IEC 60825-1:2014, *Safety of laser products – Part 1: Equipment classification and requirements*

EN 847-1:2017, *Tools for woodworking — Safety requirements — Part 1: Milling tools, circular saw blades*

EN 1837:1999+A1:2009, *Safety of machinery — Integral lighting of machines*

EN 12198-1:2000+A1:2008, *Safety of machinery — Assessment and reduction of risks arising from radiation emitted by machinery — Part 1: General principles*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 12100:2010, ISO 13849-1:2015, ISO 19085-1:2021 and the following apply.

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

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

3.1
four-sided moulding machine
machine for four-sided longitudinal processing with four or more working units with spindles, which can be equipped with planing and/or moulding tools, at least one unit on each side of the workpiece, and with integrated feed of the workpiece

Note 1 to entry: machines where the first feed roller is fitted after the first tool and machines where the feed roller before the first bottom spindle can be raised up for the purpose of straightening are, for the purpose of this document, also integrated fed machines.

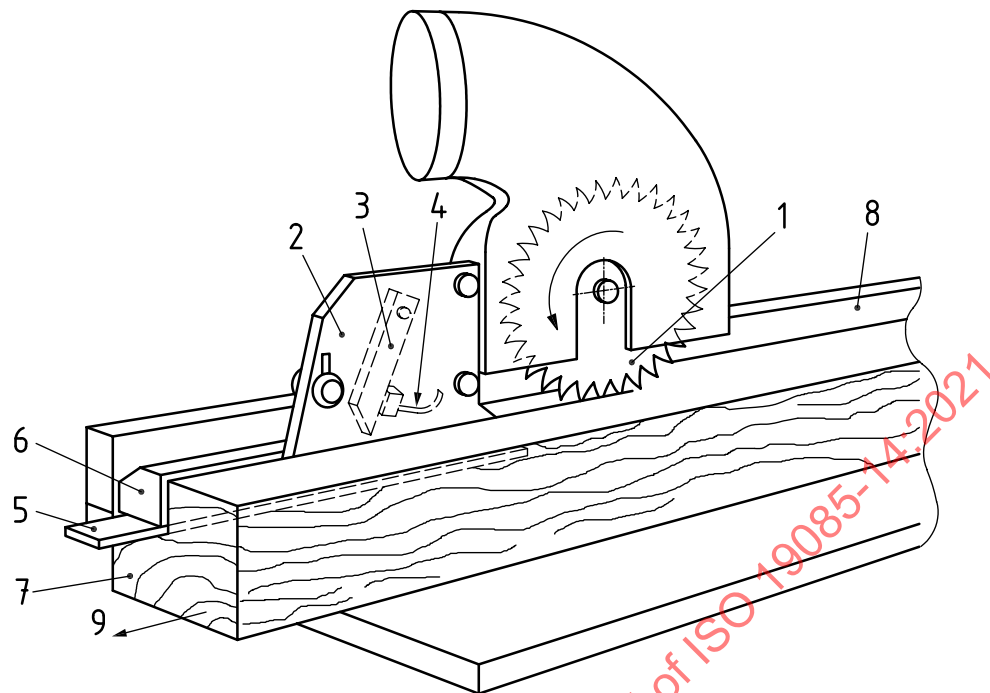
3.2
universal spindle

working unit whose position can be changed manually or under power so as to allow it to work at different positions around the workpiece

3.3
glass bead saw unit

working unit fitted with a tool, usually a saw blade, with or without coaxially mounted milling tool, to cut out a glass bead from the machined profile of the workpiece

Note 1 to entry: An example of glass bead saw unit is shown in [Figure 1](#).

**Key**

1 glass bead saw-blade	2 bed ledge separator	3 anti-kickback finger
4 pressure device	5 guiding channel for glass bead ledge	6 glass bead ledge
7 workpiece	8 fence	9 feed direction

Figure 1 — Example of glass bead saw unit

3.4 in-feed hopper

device to hold a stack of workpieces at the in-feed, so that, after the lowest one is fed, the next one can be fed to the machine automatically

Note 1 to entry: An example of in-feed hopper is shown in [Figure 2](#).

3.5 loading magazine

system where the workpieces are loaded, independently from the operational sequence of the machine, with a device to bring them to the machine feed in sequence

Note 1 to entry: An example of loading magazine is shown in [Figure 3](#) (safeguarding not complete).

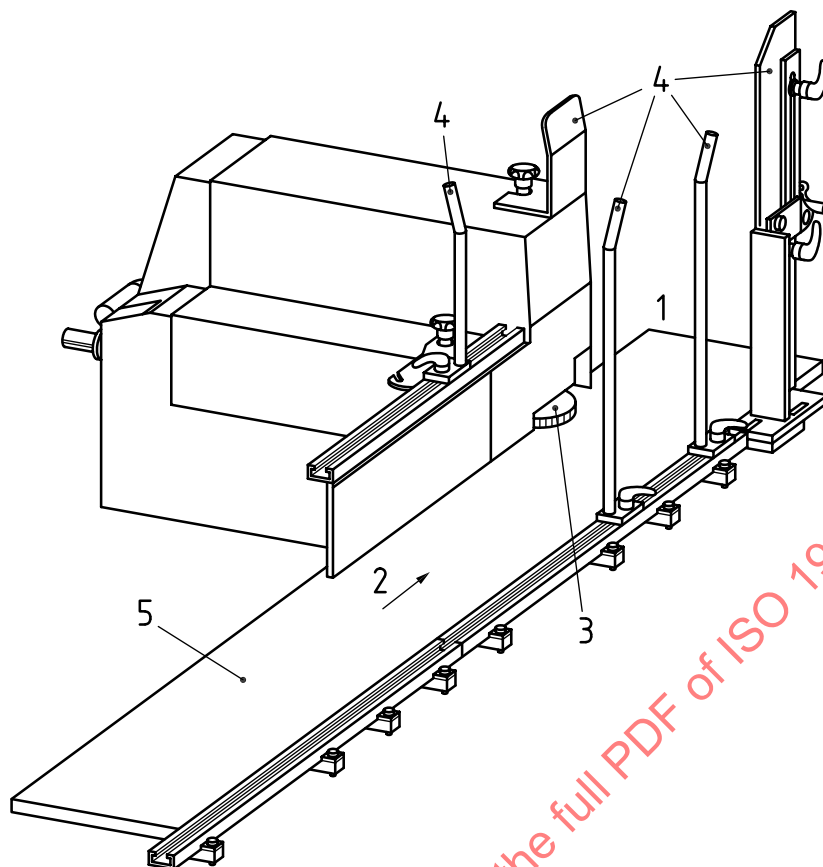
3.6 automatic workpiece returner

powered system that brings the machined workpiece from the machine end to the loading position

Note 1 to entry: An example of automatic workpiece returner is shown in [Figure 4](#) (safeguarding not complete).

3.7 integral enclosure

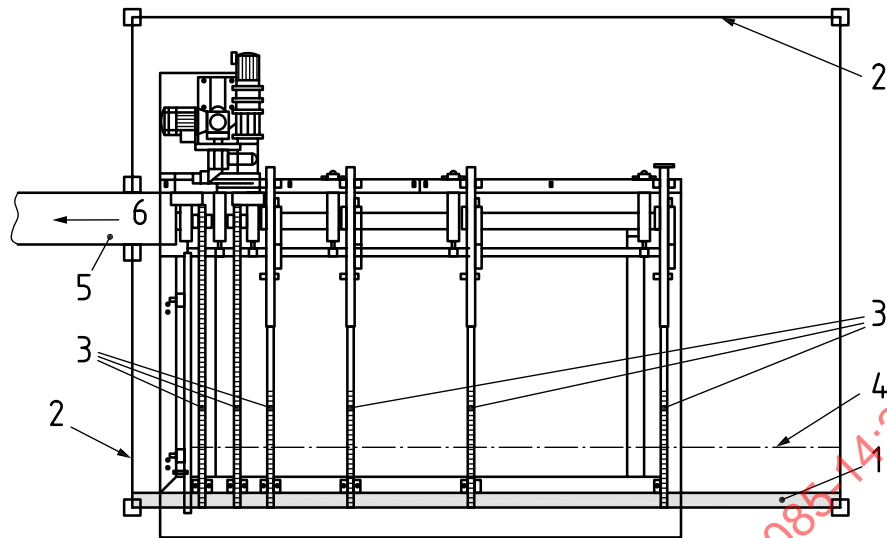
guarding designed to fit close to the machine and provide a measure of noise attenuation and where certain setting adjustments can be available outside the enclosure



