INTERNATIONAL STANDARD

ISO 19085-12

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Woodworking machines — Safety —

Part 12: Tenoning/profiling machines

Machines à bois — Sécurité —

Partie 12: Machines à tenonner/profiler

Reference number
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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

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Foreword

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

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

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

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

For an explanation 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 document is intended to be used in conjunction with ISO 19085-1:2017, 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.

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 of International Standards provides technical safety requirements for the design and construction of woodworking machinery. It concerns designers, manufacturers, suppliers and importers of the machines specified in the Scope. It also includes a list of informative items that the manufacturer will need to give to the user.

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

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

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

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

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

Thus, Clauses 5, 6, 7 and 8 with their subclauses and the annexes of this document can either

— confirm as a whole,

— confirm with additions,

— exclude in total, or

— replace with specific text

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

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

— “ISO 19085-1:2017, [subclause/Annex], applies.”;

— “ISO 19085-1:2017, [subclause/Annex], applies with the following additions.” or “ISO 19085-1:2017, [subclause/Annex], applies with the following additions, subdivided into further specific subclauses.”;

— “ISO 19085-1:2017, [subclause/Annex], does not apply.”;

— “ISO 19085-1:2017, [subclause/Annex], is replaced by the following text.” or “ISO 19085-1:2017, [subclause/Annex], is replaced by the following text, subdivided into further specific subclauses.”.

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

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

NOTE Requirements for tools are given in EN 847-1:2017 and EN 847-2:2017. Requirements for tool clamping devices are given in EN 847-3:2013.

Woodworking machines — Safety —

Part 12: Tenoning/profiling machines

1 Scope

This document gives the safety requirements and measures for stationary, manually loaded and unloaded:

— single end tenoning machines with manual feed sliding table;

— single end tenoning machines with mechanical feed sliding table;

— single end tenoning and/or profiling machines with mechanical feed;

— double end tenoning and/or profiling machines with mechanical feed, also designed to be automatically loaded/unloaded;

— angular systems for tenoning and profiling with mechanical feed;

with maximum work-piece height capacity of 200 mm for single end machines and 500 mm for double end machines, hereinafter referred to as "machines".

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

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

The machines are designed to process in one pass one end or two sides, either opposite or perpendicular to each other, of work-pieces made of:

1) solid wood;

2) materials with similar physical characteristics to wood (see ISO 19085-1:2017, 3.2);

3) fibre-cement, rock/glass wool, gypsum, plasterboard, only with machines with mechanical feed.

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

— sanding units;

— fixed or movable work-piece support;

— automatic tool changing;

— automatic work-piece returner;

— glass bead saw unit;

— hinge recessing unit;

— post forming edge pre-cutting;

— boring unit;

— dynamic processing unit;

— sawing unit installed out of the integral enclosure, between machine halves in double end machines;

— foiling unit;

— coating unit;

— grooving unit with milling tool installed out of the integral enclosure, between machine halves;

— brushing unit;

— gluing unit;

— sealing unit;

— dowels inserting unit;

— tongues inserting unit;

— inkjet marking unit;

— laser marking unit;

— labelling unit;

— work-piece back-up device (anti-chipping / anti-splintering device);

— quick tool changing system.

This document does not deal with any hazards related to:

a) systems for automatic loading and unloading of the work-piece to a single machine other than automatic work-piece returner;

b) single machine being used in combination with any other machine (as part of a line);

c) use of tools, other than saw blades or milling tools for grooving, installed between machine halves and out of the integral enclosure in double end machines;

d) use of tools protruding out of the integral enclosure;

e) chemical characteristics of fibre-cement, rock/glass wool, gypsum, plasterboard and their dust.

It is not applicable to machines intended for use in potentially explosive atmosphere nor 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 7960:1995, *Airborne noise emitted by machine tools — Operating conditions for woodworking machines*

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

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

ISO 13856-2:2013, *Safety of machinery — Pressure-sensitive protective devices — Part 2: General principles for design and testing of pressure-sensitive edges and pressure-sensitive bars*

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

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

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

IEC 61310-1:2007, *Safety of machinery — Indication, marking and actuation — Part 1: Requirements for visual, acoustic and tactile signals*

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

EN 847-2:2017, *Tools for woodworking — Safety requirements — Part 2: Requirements for the shank of shank mounted milling tools/circular saw blades*

EN 847-3:2013, *Tools for woodworking — Safety requirements — Part 3: Clamping devices*

3 Terms and definitions

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

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

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

3.1
single end tenoning machine with manual feed sliding table
machine designed for the production of *tenons* (3.10) on one end of a work-piece during one cycle where the tenon is cut by means of milling tools and saw blades mounted on one or more spindles and with manual feed sliding table supporting the work-piece during processing

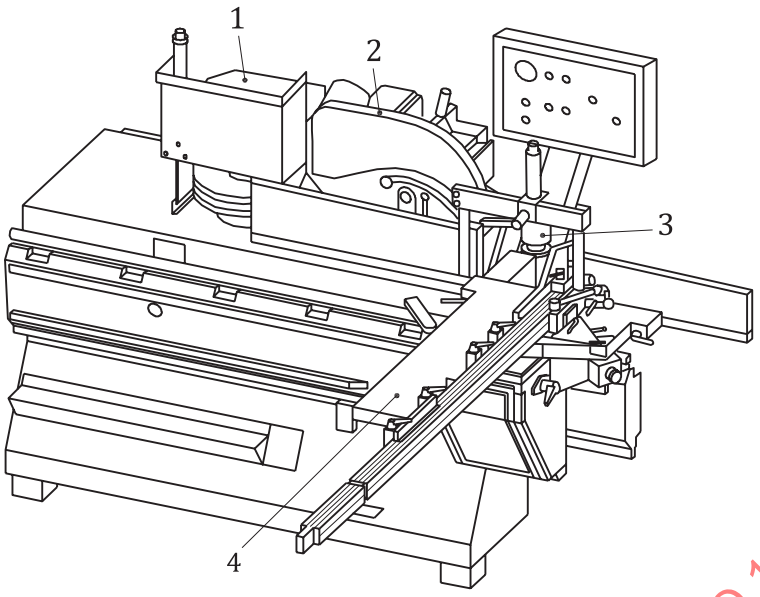
Note 1 to entry: See Figure 1 for an example.

3.2
single end tenoning machine with mechanical feed sliding table
machine designed for the production of *tenons* (3.10) on one end of a work-piece during one cycle where the tenon is cut by means of milling tools and saw blades mounted on one or more spindles, with mechanical feed sliding table and with one operator position for both loading and unloading

Note 1 to entry: See Figure 2 for an example.

3.3
single end tenoning and/or profiling machine with mechanical feed
machine designed for production of *tenons* (3.10) and/or profiles on one side of the work-piece in one pass

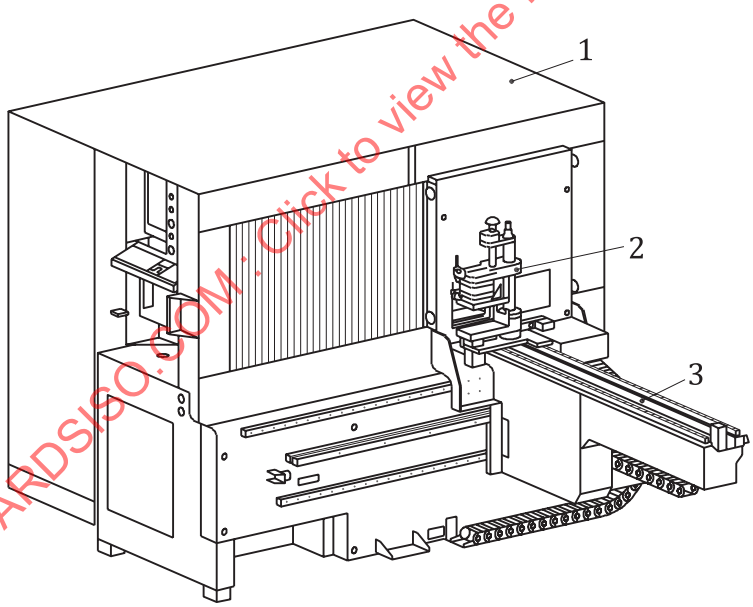
Note 1 to entry: This machine is also known as “shaper-sander” or “shape and sand machine” (e.g. in North America). See Figure 3 for an example.



Key

1 milling tool enclosure
2 saw blade enclosure
3 work-piece clamping device
4 manual feed sliding table

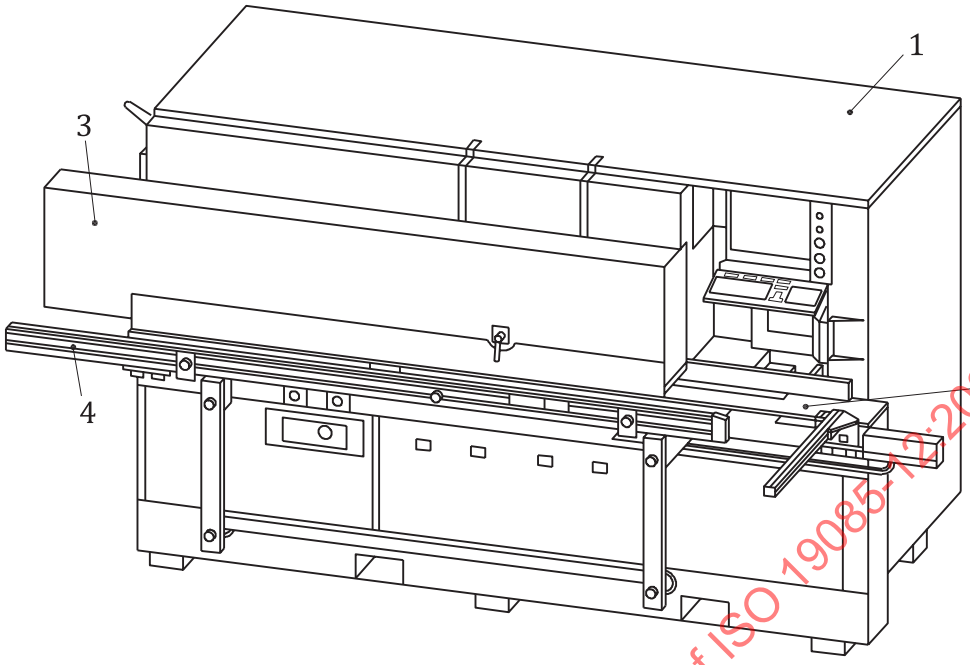
Figure 1 — Example of a single end tenoning machine with manual feed sliding table



Key

1 tools enclosure
2 work-piece clamping device
3 mechanical feed sliding table

Figure 2 — Example of a single end tenoning machine with mechanical feed sliding table



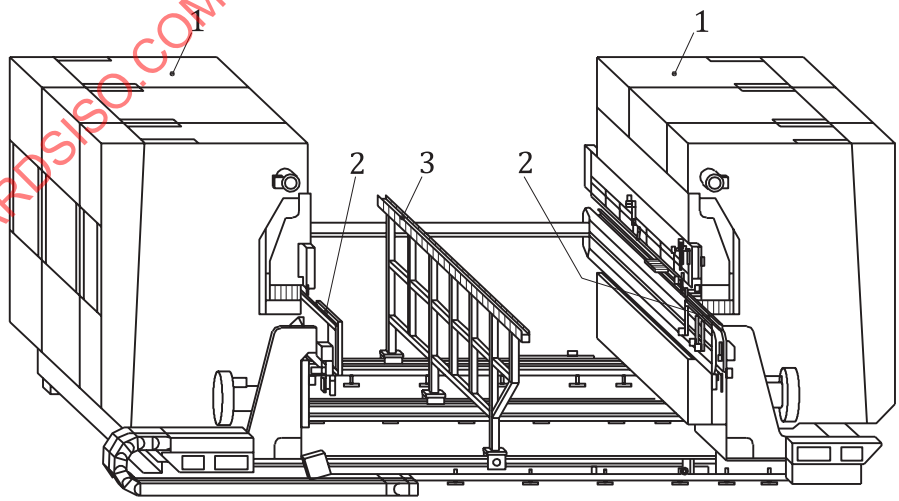
Key

1 tools enclosure
2 work-piece support
3 power-driven upper feed-rollers enclosure
4 adjustable work-piece support

Figure 3 — Example of a single end profiling machine with mechanical feed

3.4
double end tenoning and/or profiling machine with mechanical feed
machine primarily designed for production of *tenons* (3.10) and/or profiles on opposing sides of a work-piece in one pass

Note 1 to entry: See Figure 4 for an example.



