INTERNATIONAL STANDARD

ISO 19085-17

First edition
2021-05

Woodworking machines — Safety —

Part 17: Edge banding machines fed by chains

Machines à bois — Sécurité —

Partie 17: Machines à plaquer sur chant à alimentation par chaînes

Reference number
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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 first edition cancels and replaces ISO 18217:2015.

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

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.

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 the ISO 19085 series.

As far as possible, the safety requirements of parts of the ISO 19085 series refer to the relevant subclauses of ISO 19085-1. Each part 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.”.

Woodworking machines — Safety —

Part 17:
Edge banding machines fed by chains

1 Scope

This document gives the safety requirements and measures for edge banding machines fed by chains or belts, with manual loading and unloading and maximum workpiece height capacity of 100 mm, capable of continuous production use, hereinafter referred as “machines”.

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.

The machines are designed to process in one pass one end (single-end machine) or both ends (double-end machine) of panels of:

— materials with similar physical characteristics to wood (see ISO 19085-1:2021, 3.2), even with a core sheet of aluminium light alloy;

— gypsum plaster boards.

Edges to be applied by the machine can be made of:

— paper;

— melamine;

— plastic;

— composite materials;

— aluminium;

— light alloy;

— veneer;

— solid wood.

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

— hot air banding unit;

— laser banding unit;

— infrared banding unit;

— dynamic processing units;

— sanding belt units;

— milling unit installed out of the integral enclosure at the panel side on single-end machines;

— milling unit installed out of the integral enclosure between machines halves of double-end machines;

— additional fixed or movable workpiece support along the feed;

— additional infeed workpiece support;

— additional outfeed workpiece support;

— in-feed device for transversal loading of panels in single-end machines;

— intermediate workpiece support in double-end machines;

— automatic panel returner in single-end machines;

— automatic tool changing;

— quick tool changing system;

— automatic multiple edges infeed device;

— workpiece heaters.

This document does not deal with any hazards relating to:

a) systems for loading and unloading of the workpiece to a single machine other than automatic panel returner and infeed and outfeed workpiece supports (e.g. robots);

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

c) workpiece dividing unit installed out of the integral enclosure and/or whose tools protrude out of the integral enclosure;

d) plasma banding unit.

It is not applicable to machines intended for use in potentially explosive atmosphere nor manufactured before the date of its publication.

2 Normative references

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

ISO 11553-1:2005, *Safety of machinery — Laser processing machines — Part 1: General safety requirements*

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

ISO 13732-1:2006, *Ergonomics of the thermal environment — Methods for the assessment of human responses to contact with surfaces — Part 1: Hot surfaces*