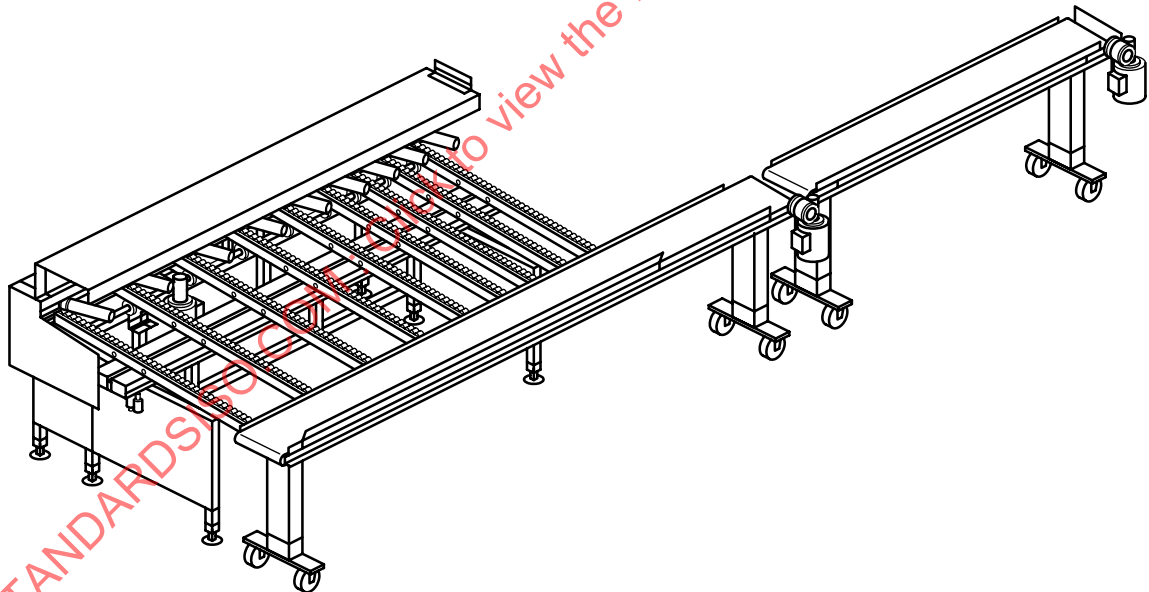
Key

- | | | | |
|---|----------------------------|---|----------------------------------|
| 1 | in-feed-end of the machine | 4 | workpieces stack vertical guides |
| 2 | feed direction | 5 | workpiece support |
| 3 | feed roller | | |

Figure 2 — Example of in-feed hopper

**Key**

- | | | | |
|---|----------------------|---|-----------------------|
| 1 | fixed guard | 4 | AOPD |
| 2 | lateral fence | 5 | machine in-feed table |
| 3 | loading belts/chains | 6 | feed direction |

Figure 3 — Example of loading magazine**Figure 4 — Example of automatic workpiece returner**

3.8 complete enclosure

total machine enclosure primarily designed for noise attenuation and to permit the operator to move around freely within it and where all machine setting and adjustments are available inside it and access is normally through a door/opening

Note 1 to entry: The complete enclosure usually contains openings for workpiece loading and unloading. The openings are usually equipped with measures for noise attenuation.

3.9

initiation control

control that does not directly start any movement, but enables power supply to specific machine actuators when activated

3.10

MODE 2

condition with safeguards disabled, for setting or adjustment of processing units, feeding and guiding devices, and/or for cleaning

3.11

MODE 3

condition with safeguards disabled, for test run, fine adjustment of processing units, feeding and guiding devices

3.12

jog control

control device for momentary activation of a function or a movement

3.13

hydrostatic tool fixing device

device for clamping the tool to the spindle using hydraulic pressure

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 replaces ISO 19085-1:2021, Table B.1.

4.2 Control devices

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

Emergency stop control devices shall be fitted at the following positions:

- a) in close proximity to the in-feed end of the machine;
- b) at the loading side of the loading magazine, if provided;
- c) in close proximity to the out-feed end of the machine;
- d) on each hand-held control set (if provided);
- e) not more than 1,5 m from each fixed hold-to-run control device and jog control device;
- f) on the main control panel.

If the distance between two required emergency stop control devices is less than 1 m, only one emergency stop control device may be provided.

Additional control devices for process start and normal stop may be provided on hand-held control sets with cable connection or wireless.

When a wireless control set loses its connection to the machine an emergency stop shall be automatically activated. The SRP/CS for interlocking of wireless connection with emergency stop shall achieve $PL_r = c$.

Reset function control devices, control devices for control power-on and mode selectors shall not be positioned on hand-held control sets and inside the complete enclosure.

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

4.3 Start

4.3.1 Direct start

ISO 19085-1:2021, 4.3.1, applies.

4.3.2 Start via control power-on

ISO 19085-1:2021, 4.3.2, applies.

4.3.3 Integrated feed

Subclause specific to this document.

In normal processing mode (MODE 1), start of the feed shall only be possible when the tool spindles are rotating or the tools of all spindles not involved in the current operation cannot come into contact with the workpiece, because the tools are removed from the spindles or the not rotating spindles are retracted to a non-cutting position.

For machines where at least one spindle is adjusted manually, by hand wheel or power operated under hold to run control, instruction shall be given according to 7.3.2 f).

For machines where at least one spindle is adjusted automatically under NC or CNC-control, one of the following requirements shall be fulfilled:

- a) the PLC shall request a confirmation by the operator at each start of the integrated feed, that the not rotating tools have been removed or are retracted to a non-cutting position;
- b) a limit position device shall detect the not rotating tool at the non-cutting position;
- c) the PLC shall ensure that no contact between a not rotating tool and the workpiece is possible, taking into account the position of the tool, the workpiece dimensions and the spindle position;
- d) the feed shall be interlocked with the rotation of all tool spindles.

The SRP/CS for interlocking of feed start with all tool spindle drives (rotation or position) may not achieve any PL_r .

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

4.3.4 Laser marking unit

Subclause specific to this document.

Laser marking unit activation shall only be possible when feed is active and workpiece is detected to be under laser marking unit. The SRP/CS for interlocking of laser marking unit activation with feed shall achieve $PL_r = c$ and with workpiece detection shall achieve $PL_r = b$.

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

4.4 Safe stops

4.4.1 General

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

On machines with laser marking unit, activating the safe stop (normal and emergency) shall also disable the laser marking unit.

The SRP/CS for disabling the laser marking unit with the safe stop 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.

4.6 Mode selection

ISO 19085-1:2021, 4.6, applies with the following additions, subdivided into further specific subclauses.

4.6.1 MODE 2

If MODE 2 is implemented for accessing the machine with the moveable guards described in [5.6.1](#) in opened position, the following requirements apply:

- a) selecting MODE 2 shall initiate stopping of the feed and tool spindles;
- b) during MODE 2, movement of the feed, forward or reverse, and adjustment of powered units shall only be possible either by:
 - 1) hold-to-run control; or
 - 2) jog control (no PL required) after actuation of an initiation control device. The SRP/CS for the initiation control shall achieve $PL_r = c$. The initiation control shall be disabled if jog control is not activated for more than 30 s (no PL required), and in any case after 10 min. The SRP/CS for the 10-minute delay of the disabling shall achieve $PL_r = c$;
- c) movement of the feed shall stop within 100 mm after the hold-to-run control device or the jog control device is released;
- d) unexpected start of any tool spindle shall be prevented; The SRP/CS for prevention of unexpected start of tool spindles shall achieve $PL_r = c$.

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

4.6.2 MODE 3

If MODE 3 is implemented for accessing the machine with the moveable guards described in [5.6.1](#) in opened position, the following requirements apply:

- a) selecting MODE 3 shall initiate stopping of the feed and tool spindles;
- b) during MODE 3, each tool spindle may be started. The SRP/CS for the start of spindle drives shall achieve $PL_r = c$. As an exception, no PL_r is required for spindle start if an initiation control is used.

The SRP/CS for this initiation control shall achieve $PL_r = c$. The initiation control shall be deactivated after 20 s. The SRP/CS for the 20 s time delay for deactivation shall achieve $PL_r = c$.

- c) during MODE 3, movement of the feed, forward or reverse, reverse only with no tools rotating, shall only be possible either by:
 - 1) hold-to-run control; or
 - 2) jog control (no PL required) after actuation of an initiation control device. The SRP/CS for the initiation control shall achieve $PL_r = c$. The initiation control shall be disabled if jog control is not activated for more than 30 s (no PL required), and in any case after 10 min. The SRP/CS for the 10-minute delay of the disabling shall achieve $PL_r = c$;

The SRP/CS for prevention of reverse feed while the tools are rotating shall achieve $PL_r = c$;

- d) during MODE 3, adjustment of powered units with tools running shall only be possible for one unit at a time either by:
 - 1) hold-to-run control; or
 - 2) jog control (no PL required) after actuation of an initiation control device. The SRP/CS for the initiation control shall achieve $PL_r = c$. The initiation control shall be disabled if jog control is not activated for more than 30 s (no PL required), and in any case after 10 min. The SRP/CS for the 10-minute delay of the disabling shall achieve $PL_r = c$.

Activation of another unit adjustment at the same time shall be prevented, and the relevant SRP/CS shall achieve $PL_r = b$. No PL is required for the specific unit selection.