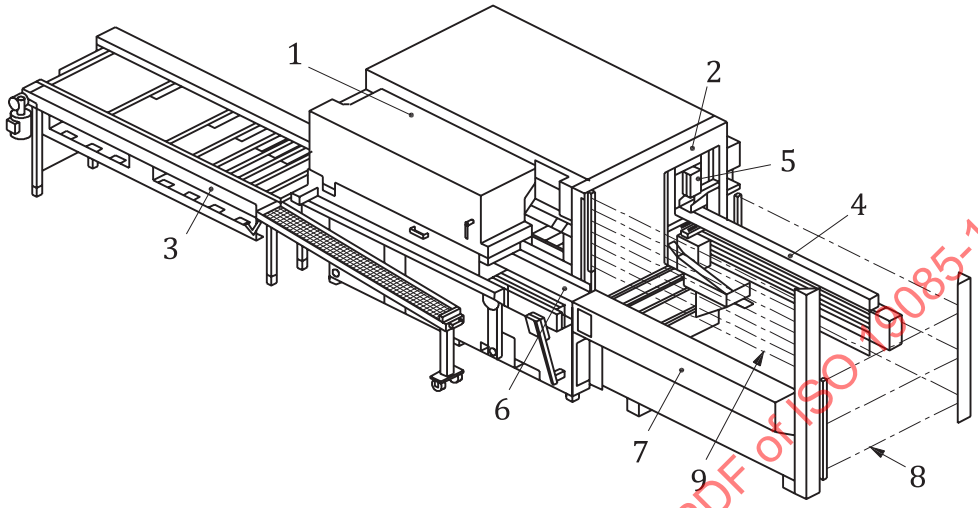
Key

1 machine half
2 work-piece feeding chain
3 intermediate work-piece support

Figure 4 — Example of a double end tenoning and/or profiling machine fed by chains

3.5
angular system for tenoning and profiling with mechanical feed
combination of a *single end tenoning machine with mechanical feed sliding table* (3.2) and a *single end profiling machine with mechanical feed* (3.3) disposed in sequence perpendicularly to each other

Note 1 to entry: See Figure 5 for an example. Transfer of work-piece from tenoning side to profiling side can be automatic or by the intervention of the operator.



Key

1	profiling unit	6	work-piece support
2	tenoning unit	7	fixed guard at loading/unloading position
3	automatic work-piece returner	8	AOPD 1
4	mechanical feed sliding table	9	AOPD 2
5	work-piece clamping device		

Figure 5 — Example of an angular tenoning and profiling system with mechanical feed

3.6
machine half
part of a machine consisting of a frame, working units, work-piece support and feeding system

Note 1 to entry: Each machine half processes one side of the work-piece. One or both machine halves are capable of being moved to accept work-pieces of different dimensions. Examples of feeding systems are chain beam and top pressure beam.

3.7
integral enclosure
guarding designed to fit close to the machine and provide a measure of sound attenuation and where certain setting adjustments can be available outside the enclosure

Note 1 to entry: Each machine half is provided with separate guarding and on the adjustable machine half/halves this guarding moves with it when adjustment is made for work-piece width.

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 work-piece loading and unloading. The openings are usually equipped with sound-absorbing sections, e.g. tunnels.

3.9
profiling
shaping of an edge of a work-piece by milling tools, saw blades and/or sanding units

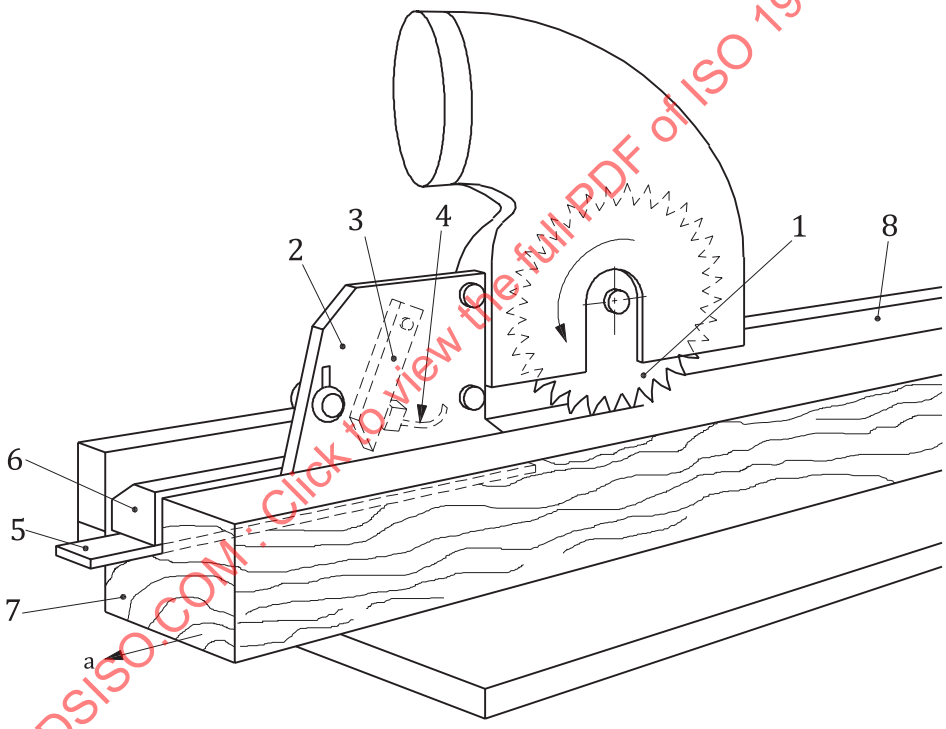
Note 1 to entry: Profiling also includes panel sizing.

3.10
tenon
machined projection and slots on the end of a work-piece to facilitate the joining of work-pieces

Note 1 to entry: Profiled tenons are included.

3.11
glass bead saw unit
work unit fitted with a tool, usually a saw blade, with or without coaxial mounted milling tool, to cut out a glass bead from the machined profile of the work-piece

Note 1 to entry: See Figure 6 for an example.



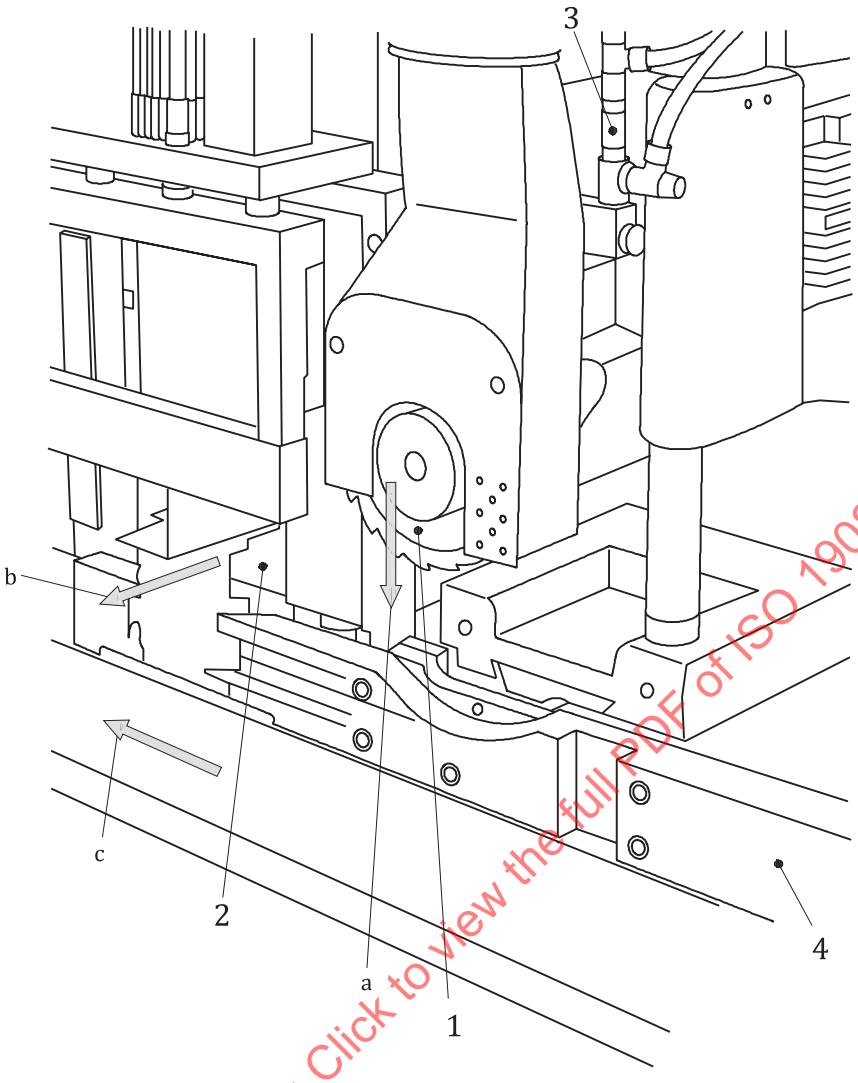
Key

1	glass bead saw-blade	6	glass bead ledge
2	bed ledge separator	7	work-piece
3	anti-kickback finger	8	fence
4	pressure device	a	Feed direction.
5	guiding channel for glass bead ledge		

Figure 6 — Example of glass bed saw unit

3.12
hinge recessing unit
work unit fitted with a milling tool to recess hinges for window fittings

Note 1 to entry: See Figure 7 for an example. The tool spindle moves in a vertical or horizontal plane during processing and returns to its starting position ready for the following (succeeding) work-piece.



Key

1	vertical hinge recessing unit	a	Processing movement of vertical hinge recessing unit.
2	horizontal hinge recessing unit	b	Processing movement of horizontal hinge recessing unit.
3	actuator for movement of vertical hinge recessing unit	c	Feed direction.
4	fence		

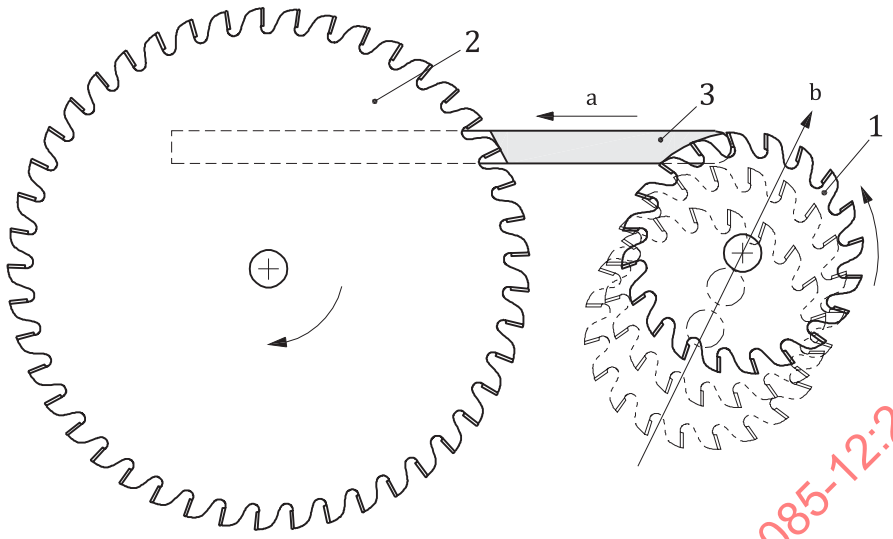
Figure 7 — Example of hinge recessing unit

3.13
post-formed edge pre-cutting
cut made by a separate saw blade or hogger in the front profiled edge of the work-piece deep enough to prevent surface damage when the main saw blade makes its cut

Note 1 to entry: See Figure 8.