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

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

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

3 Terms and definitions

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

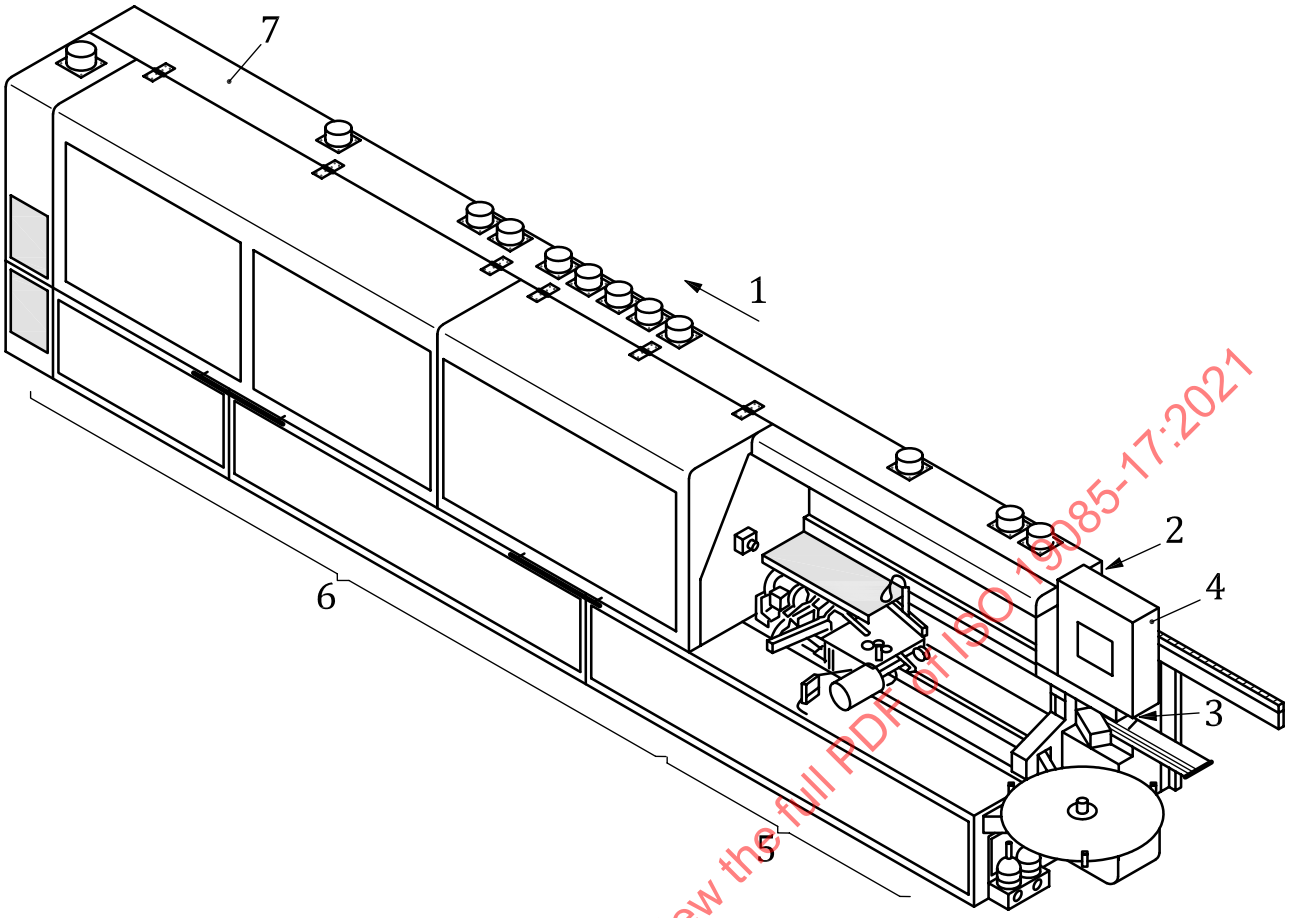
— IEC Electropedia: available at http://www.electropedia.org/

3.1
edge banding machine
machine designed for banding in one pass the edge on one side of the workpiece (single-end edge banding machine) or on both sides of the workpiece (double-end edge banding machine), consisting of an edge banding zone with various units (e.g. for heating, banding, pressing of the edge, etc.), of a zone for additional operations (e.g. for snipping, trimming, milling, sanding, polishing, chamfering, etc.) and in addition a sizing/profiling zone that can precede the edge banding zone.

Note 1 to entry: The main parts of a single-end machine and a double-end machine and their terminology are illustrated in Figures 1 and 2 respectively.

Note 2 to entry: The glue can be applied to the edge or to the workpiece side.

Note 3 to entry: Workpiece feeding can be by chains or by feeding belts.