As an exception, adjustment of multiple units at a time may be provided if the following two additional requirements are fulfilled:

- an additional selector shall be provided for this purpose. The SRP/CS for this selection shall achieve $PL_r = b$;
 - tool running is not allowed during multiple units' adjustments. The SRP/CS for interlocking of tool rotation with selection of multiple units shall achieve $PL_r = b$;
- e) movement of the feed shall stop within 100 mm after the hold-to-run control device or the jog control device is released;
 - f) access to the tools shall be prevented by fixed guards with the exception of openings necessary for changing tools and of the maximum cutting area of the tool. This requirement can be met, for example, by using the extraction hood and chip breaker system;
 - g) the openings necessary for changing tools shall be closed by movable guards, which do not require interlocking, e.g. hinged covers, and which shall be positively locked in the closed position or held in place by means of a positive connection during normal operation and may be opened without aid of a tool for tool changing;
 - h) access to the cutting area of the first right vertical and first bottom horizontal tools, when they are rotating, shall be prevented, e.g. by one or a combination of the following measures:
 - 1) automatically adjustable guards; opening and closing of the automatically adjustable guards can be either power operated, e.g. triggered by the hold-to-run control for the feed or the presence of a workpiece, or achieved by the workpiece itself;
 - 2) interlocked moveable guards; in the case of an integral enclosure, the interlocked movable guard may be obtained by dividing the movable guard required in 5.6.1, the division being such that access to any point of the first right vertical and first bottom horizontal tools being in the closest possible position to the operator is prevented up to a horizontal distance of at least 850 mm;

- 3) pressure-sensitive mats extending at least 850 mm from any point of the first right vertical and first bottom horizontal tools being in the closest possible position to the operator; when a person is detected, a safe stop of the first right vertical and first bottom horizontal tools shall be initiated; the SRP/CS for initiation of the safe stop shall achieve $PL_r = c$;
- i) access to all bottom horizontal tools other than the first one shall be prevented by an adjustable guard. This adjustable guard shall fulfil the following requirements:
 - 1) it shall be made of easily machinable material if there is the possibility of contact with the tool;
 - 2) adjustment shall be possible over the whole working range of the tool;
 - 3) at rest and over the whole range of adjustment, the adjustable guard shall totally cover the area between the two vertical planes tangent to the table lips when they are set to the maximum width plus 10mm on each side and shall not be positioned to more than 10 mm above the fixed table [see 7.3.2 o) for instruction on their adjustment];
- j) a deterring/impeding device and/or parts of the machine, e.g. pressure rollers, shall minimize the direct horizontal access to the vertical right tools other than the first right vertical one [see 7.3.2 p) for instruction on their adjustment].

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

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, does not apply.

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 apply to the maximum rotational speed set by the manufacturer for each spindle.

NOTE See also 7.2.2 b) for the indication of the minimum $n_{\max}$ of the tools allowed, and 7.3.2 k).

4.7.4 Direction of spindle rotation

Subclause specific to this document.

If the universal spindle is intended for climb cutting, the requirements in 5.9.3.2 apply. The universal spindle shall be able to run in both directions.

Selection of direction of rotation of universal spindle and any spindle that can also run in climb cutting may be done either:

- a) via a direction of rotation selection device fitted at the main control or in proximity to the universal spindle, e.g. a key or soft key or touch screen (no PL required) fulfilling the following requirements:
 - 1) the selected direction of rotation shall be indicated at the main control panel or in proximity to the universal spindle and at all other places where this spindle can be started, e.g. by a pictogram;

- 2) operation of the direction of rotation selection device shall not initiate spindle start up; or
- b) via part program (no PL required);

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

4.8 Failure of any power supply

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

If the pneumatic pressure is less than the threshold value for safe operation of the machines, which shall be determined by the manufacturer, the machine shall stop. Automatic start of the machine shall be prevented.

The SRP/CS for interlocking of the machine operation with pressure monitoring shall achieve $PL_r = b$.

Where the positions of the spindles and/or pressure shoes and/or feed mechanism and/or feed rollers are adjustable, in the event of failure of the power supply they shall remain in their adjusted position during machining. This can be realized by arranging, for example, that these components are held by means of:

- a) a securing device (e.g. screw and nut etc.), where they are moved manually;
- b) a brake or self-locking transmission (e.g. rack and pinion), where they are moved by an electric motor; or
- c) a non-return valve directly connected to the air cylinder, where they are moved by pneumatic power.

NOTE In the context of this requirement, "remain in their adjusted position" does not include controlled movement during machining.

The SRP/CS for prevention of automatic start and for maintaining adjusted position of spindles, pressure shoes, feed mechanism and feed rollers shall achieve $PL_r = c$.

4.9 Manual reset control

ISO 19085-1:2021, 4.9, applies.

4.10 Standstill detection and monitoring

ISO 19085-1:2021, 4.10, applies.

4.11 Machine moving parts speed monitoring

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

The upper speed limits of mechanically driven moving machine parts and of mechanically driven work piece feed, required by this document, shall be monitored.

4.12 Time delay

ISO 19085-1:2021, 4.12, applies.

4.13 Tele-service

ISO 19085-1:2021, 4.13, applies.

5 Safety requirements and measures for protection against mechanical hazards

5.1 Stability

ISO 19085-1:2021, 5.1, applies.

5.2 Risk of break-up during operation

ISO 19085-1:2021, 5.2, is replaced by the following text.

To reduce the probability of break-up during operation, the requirements of 5.3 apply. To reduce the effect of break-up during operation, the requirements of 5.9, 5.5.1 and 5.5.2 apply.

Feed rollers and pressure shoes (if provided) shall be adjustable [see also 7.3.2 g) and h) for manually adjustable tools].

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

5.3 Tool and tool fixing design

5.3.1 General

ISO 19085-1:2021, 5.3.1, applies with the following additions.

The tool spindles shall be manufactured from steel with a minimum ultimate tensile strength of 580 N mm^{-2} .

With regard to the balancing requirements shown in EN 847-1:2017, 5.2.3, the manufacturer shall declare for each spindle the maximum speed, maximum mass and dimensions of the tools that can be used with it (also see 7.3.1).

The spindles, except those designed for hydrostatic tool fixing, shall be provided with one of the following tool-fixing devices:

- a) a lock nut or a spindle screw and separate/integral spindle ring which ensures a positive connection between the ring and the spindle;
- b) a lock nut or a spindle screw which ensures positive connection between the tool and the spindle;
- c) a cone connection.

Planing, moulding and saw blade spindle run-out shall not exceed 0,02 mm.

Spindles with hydrostatic tool fixing devices that are an integral part of the spindle or of the tool or permanently connected with them shall have an additional mechanical device to prevent loosening of the tool in case of leakage in the hydrostatic system.

On machines with quick tool changing system, tool release shall only be possible if the spindle is stopped and its unexpected start is prevented (this applies only when the operator changes the tool manually).

The SRP/CS for the prevention of unexpected start of spindle shall achieve $PL_r = c$.

The SRP/CS for interlocking between tool release and spindle standstill shall achieve $PL_r = c$ or consist of 2 independent systems both achieving $PL_r = b$.

As an exception, the tool release function may achieve a $PL_r = b$ if the spindles are equipped with an additional mechanical system which prevents tool release while the spindle rotates.

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

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 dimensions for circular saw blades

ISO 19085-1:2021, 5.3.4, is replaced by the following text.

The diameter of all flanges shall be at least $d_{sb}/6$, where d_{sb} is the diameter of the largest saw blade for which the machine is designed.

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

5.3.5 Spindle rings

Subclause specific to this document.

Where spindle rings are provided, their bores shall have a tolerance of at least H8 in accordance with the requirements of ISO 286-2:2010. The spindle ring clamping surfaces shall be parallel within a tolerance of 0,02 mm.

Verification: By checking the 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.

5.4.2 Maximum run-down time

ISO 19085-1:2021, 5.4.2, applies with the following additions.

As an exception, where the run-up time exceeds 10 s, the maximum run-down time shall be less than the run-up time, but shall in no case exceed 30 s.

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 moveable guards**5.5.2.1 General**

ISO 19085-1:2021, 5.5.2.1, applies.

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, applies.

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.

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, is replaced by the following text, subdivided into further specific subclauses.

5.6.1 Guarding of tools

Access to the rotating tools shall be prevented by fixed guards which make up a complete enclosure or an integral enclosure other than through the in-feed and out-feed opening.

Access for cleaning, tool changing, unit adjustments or setting, shall be provided by moveable guards with interlocking and guard locking. Access to the rear side of machines may be prevented by fixed guards only, if needed less than once a week.

The integral enclosure shall be so designed that it is not possible for a person to stand inside it with the movable guards closed.

At the in-feed end, where a trip device is provided according to 5.6.3, the distance, $L_{\min}$, between the first tool and the in-feed opening of the enclosure shall be (see Figure 5):

- a) $L_{\min} \geq 200$ mm for in-feed opening heights $H_{f0} \leq 160$ mm;
- b) $L_{\min} \geq 1,25$ times H_{f0} for in-feed opening heights $H_{f0} > 160$ mm;

where H_{f0} shall be calculated or measured with a cutting depth of 3 mm.