3.14
post-formed edge pre-cutting unit
unit with saw blade or hogger used for *post-formed edge pre-cutting* (3.13) specific for this purpose

3.15
boring unit
unit provided with one or more boring tools



Key

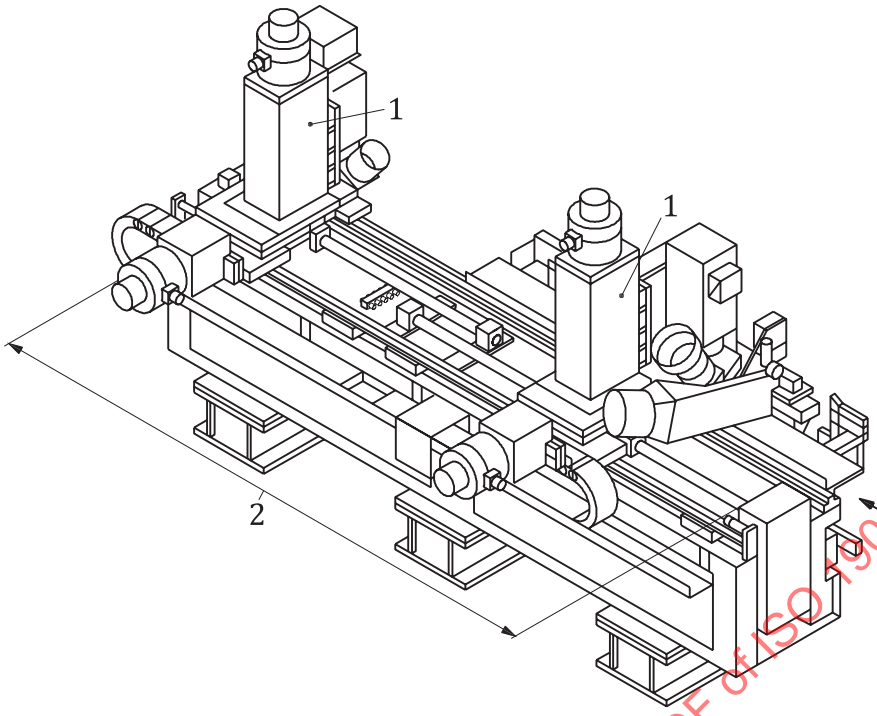
1 post-formed/soft-formed edge pre-cutting saw blade or hogger
2 main saw blade
3 work-piece
a Feed direction of the sliding table.
b Movement of post-formed/soft-formed edge pre-cutting saw blade.

Figure 8 — Post-formed edge pre-cutting

3.16
dynamic processing unit
milling/sawing/boring/disk-sanding unit which moves with the work-piece during processing and returns to its starting position ready for the following (succeeding) work-piece

Note 1 to entry: See Figure 9 for an example.

3.17
sealing unit
unit to apply sealant to the processed side of the work-piece after machining



Key

1 dynamic processing unit

2 movement zone

a Feed direction.

Figure 9 — Example of a dynamic processing unit

3.18
automatic work-piece returner
powered system that brings the machined work-piece from the machine end to the loading position

Note 1 to entry: Examples of work-piece returner are provided in Figure 10 and Figure 11 respectively for single end and double end machines with mechanical feed.

3.19
coating unit
unit to apply coating to the processed side of the work-piece after machining

3.20
gluing unit
unit to apply glue to the processed side of the work-piece before inserting dowels or for preparing it to further subsequent operation after exiting the machine

3.21
brushing unit
unit with roller provided with non-abrasive brushes for cleaning the processed side of the work-piece

3.22
dowels inserting unit
unit to insert dowels into the processed work-piece

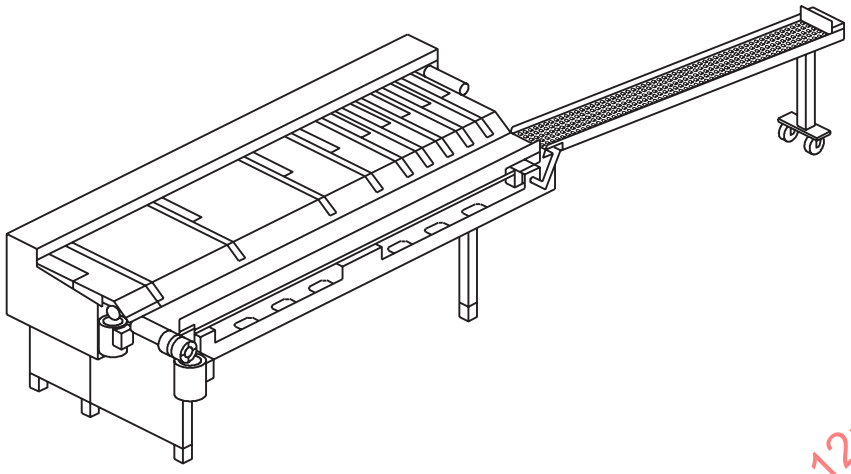
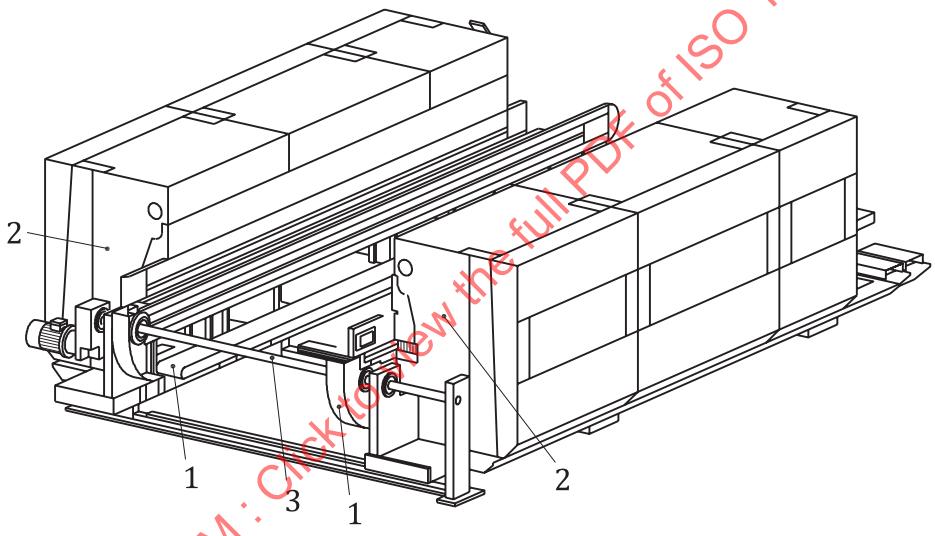


Figure 10 — Example of automatic work-piece returner for a single end machine



Key

1 work-piece returner
2 machine half
3 feed shaft

Figure 11 — Example of work-piece returner for a double end machine

3.23
tongues inserting unit
unit to insert tongues (e.g. plastic tongues) into the processed work-piece

3.24
inkjet marking unit
unit to apply marks by inkjet technology on the surface of the processed work-piece

3.25
laser marking unit
unit to mark the surface of the processed work-piece by laser technology

3.26
labelling unit
unit to apply or print and apply labels onto the surface of the processed work-piece

3.27
tele-service
machine diagnosis (including trouble-shooting), software update and tele-control from a remote service site

3.28
tele-control
control of the machine movements from a remote service site

3.29
control power-on
control that after activation enables providing power to machines actuators, also on a lower control level, e.g. by the PLC

3.30
MODE 1
automatic mode
condition for automatic processing, where all safeguards of the machine are in place and functional and some or all machine actuators are activated

3.31
MODE 2
adjustment mode
condition for adjustment of tools and other processing units, with guards opened

3.32
jog control
control device for momentary activation of a function or a movement

Note 1 to entry: For example, jog control can be a joystick, a button, a selector switch, a knob or a sphere.

4 List of significant hazards

This clause contains all significant hazards, hazardous situations and events (see ISO 12100:2010), identified by risk assessment as significant for the machines as defined in the Scope and which require action to eliminate or reduce the risk. This document deals with these significant hazards by defining safety requirements and/or measures or by reference to relevant standards.

These hazards are listed in Table 1.

Table 1 — List of significant hazards

No.	Hazards, hazardous situations and events	ISO 12100:2010	Relevant subclause in this document
1	**Mechanical hazards** related to — machine parts or work-pieces due to		
	a) shape	6.2.2.1, 6.2.2.2, 6.3	6.2, 6.3, 6.9, 6.6
	b) relative location		5.2, 5.4.4, 5.9, 6.9, 6.6, 7.5
	c) mass and stability (potential energy of elements which may move under the effect of gravity)		4.8, 4.9
	d) mechanical strength		6.2, 6.9
	— accumulation of energy inside the machinery by		
	a) liquids and gases under pressure	6.2.10, 6.3.5.4	6.9, 7.8, 7.9
1.1	Crushing hazard		6.10, 6.6
1.2	Shearing hazard		6.10, 6.7
1.3	Cutting or severing hazard		6.3, 6.4, 6.9, 6.10, 6.6

Table 1 *(continued)*

No.	Hazards, hazardous situations and events	ISO 12100:2010	Relevant subclause in this document
1.4	Entanglement hazard		6.10, 6.6
1.5	Drawing-in or trapping hazard		6.10, 6.6
1.6	Impact hazard		6.2, 6.9
1.9	High pressure fluid injection or ejection hazard	6.2.10	6.10, 7.8, 7.9
2	**Electrical hazards** due to		
2.1	Contact of persons with live parts (direct contact)	6.2.9, 6.3.5.4	7.4
2.2	Contact of persons with parts which have become live under faulty conditions (indirect contact)	6.2.9	7.4
2.4	Electrostatic phenomena	6.2.9	7.11
3	**Thermal hazards** resulting in		
3.1	Burns, scalds and other injuries by a possible contact of persons with objects or materials with an extreme high or low temperature, by flames or explosions and also by the radiation of heat sources	6.2.4	7.15
3.2	Damage to health by hot or cold working environment	6.2.4	7.15
4	**Hazards generated by noise**, resulting in		
4.1	Hearing loss (deafness), other physiological disorders (loss of balance, loss of awareness)	6.2.2.2, 6.3	7.2
4.2	Accidents due to interference with speech communication, acoustic signals	6.2.2.2, 6.3	7.2
7	**Hazards generated by materials and substances** (and their constituent elements) processed or used by the machinery		
7.1	Hazards from contact with or inhalation of harmful fluids and dusts	6.2.3, 6.2.4	7.3, 8.3
7.2	Fire	6.2.4	7.1
8	**Hazards generated by neglecting ergonomic principles** in machinery design		
8.1	Unhealthy postures or excessive effort	6.2.7, 6.2.8, 6.2.11.12, 6.3.5.5, 6.3.5.6	5.2, 7.5
8.2	Hand-arm or foot-leg anatomy	6.2.8	5.2, 7.5
8.4	Local lighting	6.2.8	8.3
8.6	Human error, human behaviour (see 10.6)	6.2.8, 6.2.11.8, 6.2.11.10, 6.3.5.2, 6.4	5.1, 7.5, 8.3
8.7	Design, location or identification of manual controls	6.2.8, 6.2.11.8	5.2, 7.5
8.8	Design or location of visual display units	6.2.8, 6.4.2	5.2, 7.5
9	**Combination of hazards**	6.3.2.1	5.6, 5.7.3
10	**Unexpected start-up,** unexpected overrun/overspeed (or any similar malfunction) from		
10.1	Failure/disorder of the control system	6.2.11, 6.3.5.4	5.1, 7.13
10.2	Restoration of energy supply after an interruption	6.2.11.4	5.10, 7.7, 7.8
10.3	External influences on electrical equipment	6.2.11.11	5.1, 7.9
10.6	Errors made by the operator (due to mismatch of machinery with human characteristics and abilities)	4.9, 6.2.8, 6.2.11.8, 6.2.11.10, 6.3.5.2, 6.4	7.5, 8.3
11	**Impossibility of stopping the machine in the best possible conditions**	6.2.11.1, 6.2.11.3, 6.3.5.2	5.2, 5.4.2, 5.4.4
12	**Variations in the rotational speed of tools**	6.2.11.1, 6.2.11.4	5.13
13	**Failure of the power supply**	6.2.11, 6.3.5.4	5.9
14	**Failure of the control circuit**	6.2.7, 6.4.5	5.10

Table 1 *(continued)*

No.	Hazards, hazardous situations and events	ISO 12100:2010	Relevant subclause in this document
15	**Errors of fitting**	6.2.3	7.12
16	**Break-up during operation**	6.2.3, 6.2.10	6.2
17	**Falling or ejected objects or fluids**	6.3.2.6	6.9
18	**Loss of stability/overturning of machinery**	6.2.11.1, 6.2.11.3, 6.3.5.2	6.1
19	**Slip, trip and fall hazards in relationship with machinery (because of their mechanical nature)**	6.3.5.6	8.3

5 Safety requirements and measures for controls

5.1 Safety and reliability of control systems

ISO 19085-1:2017, 5.1, applies.

5.2 Control devices

ISO 19085-1:2017, 5.2, applies with the following additions, subdivided into further specific subclauses.

5.2.1 General

The main electrical control devices of the machine for control power-on, start of a tool spindle and of other processing units, normal stop, integrated feed, top pressure beam movement, machine half movement and mode selection shall be located together in a position from where the loading position can be seen.

No reset function control devices, no control devices for control power-on, no mode selection shall be positioned on mobile control sets.

When a wireless control set loses its connection to the machine an emergency stop shall be automatically activated.

The SRP/CS for the automatic activation of emergency stop when wireless connection is lost shall achieve PL_r = c.

5.2.2 Additional requirements for single end tenoning machines with manual feed sliding table

An emergency stop control device shall be located at the loading position. On machines with sliding table stroke longer than 2 m an additional emergency stop control device shall be located on-board of the sliding table at the operator side.

5.2.3 Additional requirements for single end tenoning machines with mechanical feed sliding table

Emergency stop control devices shall be located at the loading and at the unloading positions.

5.2.4 Additional requirements for single end tenoning and/or profiling machines with mechanical feed

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

a) such that they can be reached from the loading and unloading positions of the machine;

b) on each mobile set of controls;

c) not more than 0,5 m from each hold-to-run control device;

d) on the main control panel.

5.2.5 Additional requirements for double end machines

Additional control devices for cycle start, operational and normal stop may be provided on mobile control sets with cable connection or wireless.

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

a) on each mobile or fixed set of controls;

b) at the loading and unloading positions of each machine half as long as there is no set of controls;

c) not more than 0,5 m from each hold-to-run device;

d) inside each enclosure, where MODE 2 is provided, and positioned with a maximum distance of 2 m from each other.

5.2.6 Additional requirements for angular systems for tenoning and profiling with mechanical feed

Emergency stop control devices shall be fitted according to 5.2.3 and 5.2.4.

5.3 Start

ISO 19085-1:2017, 5.3, is replaced by the following text subdivided into further specific subclauses.

5.3.1 Machines with manual feed

On single end tenoning machines with manual feed sliding table, before start or restart of the machine, all relevant safeguards shall be in place and operational. This is achieved by the arrangements described in 6.6. Start or restart shall only be possible by actuation of the start control device provided for that purpose. Unintended actuation shall be impeded, e.g. by a control device with shroud.

The SRP/CS for prevention of unexpected start/restart shall achieve PL_r = c.

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

5.3.2 Machines with mechanical feed

A control power-on device shall be provided and be protected against unintended actuation e.g. shrouded.

Control power-on activation in automatic mode (MODE 1) shall only be possible if all relevant safeguards are in place and functional. This is achieved by the interlocking arrangement described in 6.6.

Process start or restart shall only be possible after control power-on activation.

The SRP/CS for control power-on shall achieve PL_r = c.

NOTE 1 No PL is required for the SRP/CS of process start and restart.

On single end tenoning machines with mechanical feed sliding table, power driven movement of the sliding table shall only be possible if the following requirements for the clamping system are met:

a) pneumatic or hydraulic pressure is applied; and

b) the piston of the pneumatic or hydraulic cylinder is not fully extended.

The SRP/CS for this interlocking shall achieve PL_r = c.

Closure of interlocking movable guards or moving away from a triggered ESPE or PSPE shall not lead to an automatic restart of dangerous movements. For each restart a deliberate action of the operator is required, i.e. safeguard reset. If only one safeguard is triggered, safeguard local reset and process start can occur at the same time.

NOTE 2 Dangerous movement means movement affecting the safety of the operator or other persons, not the integrity of the machine.

If any tool spindle or other processing spindle is running, this shall be permanently indicated either on the display or by a light signal integrated with the start control or near to it.

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

For spindle units that are adjusted manually, by hand wheel or power operated, see 8.3.2 p).

For automatically adjusted spindle units under NC or CNC-control, one of the following requirements shall be fulfilled to ensure that not rotating spindles, where the tool has not been removed, are retracted to a non-cutting position:

1) a limit position device at the non-cutting position shall be provided; or

2) the PLC shall start retracting the tool from the working position.

The SRP/CS for the interlocking of feed start with spindle retraction shall achieve PL_r = b.

The SRP/CS for interlocking of feed start with all tool spindle drives 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.

5.3.3 Laser marking unit

Laser marking unit activation shall only be possible when feed is running and work-piece 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 work-piece detection shall achieve PL_r = b.

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

5.4 Safe stops

5.4.1 General

ISO 19085-1:2017, 5.4.1, applies.

5.4.2 Normal stop

ISO 19085-1:2017, 5.4.2, applies with the following additions.

On machines with laser marking unit, activating the normal stop shall also disable the laser marking unit.

The SRP/CS for disabling the laser marking unit with the normal stop shall achieve PL_r = c.

5.4.3 Operational stop

ISO 19085-1:2017, 5.4.3, applies with the following additions.

On machines with laser marking unit, activating the operational stop shall also disable the laser marking unit.

The SRP/CS for disabling the laser marking unit with the operational stop shall achieve PL_r = c.

5.4.4 Emergency stop

ISO 19085-1:2017, 5.4.4, applies with the following additions.

On machines with laser marking unit, activating the emergency stop shall also disable the laser marking unit.

The SRP/CS for disabling the laser marking unit with the emergency stop shall achieve PL_r = c.

5.5 Braking function of tool spindles

ISO 19085-1:2017, 5.5, applies.

5.6 Mode selection

ISO 19085-1:2017, 5.6, applies with the following addition subdivided into further specific subclauses.

5.6.1 General

In single and double end tenoning and/or profiling machines with mechanical feed a mode selection switch shall be provided if the guards need to be opened for adjusting whilst certain parts of the machine are in motion.

NOTE In ISO 19085-1:2017, 5.6 d), "mode with lower safety measure" refers to MODE2, "mode with higher safety measure" refers to MODE1.

5.6.2 Adjustment mode (MODE 2)

If MODE 2 is implemented for adjustment of tools and other processing units with the guards open, the following requirements apply:

a) MODE 1 (automatic control mode) shall be disabled;

b) selection of MODE 2 shall initiate stopping of the feed, tool spindles and other processing units, with the exception of dynamic processing units, hinge recessing units and post-formed pre-cutting units, if provided with their own movable guard with interlocking and guard locking and if this movable guard is closed and locked;

c) selection of MODE 2 shall not initiate any unit adjustment;

d) movement of the feed and of powered units' adjustment, one at a time, shall only be possible either by hold-to-run control or jog control together with an enabling control. The relevant maximum feed speed shall be limited to 2 m/min, but the requirements of 5.11 do not apply. The relevant hold-to run control/enabling control devices shall be located on a mobile set of controls;

   NOTE No PL is required for the SRP/CS of jog control, limited max feed speed of 2 m/min and selection of the unit to be adjusted.

e) during MODE 2 restart of each sanding unit shall only be possible if provided with relevant separate start control device. The SRP/CS for restart of drives shall achieve PL_r = c.

5.7 Spindle speed changing

5.7.1 Spindle speed changing by changing belts on the pulleys

ISO 19085-1:2017, 5.7.1, does not apply.

5.7.2 Spindle speed changing by incremental speed change motor

ISO 19085-1:2017, 5.7.2, applies with the following additions.

As an exception, no PL is required for the SRP/CS for speed selection of sanding belt units.

5.7.3 Infinitely variable speed by frequency inverter

ISO 19085-1:2017, 5.7.3, applies with the following additions.

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

NOTE See also 8.2.2 d) for the indication of the minimum n_{max} and 8.3.2 l) 2).

As an exception, speed monitoring is not required for:

— sanding belt units;

— all tools, where direct ejection of tools or their parts can be excluded, i.e. where the axis of rotation is horizontal and perpendicular to feed direction for tools installed inside integral enclosure.

5.8 Failure of any power supply

ISO 19085-1:2017, 5.8, applies with the following additions.

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

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

5.9 Manual reset control

ISO 19085-1:2017, 5.9, applies with the following additions.

Manual reset may be achieved by control power-on circuit, where control-power on device fulfils position requirements stated in 5.2 for manual reset devices.

5.10 Enabling control

ISO 19085-1:2017, 5.10, applies.

5.11 Machine moving parts limited speed monitoring

ISO 19085-1:2017, 5.11, applies.

5.12 Time delay

ISO 19085-1:2017, 5.12, applies.

5.13 Tele-service

Subclause specific to this document.

For machines equipped with tele-service facility, the following requirements apply.

A secure connection line, e.g. VPN, shall be in place between the provider of the tele-service and customer.

The tele-service functions provided for diagnosis, software update and/or tele-control shall be enabled from the machine side.

Indication that the tele-service mode is activated shall be provided at the machine (no PL required) e.g. by a message on the screen.

Any single machine shall be readily and clearly identifiable by the tele-service remote operator.

The emergency stop control function and all safety functions at the machine shall take precedence over any command issued by the remote tele-service operator.

Any tele-service operation shall not activate control power-on, nor mode selection and shall neither suspend nor reset any safeguard or safety function.

Before software update, the service technician at the remote site shall ask the operator at the machine to check that the machine is on, in normal stop condition and empty from work-pieces.

The tele-control shall be activated with the machine operator present at the machine. A warning shall appear on the control panel stating that the operator shall check that all safeguards are in place and functional, the machine is in automatic mode (MODE 1), and that he shall stay at the machine during all tele-control operation checking that nobody else is around the machine. A confirmation of the above from the operator shall be required before starting the tele-control function. (no PL required).

After the tele-service operations are accomplished, a message shall appear on the control panel stating that the machine is ready to work.

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 mechanical hazards

6.1 Stability

6.1.1 Stationary machines

ISO 19085-1:2017, 6.1.1, applies.

6.1.2 Displaceable machines

ISO 19085-1:2017, 6.1.2, does not apply.

6.2 Risk of break-up during operation

ISO 19085-1:2017, 6.2, is replaced by the following specific text.

For single end tenoning machines with sliding table, with manual or mechanical feed, also where included in an angular system for tenoning and profiling, powered adjustment of any tool spindle in the working position shall only be possible when the sliding table is at the loading position. Contact between tools and parts of the machine during powered adjustment of the spindles shall be avoided, e.g. by a manually adjustable mechanical restraint device according to ISO 12100:2010, 3.28.7.

The SRP/CS for interlocking of spindle power adjustment with sliding table position shall achieve PL_r = c.

For all other machines, see 8.3.2 e) and f).

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

6.3 Tool holder and tool design

6.3.1 General

ISO 19085-1:2017, 6.3.1, applies with the following additions.

For shafts with outboard bearings, it shall not be possible to lock the tool without the outboard bearing, or it shall not be possible to start the spindle without the outboard bearing mounted. The SRP/CS for interlocking of spindle start with the outboard bearing mounted shall achieve at least PL_r = c.

With regard to the balancing requirements shown in EN 847-1:2017, 6.2.4, 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 6.3.2).