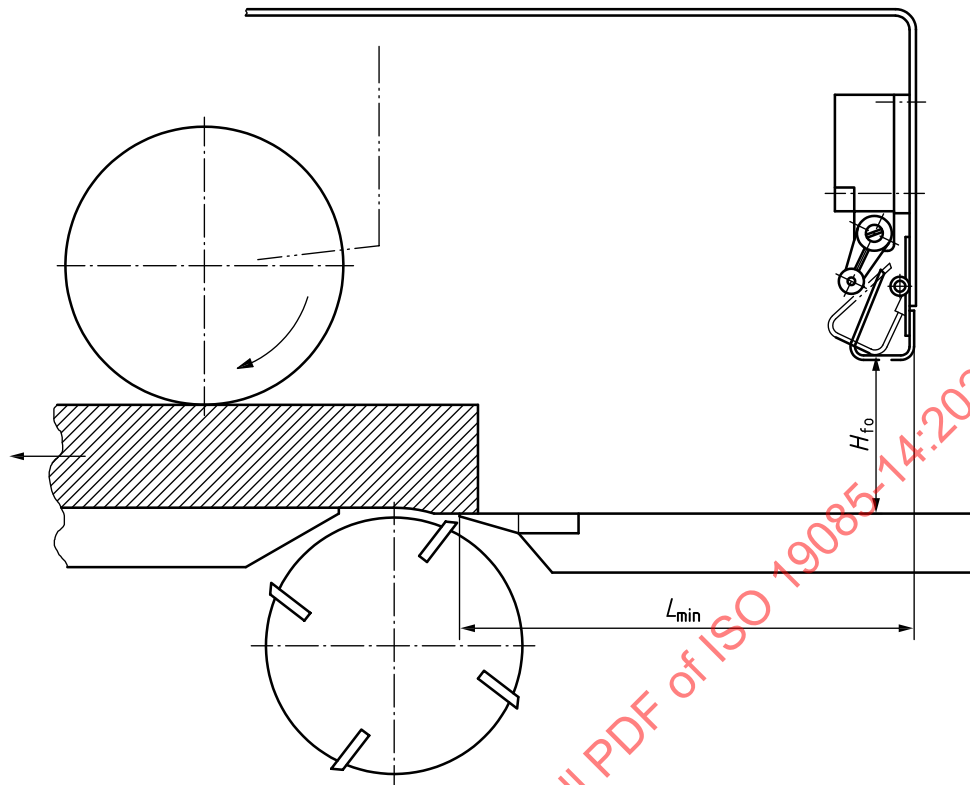
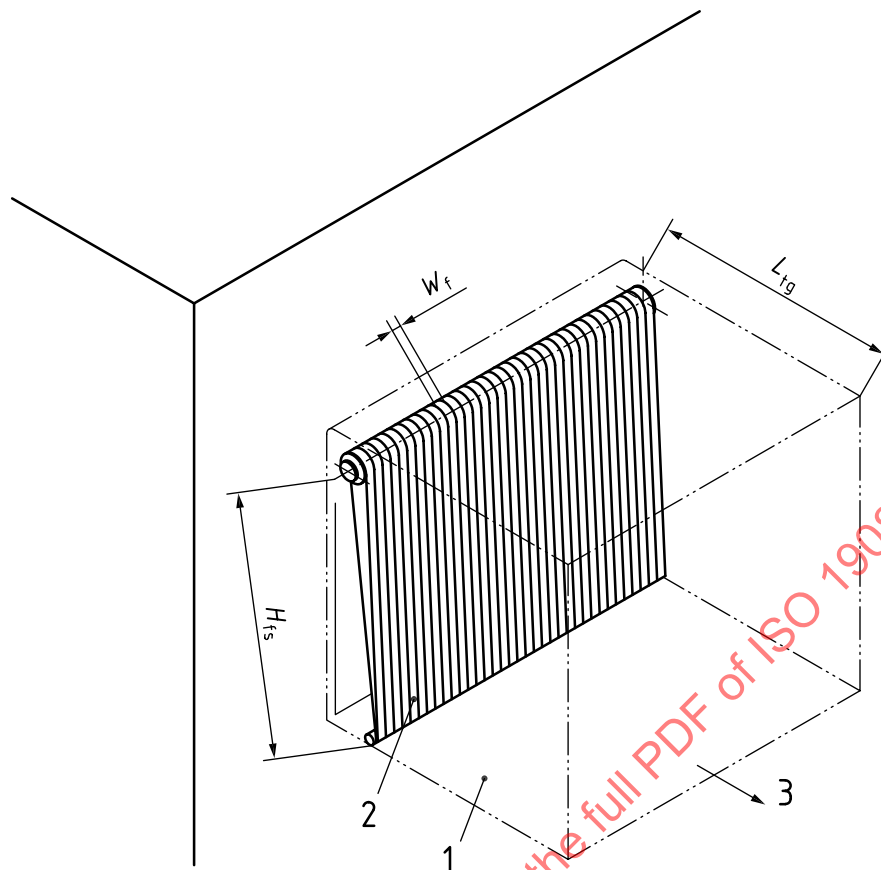


Figure 5 — In-feed opening – Minimum distance to first tool

At the out-feed end of the machine access shall be prevented by one of the following:

- 1) a fixed distance guard, e.g. tunnel. The distance between the out-feed end of the tunnel and the nearest dangerous point inside of the machine shall be at least 550 mm; the opening height of the tunnel at its out-feed end shall not exceed the height capacity of the machine by more than 20 mm; or
- 2) a single direction rigid pendulum flap system installed at the in-feed end of a tunnel guard (see [Figure 6](#)). The length, L_{tg} , of the tunnel guard beyond the flap system position shall be more than or equal to the flap system height, H_{fs} . The width, W_p , of each flap shall not exceed 20 mm.

**Key**

- | | | | |
|---|----------------|----------|----------------------------|
| 1 | tunnel guard | H_{fs} | height of the flap system |
| 2 | flaps | L_{tg} | length of the tunnel guard |
| 3 | feed direction | W_f | width of a flap |

Figure 6 — Tunnel guard at the out-feed opening

For complete enclosures the following additional requirements apply:

- at least one emergency stop device shall be placed inside the enclosure if MODE 2 and/or MODE 3 are provided;
- each door shall be provided with its own manual reset control device to reset its interlocking. As an exception, if more than one access door is provided on a side of the complete enclosure, one manual reset control device may be provided for all doors of that side;
- it shall be possible to open at least one door from inside for every accessible area, also when the guard locking is active.

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

5.6.2 Guarding of drives

Access to hazardous movements of the drives, e.g. those for the tools or the feed mechanism, shall be prevented by fixed guards or, where access to the drives is required more than once a week, by:

- movable guards with interlocking; or
- movable guards with interlocking and guard locking, if the run-down time is higher than 10 s.

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

5.6.3 Safeguarding of feed mechanisms

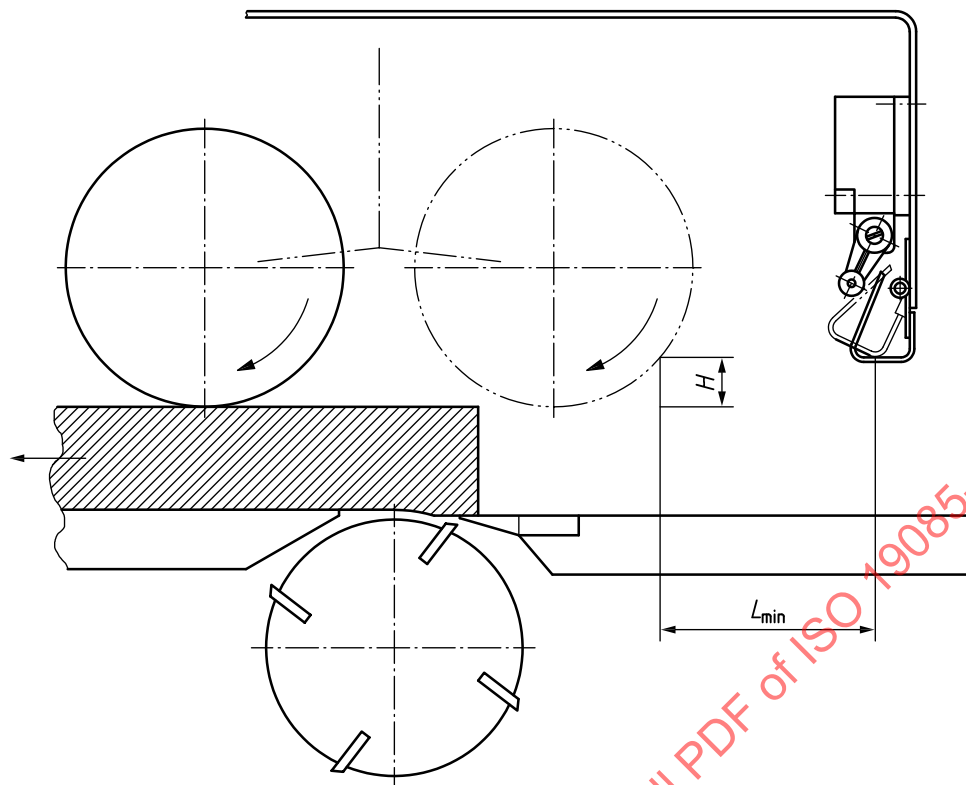
Access to feed rollers and retaining devices, e.g. pressure belt, shall be prevented by the integral or complete enclosure required in 5.6.1.