Hydrostatic tool fixing devices which are an integral part of the spindle or which are permanently connected with it 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 or automatic tool changing, tool release shall only be possible if the spindle is stopped and unexpected start is prevented – this second requirement applies only when the operator changes the tool manually.

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.

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

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

6.3.2 Spindle locking

ISO 19085-1:2017, 6.3.2, applies.

6.3.3 Circular saw blade fixing devices

ISO 19085-1:2017, 6.3.3, applies.

6.3.4 Flange dimensions for circular saw blades

ISO 19085-1:2017, 6.3.4, is replaced by the following specific text.

For fixing saw blade, two saw flanges, or a single flange in the case of flush mounted saw blade shall be provided. The diameter of all flanges shall be at least $D/6$, where D is the diameter of the largest saw blade for which the machine is designed.

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

6.3.5 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.

Spindle rings shall be manufactured of steel with an ultimate tensile strength of at least 350 N mm^{-2}.

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

6.4 Braking

6.4.1 Braking of tool spindle

ISO 19085-1:2017, 6.4.1, applies with the following addition.

The requirements stated in ISO 19085-1:2017 apply also to sanding belts.

6.4.2 Maximum run-down time

ISO 19085-1:2017, 6.4.2, applies with the following additions.

As an exception:

— For tools with run-up time exceeding 10 s, the maximum run-down time shall be less than the run-up time but in no case exceed 30 s.

— For sanding belt units, the run-down time shall not exceed 30 s.

6.4.3 Brake release

ISO 19085-1:2017, 6.4.3, applies.

6.5 Safeguards

6.5.1 Fixed guards

ISO 19085-1:2017, 6.5.1, applies.

6.5.2 Interlocking moveable guards

6.5.2.1 General

ISO 19085-1:2017, 6.5.2.1, applies.

6.5.2.2 Moveable guards with interlocking without guard locking

ISO 19085-1:2017, 6.5.2.2, applies.

6.5.2.3 Moveable guards with interlocking and guard locking

ISO 19085-1:2017, 6.5.2.3, applies.

6.5.3 Hold-to-run control

ISO 19085-1:2017, 6.5.3, applies.

6.5.4 Two hand control

ISO 19085-1:2017, 6.5.4, does not apply.

6.5.5 Electro-sensitive protective equipment (ESPE)

ISO 19085-1:2017, 6.5.5, applies.

6.5.6 Pressure sensitive protective equipment (PSPE)

ISO 19085-1:2017, 6.5.6, applies.

6.6 Prevention of access to moving parts

6.6.1 General

ISO 19085-1:2017, 6.6.1, applies.

6.6.2 Guarding of tools

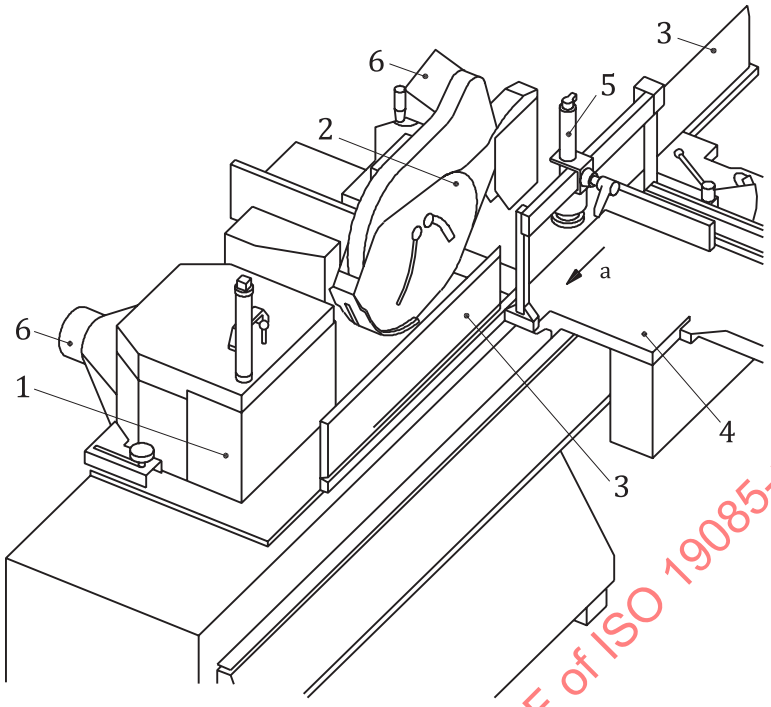
ISO 19085-1:2017, 6.6.2, is replaced by the following text, subdivided into further specific subclauses.

6.6.2.1 Single end tenoning machines with manual feed sliding table

Access to the tools shall be prevented by automatically adjustable guards (see Figure 12, keys 1 and 2). These guards shall fulfil the following requirements:

— with the sliding table (see Figure 12 key 4) in rest position they shall completely cover the tools. Any openings shall be in accordance with the requirements of ISO 13857:2008, Table 4;

— when the sliding table, during the working and the return stroke, is moved away from the rest position, the automatically adjustable guards shall open as short as necessary for the maximum possible size of the work-piece.



Key

1	power operated automatically adjustable guard for milling tool	5	work-piece clamping device
2	automatically adjustable guard by work-piece for saw blade	6	chips and dust extraction outlet
3	deterring/impeding device	a	Feed direction.
4	sliding table		

Figure 12 — Example of tools guarding

Opening and closing of the automatically adjustable guards can be either power operated or achieved by means of mechanics built into the sliding mechanism or by the work-piece itself.

In addition, a deterring/impeding device shall be attached to the sliding table (see Figure 12, key 3). This device shall prevent horizontal access, in a direction perpendicular to the device, to any exposed tool or part of the tool over the full length of the travel of the table. Any deterring/impeding device fixed to the sliding table shall not be removable without the aid of a tool.

Where it is necessary that parts of the safeguarding provided are opened or removed, e.g. for tool changing, setting, adjustment, cleaning, off-cut removal etc., these parts shall be moveable guards with interlocking and guard locking. As an exception, guard locking is not required if the rundown time is less than 10 s.

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

6.6.2.2 Single end tenoning machines with mechanical feed sliding table

Access to the tools shall be prevented by means of a combination of fixed and automatically adjustable guards, which, together with the work-piece, prevent access to the tools, e.g. see Figure 13.

The movements of the automatically adjustable guards can be either power operated or achieved by means of mechanical connection with the sliding table.

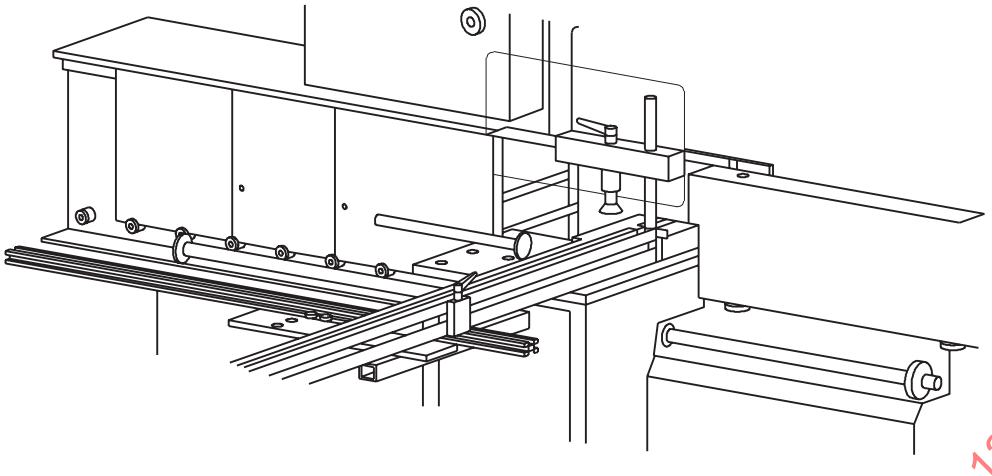


Figure 13 — Example of a combination of guards enclosing the tools

In addition, where it is necessary that parts of the safeguarding are opened, e.g. for tool changing, setting, adjustment, cleaning, off-cut removal, etc., these parts shall be moveable guards with interlocking and guard locking.

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

6.6.2.3 Single end tenoning and/or profiling machines with mechanical feed

6.6.2.3.1 General

Access to the rotating tools, including sanding tools, shall be prevented by means of fixed guards which make up:

— a complete enclosure; or

— an integral enclosure, with the exception of the opening between the feed chain and top pressure beam or between lower work-piece support and upper feed rollers.

Where access is provided for tool changing, cleaning, adjustment or setting, this access shall be via a moveable guard with interlocking and guard locking.

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

6.6.2.3.2 Measures against access to hazard points through the opening between lower work-piece support and upper feeder rollers

The risk of contact with the tools through the opening between the lower work-piece support and the upper feed rollers shall be minimised by the provision of deterring/impeding devices (see ISO 12100:2010, 3.27) that shall be positioned (see Figure 14):

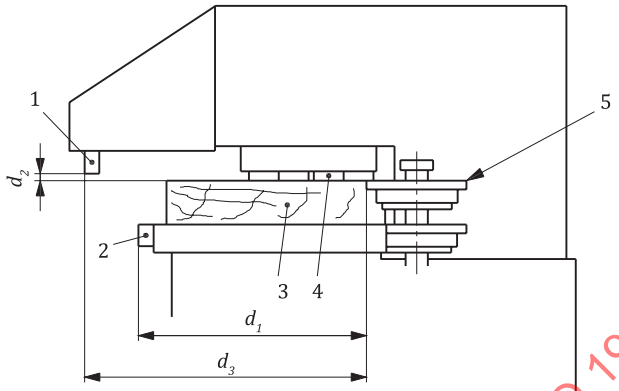
a) below the work-piece support (e.g. the table) in such a way that the horizontal distance, d_1, between the front edge of the deterring/impeding device below the workpiece and the tool is more than or equal to 230 mm; and

b) above the work-piece, fitted to the top pressure beam or the feed roller beam so that:

   1) on machines with a maximum height capacity lower than or equal to 150 mm the horizontal distance d_3 between the front edge of the device above the workpiece and the tool is more than or equal to 350 mm;

2) on machines with a maximum height capacity higher than 150 mm, the horizontal distance, d_3, between the front edge of the device above the workpiece and the tool is more than or equal to 550 mm;

3) the vertical distance, d_2, between the deterring/impeding device and the work-piece is automatically adjusted to less than or equal to 15 mm.



Key

1 deterring/impeding device above the work-piece
2 deterring/impeding device below the work-piece
3 work-piece
4 feed rollers
5 tool

Figure 14 — Illustration of deterring/impeding devices

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

6.6.2.3.3 Measures against access to hazard points through the opening between feed chain and top pressure beam

The opening between feed chain and top pressure beam shall fulfil the following requirements:

— where the opening height is lower than or equal to 60 mm, a pictogram shall be affixed at the in-feed and out-feed ends of the top pressure beam and at 4 m pitch along the top pressure beam drawing attention to the residual risk;

— where the opening is higher than 60 mm, a pictogram shall be affixed at the in-feed and out-feed ends of the top pressure beam drawing attention to the residual risk. Along the top pressure beam length, a horizontal safety distance of 1 m perpendicular to the pressure beam direction shall be kept by the deterring effect of the work-piece support.

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

6.6.2.4 Double end tenoning and/or profiling machines with mechanical feed

6.6.2.4.1 General

Access to the rotating tools, including sanding tools, shall be prevented by means of fixed guards which make up:

— a complete enclosure; or

— an integral enclosure, with the exception of the opening between work-piece support and top pressure beam.

Where access is provided for tool changing, cleaning, adjustment or setting, this access shall be via a movable guard with interlocking and guard locking.

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

6.6.2.4.2 Guarding of sanding belts

Access to the sanding belt, other than to that part necessarily exposed for sanding the work-piece, shall be prevented by fixed guards, in combination with a non-interlocking hinged cover, which is capable of being mechanically locked in the closed position during normal operation, and which can be opened for changing or adjusting the sanding belt, cleaning or dust removal.

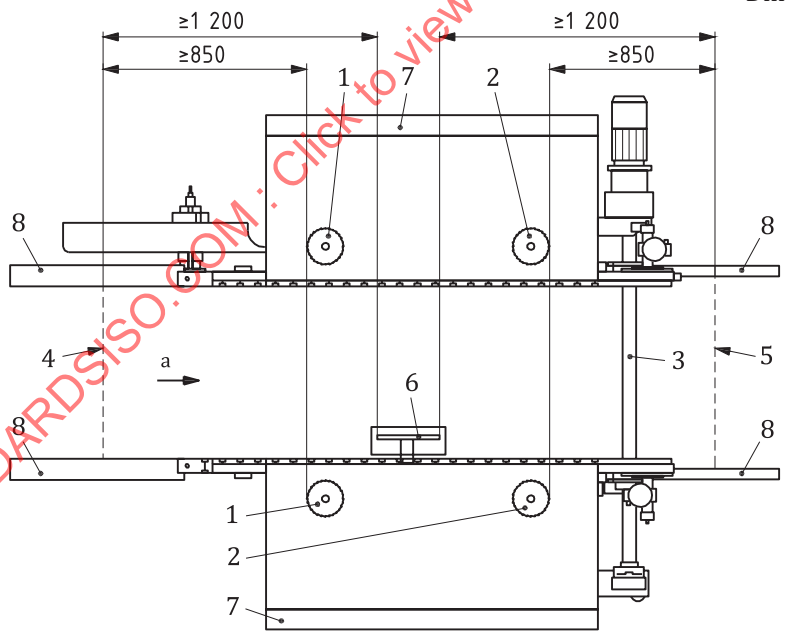
Fixed guards shall be provided to prevent shearing and crushing hazards between work-piece and external sanding unit.

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

6.6.2.4.3 Guarding of units installed out of the integral enclosure

If sawing units or milling units for grooving installed out of the integral enclosure and between machine halves are provided, saw blades and milling tools shall be guarded by fixed guards, except for the part involved in machining (see Figure 15, key 7).

Dimensions in millimetres



Key

1 first tools
2 last tools
3 feed shaft
4 infeed end AOPD
5 outfeed end AOPD
6 sawing unit or milling unit for grooving installed outside the integral enclosure
7 integral enclosure
8 work-piece support
a Feed direction.

Figure 15 — AOPDs positions to prevent access between machine halves

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

6.6.2.4.4 Access between machine halves

The machine shall be fitted with two active optoelectronic protective devices (AOPD) with at least two beams each, positioned at infeed and outfeed ends.

The AOPDs shall:

a) activate a normal stop when triggered;

b) extend across the full width of the opening between the chain beams;

c) be positioned at a height of 400 mm above the floor level for the lower light beam and for the upper light beam at a height of 900 mm ± 100 mm above the floor level;

d) be positioned at a distance of at least 850 mm from the periphery of the first and last tools (maximum mountable diameter), and of at least 1 200 mm from the periphery of the grooving tool (maximum mountable diameter) installed outside of the integral enclosure between the machine halves (see Figure 15).

The outfeed end AOPD shall in any case be positioned external (downstream) to the feed shaft where this is provided. See Figure 15.

Access between the machine halves from the lateral sides below the part of the work-piece support (Figure 15, key 9) protruding from the integral enclosure (Figure 15, key 8) shall be prevented by vertical fixed guards, extending from the AOPD position (Figure 15, keys 5, 6) to the integral enclosure. Any opening below such guards shall not be higher than 180 mm.

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

6.6.2.5 Angular systems for tenoning and profiling with mechanical feed

Requirements stated in 6.6.2.2 and 6.6.2.3 apply respectively to the tenoning and the profiling side of the machine.

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

6.6.3 Guarding of drives

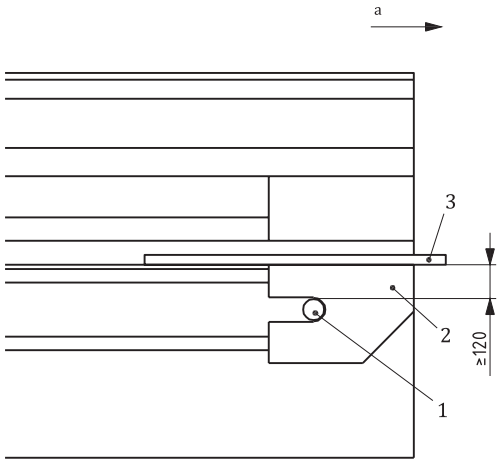
ISO 19085-1:2017, 6.6.3, applies with the following additions.

Where access to the tools is also possible, the movable guard shall be interlocked with guard locking.

In addition, ISO 19085-1:2017, 6.6.3, third paragraph, applies also where it is possible to reach the tools from the rear side of single end tenoning/profiling machines with mechanical feed and angular systems for tenoning and profiling with mechanical feed.

For double end tenoning and/or profiling machines with mechanical feed, the feed shaft (if any) shall be positioned at a vertical distance of at least 120 mm below the work-piece lower surface (see Figure 16).

Dimensions in millimetres



Key

1 feed shaft
2 work-piece support
3 work-piece
a Feed direction.

Figure 16 — Feed shaft at machine out feed

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

6.6.4 Guarding of shearing and/or crushing zones

ISO 19085-1:2017, 6.6.4, applies with the following additions, divided into further specific subclauses.

6.6.4.1 Guarding of the chain or feed mechanisms

6.6.4.1.1 General

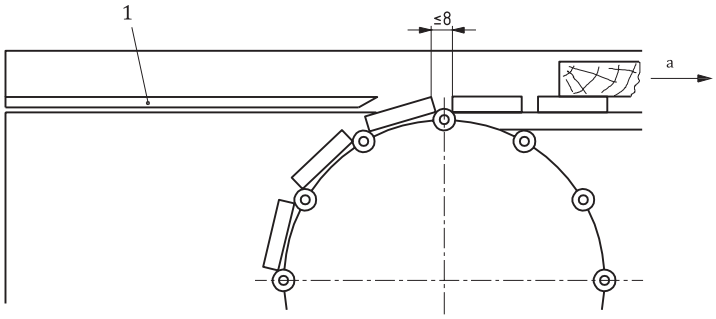
Access to chains and pressure devices shall be prevented by the enclosure required by 6.6.2.3 and for such parts outside the enclosure by fixed guards except for that part of the chain and the pressure device necessarily exposed for holding and feeding the work-piece.

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

6.6.4.1.2 Infeed end of the machine

At the infeed end, outside the enclosure, the hazard of crushing between the closing pads of the chain shall be minimised by adequate design of the chain, e.g. by limiting opening between chain pads to 8 mm maximum where accessible from above (e.g. see Figure 17), or provision of a fixed guard to prevent direct access from above.

Dimensions in millimetres



Key

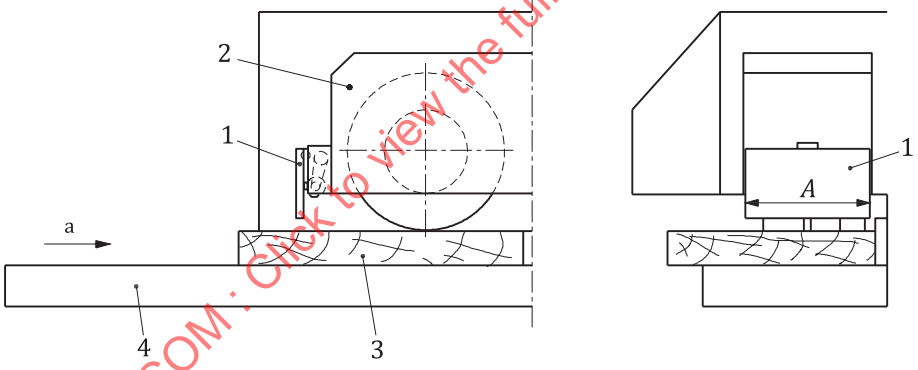
1 work-piece support

a Feed direction.

Figure 17 — Example of adequate feed chain design

Access to the trapping points of each top pressure beam shall be prevented by a mechanically actuated trip device (PSPE, see Figure 18) which shall meet the following additional requirements:

a) The width of the sensor of each trip device shall extend at least over the full width of the beam (see Figure 18, key A).



Key

1 trip device sensor

2 feed roller or top pressure beam

3 work-piece

4 work-piece support

A trip device sensor width

a Feed direction.

Figure 18 — Example of trip device at the infeed end of single end profiling machines with integrated feed

b) With regard to the gap between the trip sensor and the work-piece, the horizontal distance from the trip sensor to the hazard point, the response time of the trip device and the stopping time of the feed, the trip sensor shall be designed and positioned so that the front end of a test wedge, resting on the work-piece moving at the maximum feed speed against the trip, 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.

c) The trip device shall not in itself create a trapping hazard.

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

6.6.4.1.3 Outfeed end of the machine

At the outfeed end the hazard of being drawn in between the chain and a fixed part of the machine shall be reduced by using a work-piece support or a suitable extension to the casing minimising the gap between it and the chain.

In addition, a fixed guard shall be provided to prevent direct access from above to the crushing and shearing points created by the work-piece and machine parts.

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

6.6.4.2 Safeguarding of machine half movement on double end machines

6.6.4.2.1 Crushing between machine halves during closing movement

Crushing hazard between machine halves or machine closing half and intermediate work-piece support or intermediate work-piece support and fixed machine half shall be prevented by one of the following:

a) a combination of:

   1) an AOPD with a resolution not greater than 30 mm, placed over the full height of the internal edges of machine ends (see Figure 19); triggering AOPD shall cause a safe stop of the machine half; and

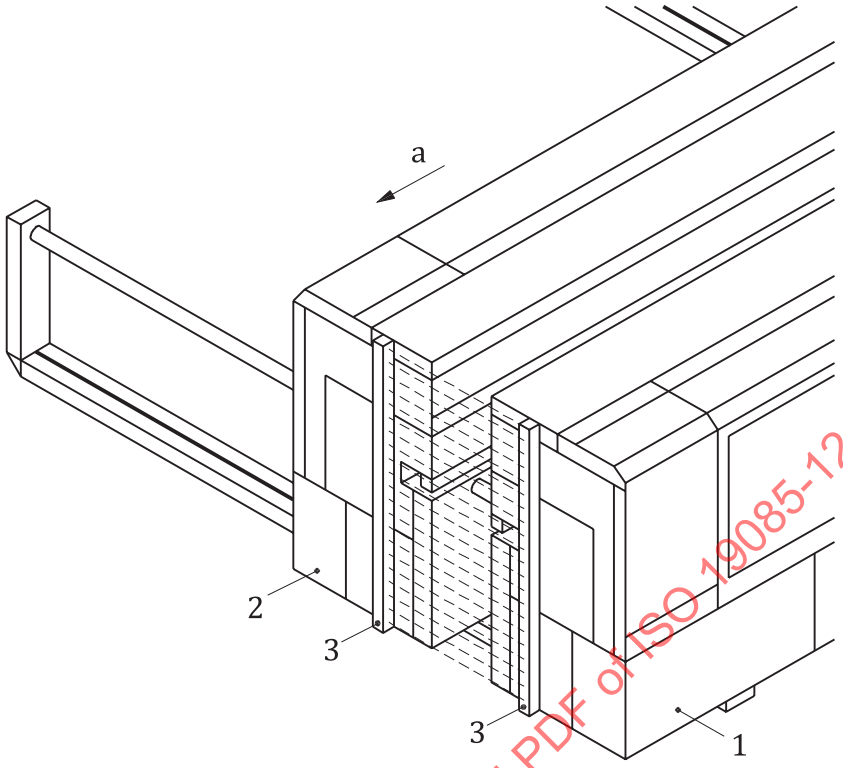
   2) a PSPE which complies with the following four additional requirements:

      i) it shall extend at least over the full length of the machine half;

      ii) it shall be fitted to the moving machine half and positioned such that its sensor is between 0 mm and 70 mm below the lowest crushing point of the machine half;

      iii) it shall have a maximum tripping force of 150 N with test probe Ø80 mm according to ISO 13856-2:2013;

      iv) triggering PSPE shall cause a safe stop of the machine half before the PSPE is fully compressed.