Access to the trapping points at the in-feed opening of the machine shall be prevented by a mechanically actuated trip device (see Figure 7), which shall meet the following requirements:

- a) the width of the trip device shall be at least equal to the width of the in-feed opening;
- b) in the rest position, the bottom of the trip device shall have a vertical distance, H , to the base of the first in-feed roller less than or equal to 30 mm, measured at the lowest level of the roller with no workpiece in the machine;
- c) the tripping force shall be less than or equal to 50 N;
- d) the distance, $L_{\min}$, between the trip device activation position and the drawing in point shall be at least 125 mm. Where the vertical distance, H , does not exceed 25 mm, a minimum distance, $L_{\min}$, of 100 mm is acceptable;
- e) with regard to the gap between the trip device, set at a pre-tension of the first in-feed roller of 3 mm, and the workpiece, the horizontal distance from the trip device to the hazard point, the response time of the trip device and the stopping time of the feed, the trip device shall be designed and positioned so that the front end of a test wedge, resting on the workpiece moving at the maximum feed speed against the trip device, shall not reach the hazard point and shall still be able to be retracted (not clamped). The test wedge shall be made of solid wood, be 200 mm long, 100 mm wide, 12 mm high at the front end and 40 mm at the rear end;
- f) the trip device shall not in itself create a trapping hazard.

When a removable mechanical in-feed device (e.g. magazine, hopper) which also prevents access to the in-feed opening, is fitted to the machine, it may override or replace the trip device.

The SRP/CS for interlocking of the override function shall achieve $PL_r = c$.

**Key**

$L_{\min} = 100 \text{ mm}$ for $H \leq 25 \text{ mm}$

$L_{\min} = 125 \text{ mm}$ for $25 \text{ mm} < H \leq 30 \text{ mm}$

Figure 7 — Trip device positioning

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

5.7 Impact hazard

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

For manual unloading, where impact for the operator is possible, a feed speed limit of 40 m/min applies.

For stand-alone machines with feed speed exceeding the above value and up to 60 m/min, an out-feed unloading table, e.g. a roller table according to [5.10.1](#), shall be connected to the machine.

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

5.8 Clamping devices

ISO 19085-1:2021, 5.8, is replaced by the following text.

The workpiece shall be held during its passage through the machine by means of retaining devices, e.g. pressure belt or feed rollers. These retaining devices shall be designed so that the workpiece remains held in case of a failure of the power supply and during braking.

The SRP/CS for interlocking between workpiece holding and power supply shall achieve $PL_r = c$.

For manual height adjustment of the feed mechanism by hand-wheel, instructions shall be given as per [7.3.2 i\)](#).

Power operated non-automatic height adjustment of the feed mechanism (also under NC or CNC control) shall be via hold-to-run control, or jog control after actuation of an initiation control device. The SRP/CS of the initiation control shall achieve $PL_r = c$; The initiation control shall be disabled if jog control is not activated for more than 30 s (no PL required), and in any case after 10 min. The SRP/CS for the 10-minute delay of the disabling shall achieve $PL_r = c$.

Automatic height adjustment of the feed mechanism under NC or CNC-control shall only be possible with the movable guards required in 5.6.1 in closed position or if the height adjustment movements do not create new hazards and the tool spindles are not rotating. The SRP/CS for the interlocking of height adjustment with the standstill of tools shall achieve $PL_r = c$.

For both automatic and non-automatic power-operated height adjustment of the feed mechanism, upward movement of the feed mechanism while the tools are rotating shall only be possible:

- a) if the workpiece is retained safely by design, i.e. pressure elements;
- b) if a movable guard interlocked with the tools' rotation is provided to completely close the in-feed opening, and if this moveable guard and the movable guards required in 5.6 in closed position are interlocked with the upward movement of the feed mechanism; this guard shall be of class A according to 5.9.2 and it shall extend to the whole opening area; if this guard closes automatically, the closing force shall not exceed 50 N. The SRP/CS for interlocking of the upward movement of the feed mechanism when tools are rotating with this guard and the moveable guards required in 5.6 shall achieve $PL_r = c$; or
- c) with a means of detecting that workpieces which have entered the in-feed of the machine have passed the tools, e.g. monitoring of the position of the powered rollers associated with time delay devices. The SRP/CS for this detection system shall achieve $PL_r = b$;

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

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 A.

5.9.2.2 Guards of class A

ISO 19085-1:2021, 5.9.2.2, applies.

5.9.2.3 Guards of class B

ISO 19085-1:2021, 5.9.2.3, does not apply.

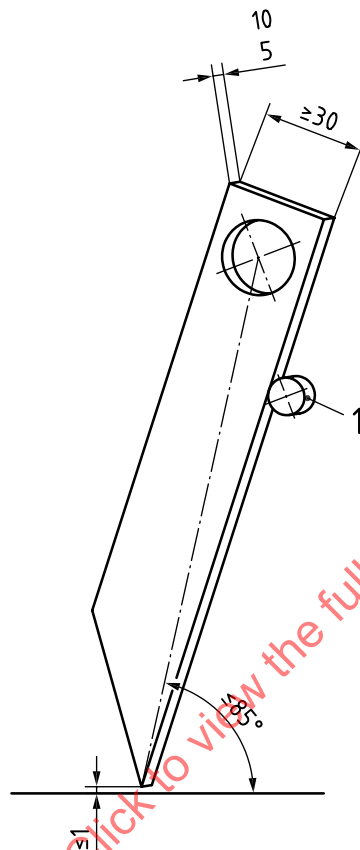
5.9.3 Devices to minimize the possibility or effect of ejection or kickback

Subclause specific to this document.

5.9.3.1 In-feed end of the machine

Where the machine is fitted with spindles designed to be used with tools for dividing the workpiece, e.g. saw units and multi-profiling units, a row of anti-splinter fingers shall be fitted to prevent ejection of divided parts and splinters of the workpiece (see [Figure 8](#)).

Dimensions in millimetres



Key

- 1 mechanical stop

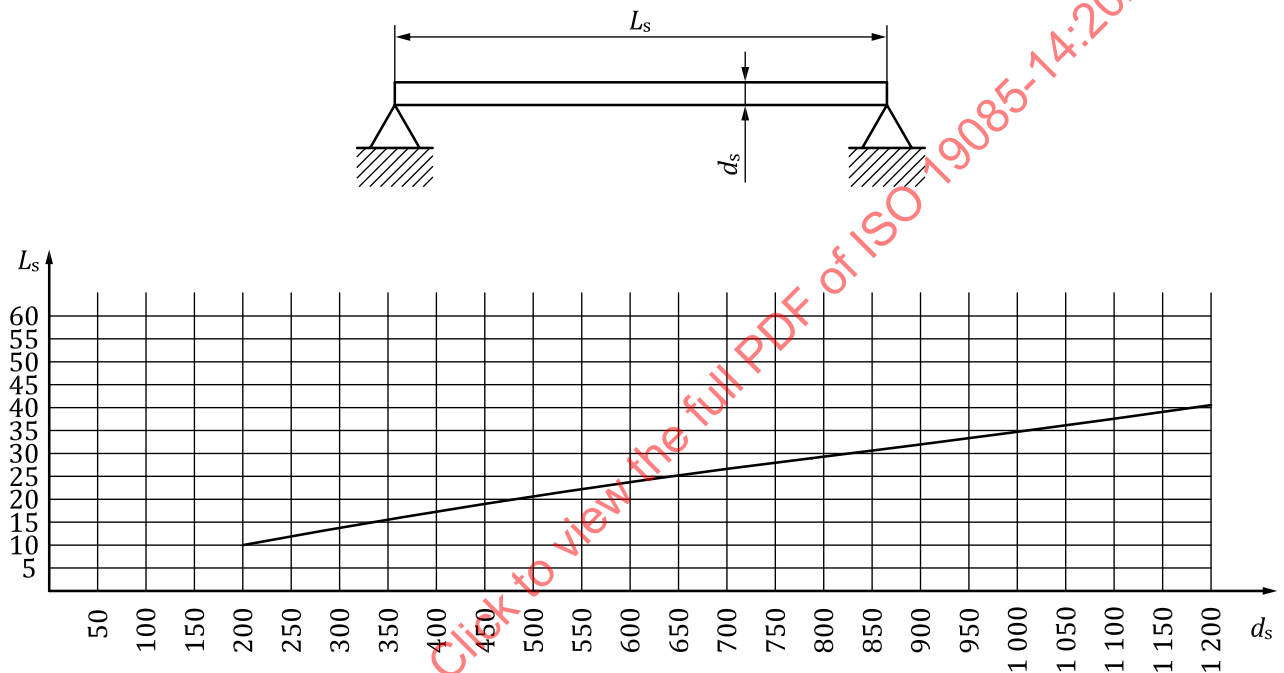
Figure 8 — Anti-splinter finger

This row of anti-splinter fingers is not required for machines only fitted with a glass bead saw unit (see [5.9.3.3](#)).

The row of anti-splinter fingers shall fulfil the following requirements:

- the row of anti-splinter fingers shall extend over the full in-feed opening width of the machine;
- the anti-splinter fingers shall be manufactured from steel having an ultimate tensile strength of at least 570 N mm^{-2} ;
- a mechanical stop shall be provided to prevent the anti-splinter fingers from moving beyond 85° (see [Figure 8](#), key 1);
- the mounting shaft for the row of anti-splinter fingers shall be in accordance with [Figure 9](#), and shall be manufactured from solid steel having an ultimate tensile strength of at least 570 N mm^{-2} ;
- the thickness of each spacer between the anti-splinter fingers shall be at least 0,5 mm and not more than 1 mm;

- f) the anti-splinter fingers shall return automatically to their rest position when not in contact with the workpiece;
- g) the lateral surfaces of each anti-splinter finger shall be flat and parallel to each other within $\pm 0,5$ mm;
- h) the thickness of each anti-splinter finger shall be at least 5 mm and the maximum thickness shall be 10 mm;
- i) the width of the anti-splinter fingers shall be at least 30 mm;
- j) in the fully closed position, the anti-splinter fingers tips shall have a maximum distance of 1 mm to the machine table (see [Figure 8](#)).



Key

- L_s length of the shaft
 d_s diameter of the shaft

Figure 9 — Dimensions of the shaft of the anti-splinter fingers row

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

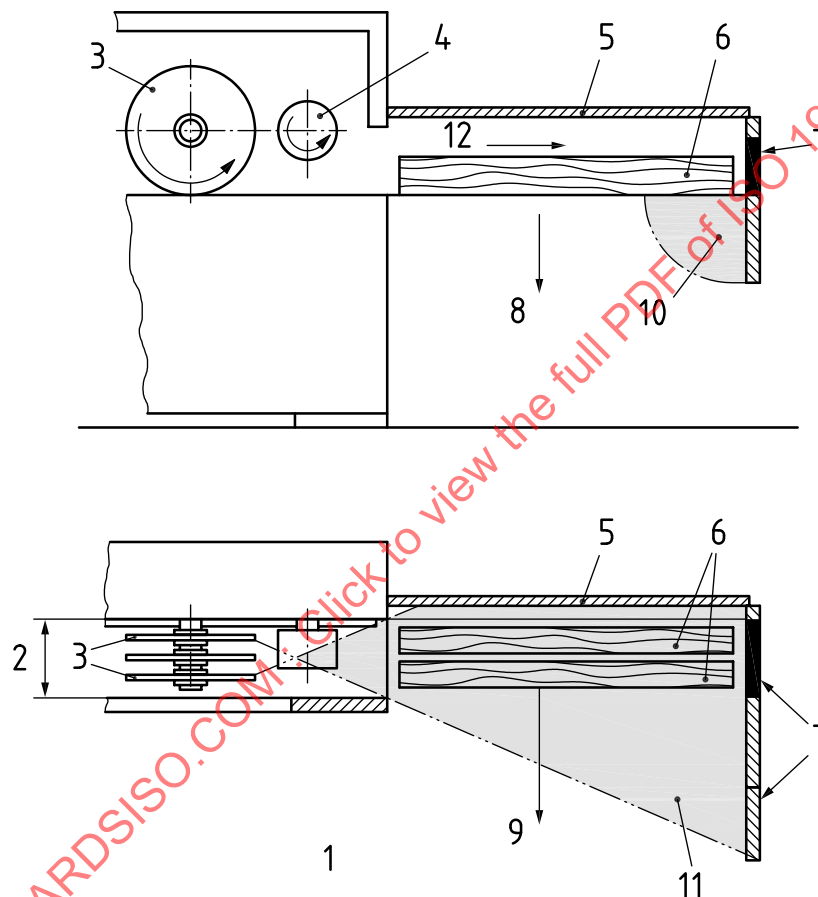
5.9.3.2 Out-feed end of the machine

Climb cutting on one or both of the last two working spindles, or on spindles designed to cut workpieces, shall be possible only if a tunnel guard ([Figure 10](#), key 5) is installed on the out-feed side of the machine. The tunnel guard shall meet the following requirements:

- a) it shall allow side or bottom off-loading;
- b) its end shall be designed and constructed to retain any workpiece ejected by an end wall (impact wall), the area of which shall be at least equivalent to and in feed direction aligned with the out-feed opening (see [Figure 10](#), key 7);

- c) access to the danger zone in the discharge area (see Figure 10, keys 10 and 11) shall be prevented in accordance with the requirements in ISO 13857:2019, 4.2.4.1, for reaching through openings and in accordance with the requirements in ISO 13857:2019, 4.2.2.1.2, for access to the danger zone;
- d) where frequent access to dangerous points inside the tunnel guard is necessary (i.e. more than once per week), it shall be via a movable guard interlocked with guard locking;
- e) the drives of the spindles that work in climb cutting shall be interlocked with the tunnel guard, if this is removable; the SRP/CS for this interlocking shall achieve $PL_r = c$;
- f) other parts of the tunnel guard shall be manufactured from materials that are in accordance with the requirements of 5.9.2. Mesh shall not be used.

The requirements above do not apply to universal units unless they are intended for climb cutting.



Key

- | | | | |
|---|---|----|-------------------------------------|
| 1 | plan view | 7 | end wall |
| 2 | width of the out-feed opening | 8 | bottom off-loading of the workpiece |
| 3 | tool for dividing the workpiece, e.g. saw blade | 9 | side off-loading of the workpiece |
| 4 | last feed roller | 10 | danger zone in the discharge area |
| 5 | tunnel guard | 11 | danger zone in the discharge area |
| 6 | workpiece | 12 | feed direction |

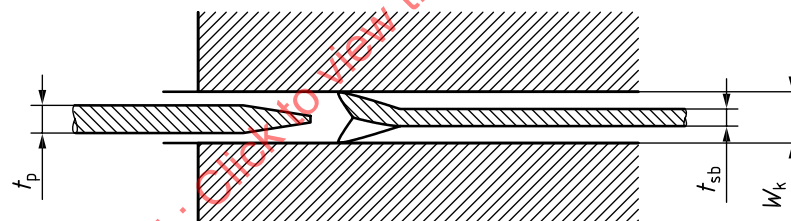
Figure 10 — Safeguarding of the out-feed end of the machine

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

5.9.3.3 Devices for machines with glass bead saw unit

Machines with a glass bead saw unit (see [Figure 1](#)) shall be equipped with:

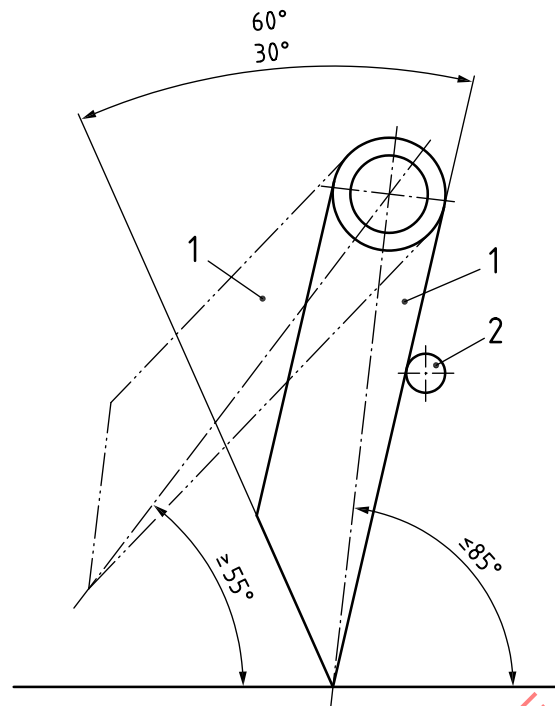
- a) a bead ledge separator. It shall be manufactured from steel with an ultimate tensile strength of at least 580 N mm^{-2} or of a comparable material, have flat sides (within $0,1 \text{ mm}$ per 100 mm) and shall have a thickness t_p smaller than the width of cut W_k (kerf) and at least $0,2 \text{ mm}$ greater than the saw blade plate t_{sb} (see [Figure 11](#));
- b) a device to guide the bead ledge, for example a guiding channel;
- c) a device to avoid or minimize the risk of kick-back of the bead ledge, for example an anti-kickback finger. If an anti-kickback finger is fitted, it shall be designed as follows:
 - 1) it shall be located after the glass bead cutting tool in the direction of the feed;
 - 2) it shall be made from steel with an ultimate tensile strength of at least 350 N mm^{-2} or of a comparable material;
 - 3) it shall have a lower tip with a maximum radius of $0,5 \text{ mm}$;
 - 4) the angle of the tip shall be between 30° and 60° (see [Figure 12](#));
 - 5) it shall be effective over the full cutting height capacity of the glass bead saw unit. "Effective operation" shall be between 85° and 55° , this angle being measured between a line from the tip to the axis of pivot of the fingers and the horizontal (see [Figure 12](#));
 - 6) a mechanical stop shall be provided to prevent the anti-kickback finger moving beyond the 85° point (see [Figure 12](#)).



Key

- W_k width of cut (Kerf)
 t_p thickness of bead ledge separator plate
 t_{sb} thickness of saw blade plate

Figure 11 — Bead ledge separator thickness in relation to saw-blade dimensions



Key

- 1 anti-kickback finger
- 2 mechanical end stop

Figure 12 — Example of anti-kickback finger

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

5.10 Workpiece support and guides.

ISO 19085-1:2021, 5.10, applies with the following additions, subdivided into further specific subclauses.