Key

1 fixed half
2 movable half
3 AOPD
[a] Feed direction.

Figure 19 — AOPD at the out-feed end

b) a combination of:

   1) an AOPD with a resolution not greater than 30 mm, placed over the full height of the internal edges of machine ends (see Figure 19); triggering AOPD shall cause a safe stop of the machine half; and

   2) an AOPD with one beam which complies with the following four additional requirements:

      i) it shall extend at least over the full length of the machine half;

      ii) it shall be fitted to the moving machine half and positioned such that its sensor is between 0 mm and 70 mm below the lowest crushing point of the machine half;

      iii) triggering AOPD shall cause a safe stop of the machine half;

      iv) the residual movement of the machine half after AOPD triggering shall not be greater than the distance between the AOPD and the machine half;

c) a limiting device (see ISO 12100:2010, 3.26.8), which prevents the machine halves coming closer than 500 mm. In this case, the machine halves shall only be permitted to come closer than 500 mm by using a hold-to-run control device or a jog control together with an enabling control (the jog control is allowed to achieve no PL_r); The SRP/CS for interlocking by limiting device shall achieve $PL_r = c$;

d) a hold-to-run control for the closing movement or jog control together with an enabling control (the jog control is allowed to achieve no PL_r).

In a) and b), a manual reset control shall be provided.

Where the distance between the chain beams is greater than or equal to 500 mm or less than 150 mm, the device in longitudinal direction required in a) or b) may be overridden.

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

6.6.4.2.2 Crushing between machine halves and fixed parts of the machine during opening movement

Crushing/shearing hazard between fixed parts of the machine and the moving/opening of the machine halves shall be prevented by one of the following:

a) a mechanically actuated trip device (PSPE), which shall comply with the following additional requirements:

   1) it shall extend over at least the full length of the crushing area;

   2) it shall have a maximum tripping force of 150 N with test probe Ø80 mm according to ISO 13856-2:2013;

   3) triggering PSPE shall cause a safe stop of the machine half before the PSPE is fully compressed;

b) an AOPD with one beam, which shall comply with the following additional requirements:

   1) it shall extend over at least the full length of the crushing area;

   2) it shall be positioned so that the sensor is at least 50 mm in front of the crushing area;

   3) the residual movement after actuation shall be no more than 50 mm;

   4) triggering AOPD shall cause a safe stop of the machine half;

c) a limiting device shall be fitted which prevents the machine half coming closer than 500 mm to a fixed part of the machine, further movement in the same direction shall only be possible by means of a hold-to-run control device or a jog control together with an enabling control (the jog control is allowed to achieve no PL_r); The SRP/CS for interlocking by limiting device shall achieve PL_r = c;

d) a hold-to-run control for the opening movement of the machine half or a jog control together with an enabling control (the jog control is allowed to achieve no PL_r).

In a) and b), a manual reset control shall be provided.

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

6.6.4.3 Safeguarding of sliding table in angular systems for tenoning and profiling with mechanical feed

Crushing/shearing hazard between fixed parts of the machine and/or the sliding table and/or the machined work-piece shall be prevented:

a) at the loading/unloading side, by a fixed guard (see Figure 5, key 7) extending from the level of the work-piece support downwards to a distance from the floor not greater than 180 mm; in addition, when the crushing points are closer than 850 mm, an AOPD with a resolution of 40 mm or better shall be provided and placed at a distance of at least 150 mm from the crushing points and up to a height of at least 1 400 mm (see Figure 5, key 9); and

b) by fixed guards with a height greater than 1 800 mm and extending downwards to a distance from the floor not greater than 180 mm; and/or

c) optoelectronic protective devices (AOPD, see Figure 5, key 8) with at least three beams, positioned at heights of 300 mm, 700 mm and 1 100 mm above the floor level and at a horizontal distance not lower than 850 mm from any crushing/shearing point.

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

6.7 Impact hazard

ISO 19085-1:2017, 6.7, applies with the following additions.

Requirements stated in ISO 19085-1:2017 apply only to machine half movements.

6.8 Clamping devices

ISO 19085-1:2017, 6.8, is replaced by the following text subdivided into further specific subclauses.

6.8.1 Single end tenoning machines with sliding table

Machines shall be provided with work-piece clamping.

The sliding table shall have a facility for fitting one or more side clamps to prevent the work-piece turning during cutting.

On machines with mechanical feed sliding table, clamping shall be powered and designed such that the work-piece remains clamped until the tool spindles have stopped rotating if there is a failure of the power supply.

Where powered clamping is provided, crushing hazards shall be prevented by one of the following measures:

a) two-stage clamping with a maximum clamping force at the clamping device of 50 N for the first stage, followed by full clamping force actuated by a manual control;

b) reduction of the gap between clamp and work-piece to 6 mm or less by a manually adjustable device in combination with clamping stroke limitation to a maximum of 10 mm; or

c) guarding of the clamp by a guard fixed to the clamping device to reduce the gap between work-piece and guard to less than 6 mm; the maximum extension of the clamp outside the guard shall not exceed 6 mm.

The SRP/CS for prevention of unexpected activation of second stage clamping force in a) shall achieve PL_r = c.

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

6.8.2 Machines other than single end tenoning machines with sliding table

Clamping is referred to (as performed by) top pressure beam of the machine or upper feed rollers or feeding clamps, whichever the case.

On machines with manual height adjustment of the feed mechanism, by hand-wheel or power operated, instructions shall be given as per 8.3.2 g).

On machines with automatic height adjustment of the feed mechanism under NC or CNC-control, upward movement of the feed mechanism while the tools are rotating shall only be possible providing a means of detecting that any work-piece entered the in-feed of the machine has passed the tools. The SRP/CS for interlocking of upward automatic height adjustment with work-piece detection shall achieve PL_r = b.

When the top pressure beam or the upper feed rollers are detected to be incorrectly automatically adjusted for the height of the loaded work-piece, the feed shall stop. The SRP/CS for interlocking of automatic height adjustment for the loaded work-piece height and the feed 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.

6.9 Measures against ejection

6.9.1 General

ISO 19085-1:2017, 6.9.1, applies with the following addition.

If provision is made to see through the guards, and there is a risk of ejection, visibility shall be provided by the use of polycarbonate (see 6.9.2). Wire mesh shall not be used.

6.9.2 Guards materials and characteristics

6.9.2.1 Choice of class of guards

ISO 19085-1:2017, 6.9.2.1, applies with the following additions.

Guards used to prevent ejection shall be of class A.

As an exception, in single end tenoning machines with manual feed sliding table, guards to prevent ejection from saw blade when separately guarded from milling tool may be of class B.

6.9.2.2 Guards of class A

ISO 19085-1:2017, 6.9.2.2, applies.

6.9.2.3 Guards of class B

ISO 19085-1:2017, 6.9.2.3, applies.

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

Subclause specific to this document.

Means, e.g. deflectors, shall be fitted to move off-cuts away from the saw-blade in order to prevent them from coming into contact with the subsequent tools and being ejected from the machine, or the off-cuts shall be hogged and extracted.

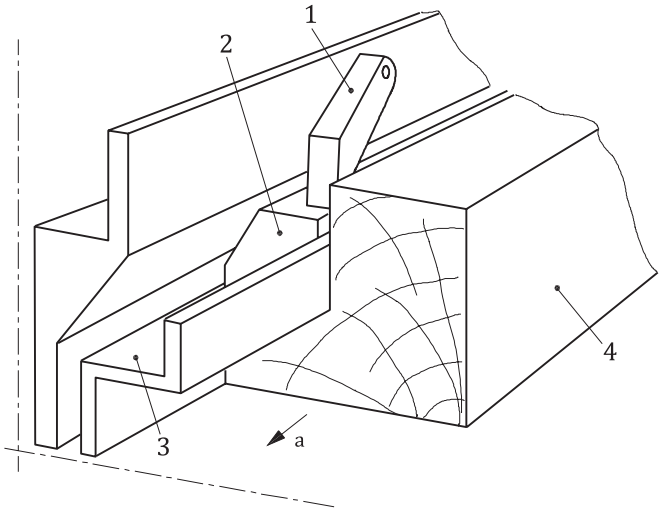
Single end tenoning machines with manual feed sliding table shall be designed so that climb cutting is not possible.

Single end tenoning and/or profiling machines with mechanical feed with or without sliding table (also when integrated in an angular system for tenoning and profiling) if fitted with a glass bead saw unit shall be equipped with:

— a riving knife or bead ledge separator;

— a device to guide the bead ledge, for example a guiding channel (see Figure 20);

— a device to avoid or minimize the risk of kick-back of the bead ledge, for example an anti-kickback finger in front or behind the saw-blade (see Figure 20).



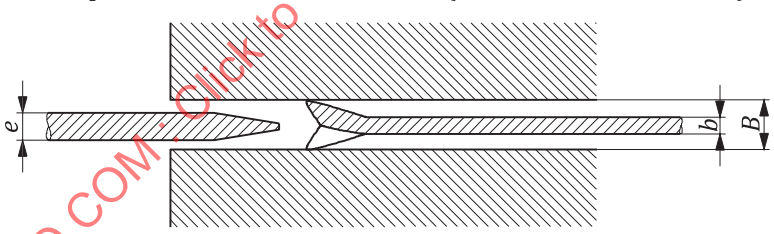
Key

1 anti-kickback finger behind the saw-blade
2 bead ledge
3 guiding channel for bead ledge
4 work-piece
a Feed direction.

Figure 20 — Example of anti-kickback finger and guiding channel

When a riving knife is fitted it shall meet the following requirements:

a) riving knife shall be manufactured from steel with a minimum tensile strength of 580 N mm^{-2}, or of a comparable material, have flat sides (within 0,1 mm in 100 mm) and shall have a thickness between the saw-blade plate thickness and the kerf (width of saw blade cut), see Figure 21.



Key

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

Figure 21 — Riving knife thickness in relation to saw-blade dimensions

b) riving knife shall be designed so that when it is mounted and adjusted, and its closest point to the sawblade is 3 mm from the saw-blade, then at no point shall the gap between the saw-blade and the riving knife exceed 8 mm, measured radially through the centre of the saw spindle (see Figure 22).

c) the riving knife shall be held in position by guiding elements, e.g. guiding pins or screws.

Dimensions in millimetres

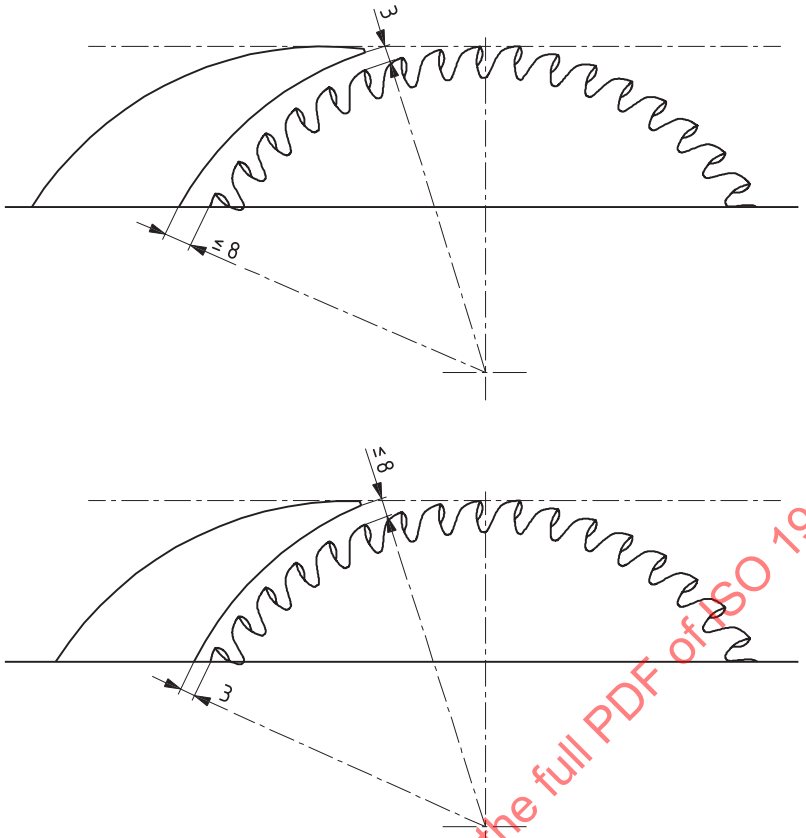


Figure 22 — Riving knife positioning limits

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

6.10 Work-piece support and guides

ISO 19085-1:2017, 6.10, applies with the following additions subdivided into further specific subclauses.

6.10.1 Single end tenoning machines with sliding table

Machines shall be provided with a fence on the sliding table, against which the work-piece is located during machining. If the part of the fence guiding the work-piece is adjustable and if there is a possibility of contact between the fence and the tools, this part of the fence shall be made of easily machinable material.

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

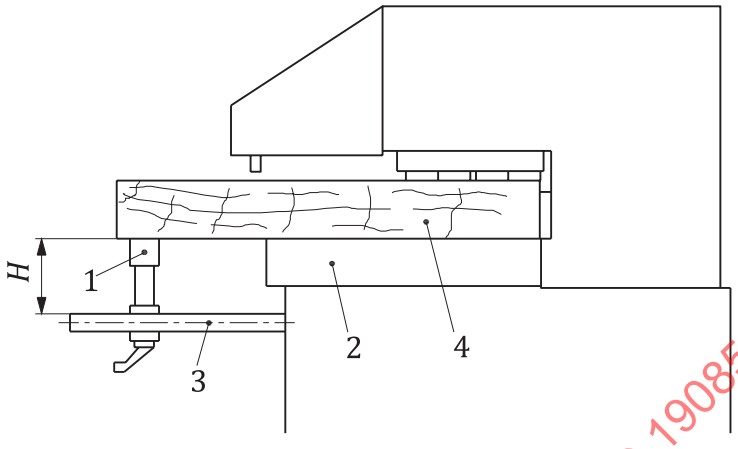
6.10.2 Single end tenoning and/or profiling machines with mechanical feed

A fence shall be provided and placed upstream before the first cutting unit. Where this fence is adjustable it shall be capable of being locked in position.

A support for overhanging work-pieces, like a complete window frame, for example, shall be provided. Hand/arm/head shearing or crushing hazards between the overhanging work-pieces and this support shall be minimized by positioning the bars or structure carrying this support at a gap, *H*, of more than 120 mm below the top of the feed chain or fixed table (see Figure 23).

When the risk of shearing or crushing of the whole body is present, the gap, *H*, shall be at least 500 mm.

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



Key

1	work-piece support	4	work-piece
2	machine table	*H*	minimum gap between work-piece and carrying bar
3	carrying bar for work-piece support		

Figure 23 — Support for overhanging work-pieces

6.10.3 Double end tenoning and/or profiling machines with mechanical feed

The work-piece shall be guided and supported by the chain beam or by similar conveyor (e.g. belt conveyor) or by feeding clamps and the top pressure beam.

Intermediate work-piece support may be provided (see Figure 4, key 3).

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

6.10.4 Angular systems for tenoning and profiling with mechanical feed

Requirements stated in 6.10.1 and 6.10.2 apply to tenoning and profiling side of the machine, respectively.

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

6.10.5 Work-piece returner

On single end tenoning and/or profiling machines with mechanical feed and on angular systems for tenoning and profiling fitted with an automatic work-piece returner (see Figure 10), the following requirements apply:

a) access to the shearing and crushing points shall be prevented e.g. by one or a combination of the following means:

   1) fixed guards with a minimum height of 1 800 mm and a maximum distance from the floor of 300 mm, laterally extending at least 850 mm beyond such points to prevent lateral access;

   2) where a work-piece support is equipped with a roller table, the gaps between the rollers shall be closed by infill plates. The gaps between the rollers and the infill plates and between the

first and last rollers and fixed parts or belt conveyor shall be less than or equal to 4 mm. The infill plates between the rollers shall have a maximum depth below the top of the rollers of 15 mm (see Figure 24).

Dimensions in millimetres

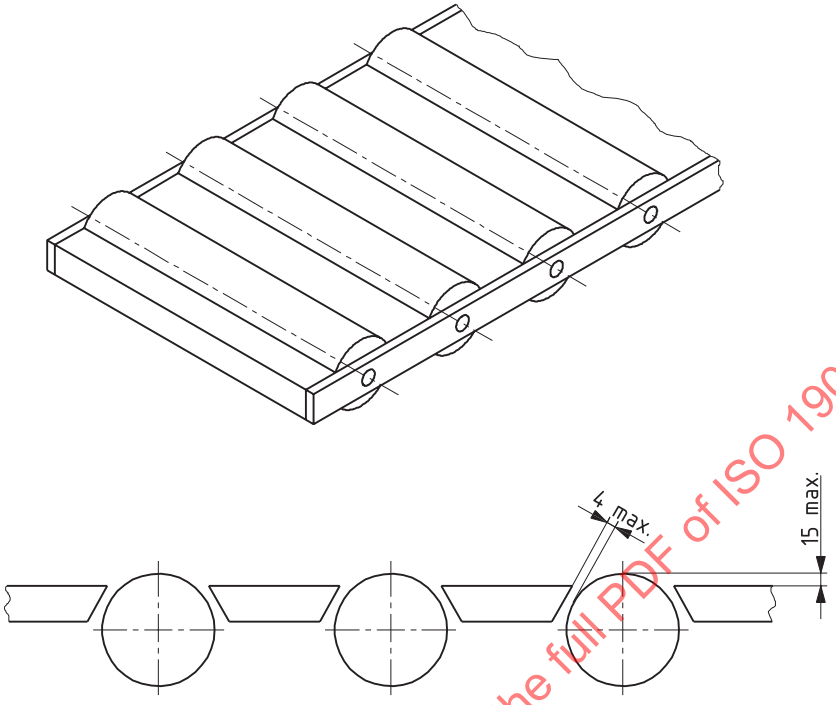


Figure 24 — Safeguarding of gaps between the rollers

b) access to the hazardous points through the gap (if any) between the work-piece returner and the machine shall be prevented either by:

   1) a fixed guard with a minimum height of 800 mm and a maximum distance from the floor of 300 mm in combination with an AOPD with at least one beam positioned 800 mm from the floor level and 300 mm from the fixed guard inwards; or

   2) an AOPD with at least two beams at the height of 300 mm and 800 mm above the floor level,

installed at the infeed side, in combination with a fixed guard below the work-piece returner's external sides made in such a way that remaining gaps are not higher than 300 mm.

When the AOPD is triggered, the machine feed and any work-piece returner dangerous movement shall be stopped and power shall be cut to the relevant actuators. A manually operated reset control device for reactivating the AOPD shall be provided.

On double end tenoning and/or profiling machines with mechanical feed provided with work-piece returner between machine halves (see Figure 11), access to crushing/shearing points of the work-piece returner between machine halves are prevented by the AOPD required in 6.6.2.4.4.

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

7 Safety requirements and measures for protection against other hazards

7.1 Fire

ISO 19085-1:2017, 7.1, applies.

7.2 Noise

7.2.1 Noise reduction at the design stage

ISO 19085-1:2017, 7.2.1, applies with the following additions.

With the exception of single end tenoning machines with manual feed sliding table, machines shall be provided with noise enclosure. If this noise enclosure is part of the guarding system, the requirements in 6.6.2 shall be fulfilled. If the noise enclosure is only effective for the noise hazards i.e. there are other guards against the mechanical hazards, the noise enclosure need not be interlocked (also see 8.3.2).

The enclosure should be lined with sound absorbing material where possible. A lining material with a noise absorbing factor, α, of 0,7 at 1 kHz measured in accordance with the requirements of ISO 354:2003 may be used.

ISO 15667:2000 provides guidelines for noise control by enclosures and cabins.

7.2.2 Noise emission measurement

ISO 19085-1:2017, 7.2.2, applies with the following additions.

The operating conditions for noise measurement shall comply with:

— ISO 7960:1995, Annex K, for single end tenoning machines with and without sliding table;

— Annex E for single end profiling machines with mechanical feed;

— ISO 7960:1995, Annex U, for double end tenoning machines with mechanical feed;

— ISO 7960:1995, Annex E, for double end profiling machines with mechanical feed;

— Annex E for the profiling unit and ISO 7960:1995, Annex K, for the tenoning unit of angular systems for tenoning and profiling machines with mechanical feed.

7.3 Emission of chips and dust

ISO 19085-1:2017, 7.3, applies with the following addition.

Requirements referred to tools apply to sanding units too.

Unintended access to the tool through any dust extraction outlet with disconnected exhaust system shall be impeded.

NOTE The requirements of ISO 13857:2019 cannot be applied here due to the negative impact on the extraction of chips and dust.

7.4 Electricity

7.4.1 General

ISO 19085-1:2017, 7.4.1, applies.

7.4.2 Displaceable machines

ISO 19085-1:2017, 7.4.2, does not apply.

7.5 Ergonomics and handling

ISO 19085-1:2017, 7.5, applies with the following addition.

The height of the work-piece support should normally be between 800 mm and 1 100 mm above the floor level.

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

If graphical symbols related to the operation of actuators are used, they shall be in accordance with IEC 61310-1:2007, Table A.1.

7.6 Lighting

ISO 19085-1:2017, 7.6, applies.

7.7 Pneumatics

ISO 19085-1:2017, 7.7, applies.

7.8 Hydraulics

ISO 19085-1:2017, 7.8, applies.

7.9 Electromagnetic compatibility

ISO 19085-1:2017, 7.9, applies.

7.10 Laser

ISO 19085-1:2017, 7.10, applies with the following addition.

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

The SRP/CS for interlocking between movable guards and laser marking unit enabling 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.

7.11 Static electricity

ISO 19085-1:2017, 7.11, applies.

7.12 Errors of fitting

ISO 19085-1:2017, 7.12, applies.

7.13 Isolation

ISO 19085-1:2017, 7.13, applies with the following additions.

If machine is fitted with any braking system other than mechanical brake, the electrical supply disconnecting device may be situated, as an alternative to ISO 19085-1:2017, 7.13, third paragraph, a) and b), on the same side of the machine/main control panel as the stop controls, at a distance from these controls not less than 1 200 mm.

7.14 Maintenance

ISO 19085-1:2017, 7.14, applies.

7.15 Heat

Subclause specific to this document.

Where foiling unit is fitted, it shall retract automatically disengaging the rollers from the work-piece in case of a power supply failure.

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

7.16 Substances

Subclause specific to this document.

Laser marking unit and gluing unit shall be provided with one dedicated extraction outlet for each.

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

8 Information for use

8.1 Warning devices

ISO 19085-1:2017, 8.1, applies.

8.2 Marking

8.2.1 General

ISO 19085-1:2017, 8.2.1, applies.

8.2.2 Additional markings

ISO 19085-1:2017, 8.2.2, is replaced by the following text.

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

a) in machines fitted with manual height adjustment, by hand-wheel or power operated, of top pressure beam or upper feed rollers, a pictogram or written warning shall be permanently affixed to the machine stating that the top pressure beam shall be correctly adjusted to accommodate the work-piece to be machined;

b) on double end machines when two separate pneumatic isolators, one for each half, are provided, a warning label shall be placed in proximity of each pneumatic supply disconnection device warning that the other pneumatic supply is not isolated by isolation of the current pneumatic supply disconnection device;

c) an arrow for spindles rotating in clockwise direction and double arrow for spindles which can rotate in both directions of rotation;

d) for each spindle requiring speed monitoring according to 5.7.3, a label positioned close to the spindle, stating the minimum n_{max} (maximum rotational speed) of the tools that are allowed to be mounted;

e) on single end machines fed by chain, a pictogram shall be affixed drawing attention to the residual risk as required in 6.6.2.3.3;