5.10.1 General

The machine table shall be provided with a fixed or adjustable fence prior to the first vertical spindle.

If an adjustable fence is provided it shall be capable of being locked in position and it shall not be able to come into contact in any position with the tool.

Adjustable side guides and/or pressure pads capable of being locked in position for proper workpiece guiding shall be provided.

If the machine is designed so that it can be used in such a way that the first powered feed roller is after the first horizontal spindle, then the tables and table lips near to this spindle shall meet the following requirements:

- a) the tables, including table lips, shall be made of light alloy, cast iron, or steel;
- b) where the table or table lips are slotted (for the purpose of noise reduction), the dimensions shall be according to [Figure 13](#);
- c) where the table or table lips are drilled (for the purpose of noise reduction), the bores shall not allow for the passage of a 6 mm in diameter cylindrical pin;

- d) the table lips shall have an ultimate tensile strength of at least 350 N mm^{-2} and a minimum resilience of at least $3,5 \text{ daJ cm}^{-2}$.

If the requirements b) and d) are not fulfilled, the test described in [Annex G](#) shall be performed and passed.

Dimensions in millimetres

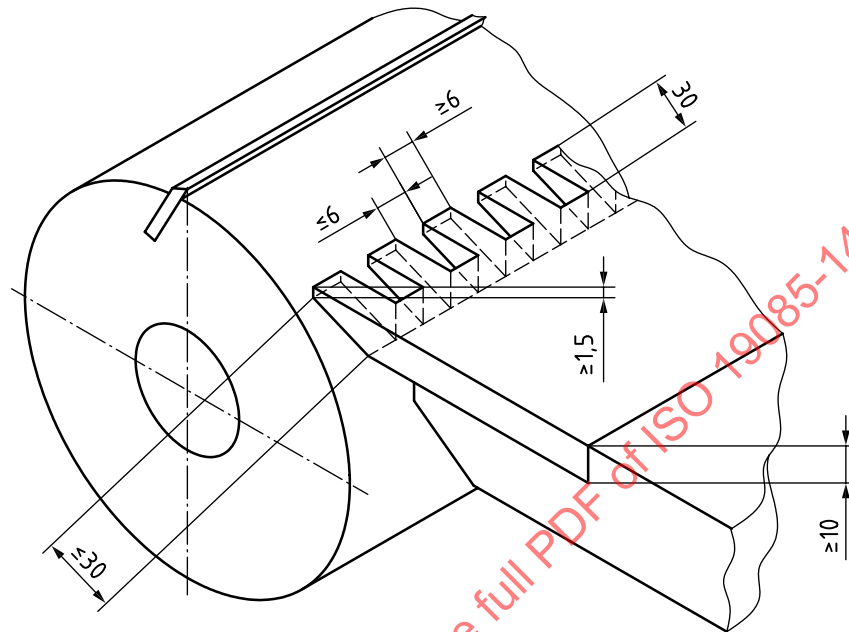


Figure 13 — Dimensions of slotted table lips

Verification: By checking the relevant drawings, measurement, inspection of the machine, relevant functional testing of the machine and performing the test in [Annex G](#).

5.10.2 In-feed hopper

On machines fitted with in-feed hopper (see [Figure 2](#)), entanglement and crushing points between the feed roller of the in-feed hopper (see [Figure 2](#), key 3) and fixed parts of the in-feed hopper shall be prevented, providing a minimum gap of 20 mm in any position of the roller.

Alternatively, automatic processing shall only be possible with a minimum filling level of at least 50 mm and the emptying of the in-feed hopper shall only be possible via a hold-to-run control.

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

5.10.3 Loading magazine

On machines fitted with a loading magazine (see [Figure 3](#)), access to any hazardous point of the loading magazine up to the infeed opening of the machine shall be prevented e.g. by one or a combination of the following measures:

- fixed guards with a minimum height of 1 800 mm and a maximum distance from the floor of 180 mm, positioned at a horizontal distance of at least 850 mm from any hazardous point;
- fixed guards in combination with moveable guards with interlocking, preventing access to the hazardous points up to a distance of at least 850 mm. The moveable guards shall be provided with guard locking if the stopping time is higher than 2 s;

- c) pressure-sensitive mats extending at least 850 mm from any hazardous point; when a person is detected, a safe stop shall be initiated. The SRP/CS for the initiation of the safe stop shall achieve $PL_r = c$. A manual reset control device shall be provided;
- d) an AOPD mounted vertically, with at least two light beams, situated at a height of 400 mm and 900 mm above the floor level, positioned at a horizontal distance of at least 850 mm from any hazardous point. When a person is detected, a safe stop shall be initiated. The SRP/CS for the initiation of the safe stop shall achieve $PL_r = c$. A manual reset control device shall be provided.

As an exception, at the loading sides, one of the following solutions may be applied:

- 1) a fixed guard with a minimum height of 700 mm shall be provided (Figure 3, key 1). In addition, access to the gaps between two consecutive loading belts/chains (Figure 3, key 3), where these gaps are wider than 400 mm, shall be prevented, for example, by an AOPD with at least one beam positioned at $700 \text{ mm} \pm 100 \text{ mm}$ from the floor level and 300 mm from the fixed guard inwards (Figure 3, key 4).
- 2) a fixed guard, with a minimum height of 1 000 mm.
- 3) a moveable guard with interlocking without guard locking, with a minimum height of 1 000 mm in the space between the extreme loading belt/chain and the lateral fence (Figure 3, key 2).

The guards required in 1), 2), 3) above shall be positioned at a horizontal distance of at least 850 mm from any hazardous point. Solutions 1) and 2) may be applied also to the space between the extreme loading belt/chain and the lateral fence.

If guards have reaching-through openings, these openings shall fulfil the requirements of ISO 13857:2019, Table 4.

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

5.10.4 Automatic workpiece returner

On machines fitted with an automatic workpiece returner (see Figure 4), access to any hazardous points shall be prevented e.g. by one or a combination of the following measures:

- a) fixed guards with a minimum height of 1 800 mm and a maximum distance from the floor of 180 mm, laterally extending at least 850 mm beyond such points to prevent lateral access;
- b) pressure-sensitive mats extending at least 850 mm from any hazardous point. When a person is detected, a safe stop shall be initiated. The SRP/CS for the initiation of the safe stop shall achieve $PL_r = c$. A manual reset control device shall be provided;
- c) an AOPD mounted vertically, with at least two light beams, situated at a height of 400 mm and 900 mm above the floor level, positioned at a horizontal distance of at least 850 mm from any hazardous point. When a person is detected, a safe stop shall be initiated. The SRP/CS for the initiation of the safe stop shall achieve $PL_r = c$. A manual reset control device shall be provided.

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

6.2 Noise

6.2.1 Noise reduction at the design stage

ISO 19085-1:2021, 6.2.1, applies with the following additions.

For the purpose of noise reduction, effective means are:

- table lips slotted or drilled as per [5.10.1](#) b) and c);
- integral enclosure as per [3.7](#) or complete enclosure as per [3.8](#);
- tunnels lined with sound-absorbing material at the openings in the complete enclosure for workpiece loading and unloading.

NOTE It is possible that small machines do not need these solutions to reach acceptable noise emissions.

6.2.2 Noise emission measurement and declaration

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

Annex F replaces ISO 19085-1:2021, Annex F.

6.3 Emission of chips and dust

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

Laser marking unit shall be provided with a dedicated extraction outlet.

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.

On machines designed for manual loading and/or unloading the height of the workpiece support shall be between 750 mm and 900 mm above the floor level.

The integral enclosure described in [5.6.2](#) shall allow viewing of the working area. This requirement is met if there is a window of at least $6 \times 10^4 \text{ mm}^2$ every 1 m along the front length of the machine.

6.6 Lighting

ISO 19085-1:2021, 6.6, applies with the following additions.

Lighting shall be provided inside the machine enclosures in accordance with the requirements of EN 1837:1999+A1:2009.

6.7 Pneumatics

ISO 19085-1:2021, 6.7, applies.

6.8 Hydraulics

ISO 19085-1:2021, 6.8, applies.

6.9 Electromagnetic compatibility

ISO 19085-1:2021, 6.9, applies.

6.10 Laser

ISO 19085-1:2021, 6.10, applies with the following addition.

Accessible parts of the laser marking unit shall be of category 1 according to IEC 60825-1:2014. Access to other parts of higher risk category according IEC 60825-1:2014 shall be prevented by fixed guards and/or movable guards interlocked with the laser unit.

The SRP/CS for interlocking of movable guards with laser marking unit activation shall achieve $PL_r = c$.

Where a laser marking unit is provided, the machine shall be designed to avoid the spread and reflection of its radiation.

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.

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

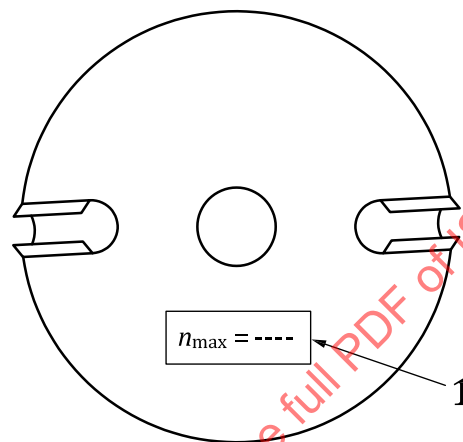
ISO 19085-1:2021, 7.2.2, applies with the following additions.

The following additional information shall be marked in the same ways:

- a) parts of the machine which can heat up during operation exceeding a temperature of 70 °C (see ISO 13732-1:2006, Figure 2), with a warning label placed in proximity to all potentially hot parts, warning of hot surfaces;

NOTE The machine table temperature depends largely on the quality of the table surface, the working conditions and the workpiece material. Particularly, machining of certain species of tropical hardwood is known to result in high machine table temperatures.

- b) for each spindle, a label positioned close to the spindle, showing a tool and stating the minimum $n_{\max}$ (maximum rotational speed) of the tools that are allowed to be mounted. For example, see [Figure 14](#);



Key

- 1 $n_{\max} \geq 5\,000\,1/\text{min}$

Figure 14 — Example of label for spindles

- c) where the machine is fitted with laser marking unit, a warning symbol for accessible laser radiation according to EN 12198-1:2000+A1:2008;
- d) for each vertical right spindle other than the first vertical right one, a warning label stating to fit the deterring/impeding devices, e.g. the pressure/feed roller in front of the spindle;
- e) for infeed hopper, a label, positioned close to the workpiece stack vertical guides (see [Figure 2](#), key 4), warning of the residual entanglement and crushing hazards.

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 addition.

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

- a) reasonably foreseeable misuse includes simultaneous machining of multiple workpieces side by side (in parallel), planing and/or thicknessing, operating climb cutting in machines where it is not allowed (e.g. universal spindle), but does not include demounting of safety equipment;

- b) information that the maximum length of the workpieces to be processed shall not exceed the free space at the out-feed end of the machine minus 500 mm;
- c) a warning that saw blades made of high speed steel (HSS) shall not be used;
- d) a warning that only the fixing device for the tool provided by the manufacturer shall be used;
- e) a warning that parts of the machine can heat up during operation and indication of all parts that can exceed 70 °C, e.g. machine table and fences;
- f) a warning to check that the manually adjusted spindles that are not rotating are in a non-cutting position before starting the integrated feed or their tools are removed;
- g) where relevant, information on how to avoid contact between the tools which are adjusted manually and other parts of the machine, e.g. pressure shoes and feed rollers, in particular to turn the tool by hand after its mounting to check that it does not contact other parts of the machine;
- h) where relevant, information on how to avoid contact between the tools and other parts of the machine during powered adjustment of the spindles, e.g. the correct positioning of the manually adjustable mechanical retaining device, or by validating the operation of the relevant work program in the numeric control system;
- i) on machines with manual height adjustment by hand-wheel, information to avoid rising up the feed mechanism while tools are rotating and workpieces or parts of it are still in the machine;
- j) for machines equipped with hydrostatic tool fixing, only tool fixing devices with additional mechanical device to protect against loosening of the tool in case of leakage in the hydrostatic system shall be used;
- k) instruction to use only tools with $n_{\max}$ equal to or higher than the rotational speed indicated by the corresponding label [see 7.2.2 b)];
- l) information that the laser marking unit shall be connected to a dedicated extraction system, separate from the CADES to which are connected the other extraction outlets of the machine;
- m) warning of the entanglement and crushing hazards existing at the in-feed hopper as residual risks;
- n) instructions about protective devices tests, method and frequency shall also include:
 - 1) row of anti-splinter fingers – by inspection to check that the anti-splinter fingers are in the fully closed position when no workpiece is present;
 - 2) anti-kickback fingers of glass bead saw unit – by inspection to check that the anti-kickback fingers are in the rest position when no workpiece is present;
- o) instruction on how to adjust the adjustable guard preventing access to any bottom horizontal tool other than the first one;
- p) instruction on how to fit, use and adjust the deterring/impeding devices for the vertical right spindles other than the first right vertical one, together with a picture of these deterring/impeding devices;
- q) information that the pull-in force of spindles of HSK clamping systems shall be periodically checked by personnel authorized by the manufacturer, including the intervals.

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 four-sided moulding 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	ISO 12100:2010	Relevant section of this document
1	Mechanical hazards related to		
	— machine parts or workpieces		
	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		
	f) liquids and gases under pressure	6.2.10, 6.3.5.4	4.8 , 6.7 , 6.13
1.1	Crushing hazard		4.3 , 4.4 , 4.8 , 5.4 , 5.6 , 5.10 , 6.12 , 6.13
1.2	Shearing hazard		4.3 , 4.4 , 5.4 , 5.6 , 5.10 , 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 , 5.10 , 6.12
1.9	High pressure fluid injection or ejection hazard	6.2.10	4.4 , 5.9 , 5.10 , 6.12
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 , 7.3
4.2	Interference with speech communication, acoustic signals.		
6	Hazards generated by radiation		

Table A.1 (continued)

No.	Hazards, hazardous situations and hazardous events	ISO 12100:2010	Relevant section of this document
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		
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 related to		
8.1	Unhealthy postures or excessive effort	6.2.7, 6.2.8, 6.2.11.12, 6.3.5.5, 6.3.5.6	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	6.2.8.1, 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	6.2.8.7, 6.2.11.8	4.2
8.8	Design or location of visual display units	6.2.8.8, 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 , 6.13
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
10.6	Errors made by the operator (due to mismatch of machinery with human characteristics and abilities, see 8.6)	6.2.8, 6.2.11.8, 6.2.11.10, 6.3.5.2	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	Variations in the rotational speed of tools	6.2.2.2, 6.2.3	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
19	Slip, trip and fall hazards in relationship with machinery (because of their mechanical nature)	6.3.5.6	7.3

Annex B (informative)

Performance levels required

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

[Table B.1](#) gives a quick-view summary of the performance level required (PL_r) for each safety function. However, refer to [Clauses 4, 5](#) and [6](#) for full requirements.

Table B.1 — Safety functions and performance level (PL) required

Area	Safety function		PL _r	Subclause of ISO 19085-1	Subclause of 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	Prevention of unexpected control power-on	c	4.3.2	
	5	Interlocking of control power-on with safeguards	c	4.3.2	
	6	Interlocking of laser marking unit activation with feed	c		4.3.4
	7	Interlocking of laser marking unit activation with workpiece detection	b		4.3.4
Stop	8	Disabling of laser marking unit with safe stop	c		4.4.1
	9	Normal stop (braking function excluded)	c	4.4.2	
	10	Emergency stop (braking function excluded)	c	4.4.4	
	11	Interlocking of wireless connection with emergency stop	c		4.2
Tool braking	12	Activation of the brakes	c	4.5	
	13	Electric braking system	b	4.5	
	14	SS1 of PDS(SR)	c	4.5	
	15	Interlocking of brake release	c	5.4.3	
Mode selection	16	Mode selection	c	4.6	
	17	Start of spindle drives	c		4.6.2
	18	Prevention of reverse feed while the tools are rotating	c		4.6.2
	19	Prevention of activation of another unit adjustment at the same time	b		4.6.2
	20	Selection of multiple units' adjustment at a time	b		4.6.2
	21	Interlocking of tool rotation with selection of multiple units' adjustment at a time	b		4.6.2
Spindle speed	22	Maximum rotational speed monitoring	c	4.7.3	4.7.3
Controls	23	Interlocking of operations with pressure monitoring	b		4.8
	24	Prevention of automatic start and maintaining of adjusted positions	c		4.8
	25	Manual reset	c	4.9	
	26	Standstill detection and monitoring	c	4.10	
	27	Machine moving parts speed monitoring	b	4.11	
	28	Time delay	c	4.12	
	29	Prevention of unexpected start of tool spindles	c		4.6.1, 5.3.1
	30	Initiation control	c		4.6.1, 4.6.2, 5.8
	31	10-minute delay of the disabling of initiation control	c		4.6.1, 4.6.2, 5.8
	32	20 s delay for deactivation of initiation control	c		4.6.2

Table B.1 (continued)

Area	Safety function		PL _r	Subclause of ISO 19085-1	Subclause of this document
Tool fixing	33	Interlocking of tool release with spindle standstill	c/b + b/b + mech. syst.		5.3.1
Safeguards	34	Interlocking of movable guards	c	5.5.2.2 , 5.5.2.3	
	35	Guard locking of movable guards	c	5.5.2.3	
	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 the override function of the trip device	c		5.6.3
	40	Interlocking of removable tunnel guard with spindles in climb cutting	c		5.9.3.2
	41	Safe stop initiation by triggering PSPE/AOPD	c		4.6.2 , 5.10.3 , 5.10.4
	42	Interlocking of movable guards with laser marking unit	c		6.10
Clamping	43	Interlocking of workpiece holding with power supply	c		5.8
	44	Interlocking of height adjustment with tools' standstill	c		5.8
	45	Interlocking of upward movement of feed mechanism with guards	c		5.8
	46	Workpiece detection system	b		5.8

Annex C
(normative)

Stability test

ISO 19085 1:2020, Annex C, does not apply.

STANDARDSISO.COM : Click to view the full PDF of ISO 19085-14:2021