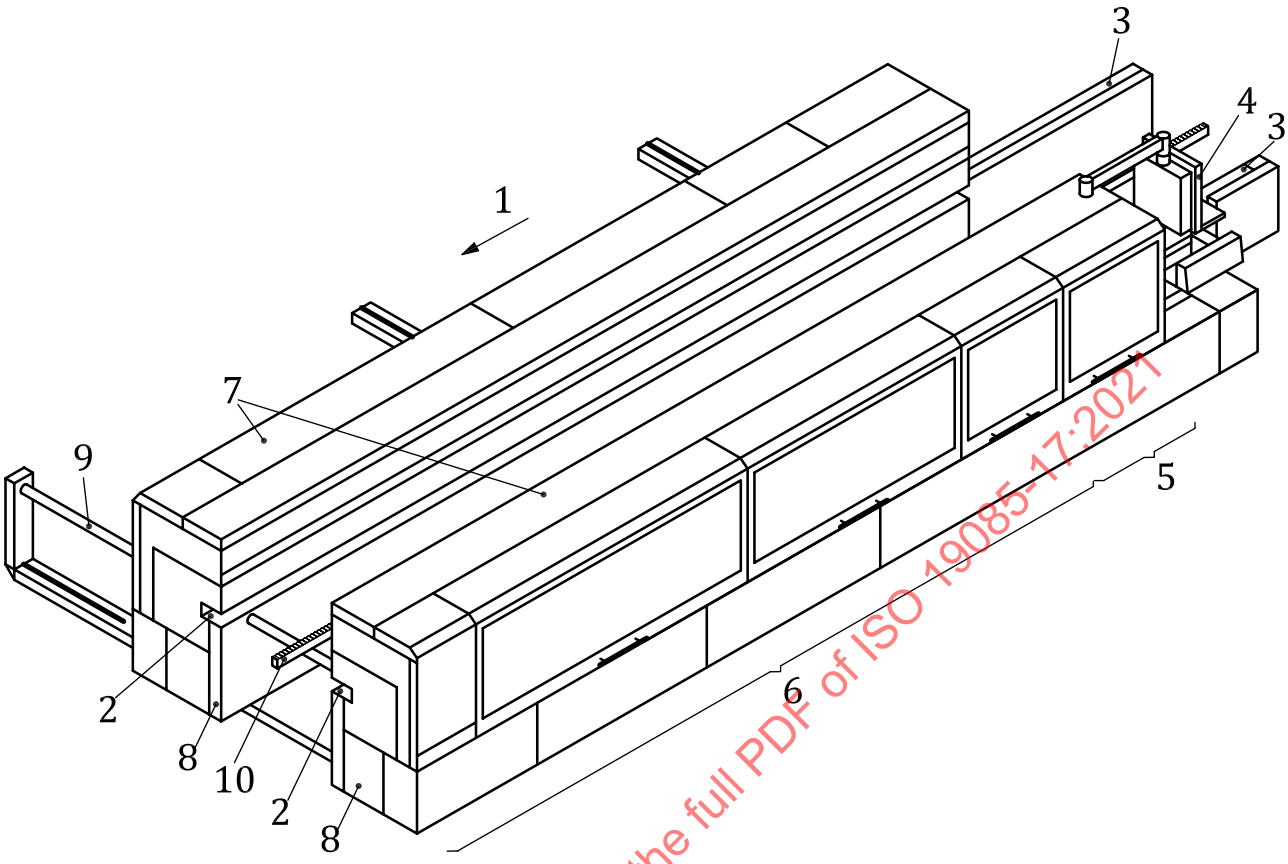
Key

1	feed direction	5	edge banding zone
2	top pressure beam	6	additional operation zone
3	chain/belt beam	7	integral enclosure
4	controls		

Figure 1 — Example of a single-end machine

3.2
machine half
<double-end machines> part of a machine consisting of a frame, chain/belt beam, top pressure beam and working units

Note 1 to entry: the two machine halves process the two opposite sides of the workpiece in the same pass. One or both machine halves are capable of being moved to accept workpieces of different dimensions.



Key

1	feed direction	6	additional operation zone
2	top pressure beam	7	integral enclosure
3	chain beam	8	machine halves
4	controls	9	feed cross drive shaft
5	edge banding zone	10	intermediate workpiece support

Figure 2 — Example of a double-end machine

3.3
integral enclosure
guarding designed to fit close to the single-end machine or to each *machine half* (3.2) of double-end machines, to provide a measure of sound attenuation and where certain setting adjustments can be available outside the enclosure

3.4
gluing unit
unit for the adhesion of the edge to the panel by any technology

Note 1 to entry: *Hot melt banding unit* (3.5), *hot air banding unit* (3.6), *laser banding unit* (3.7), *infrared banding unit* (3.8) are kinds of gluing unit, and can be alternative or additional to each other in a machine.

3.5
hot melt banding unit
unit using hot melt glue for edge banding

3.6
hot air banding unit
unit heating the edge using high temperature compressed air for edge banding, without addition of glue

3.7
laser banding unit
unit heating the edge using laser radiation for edge banding, without addition of glue

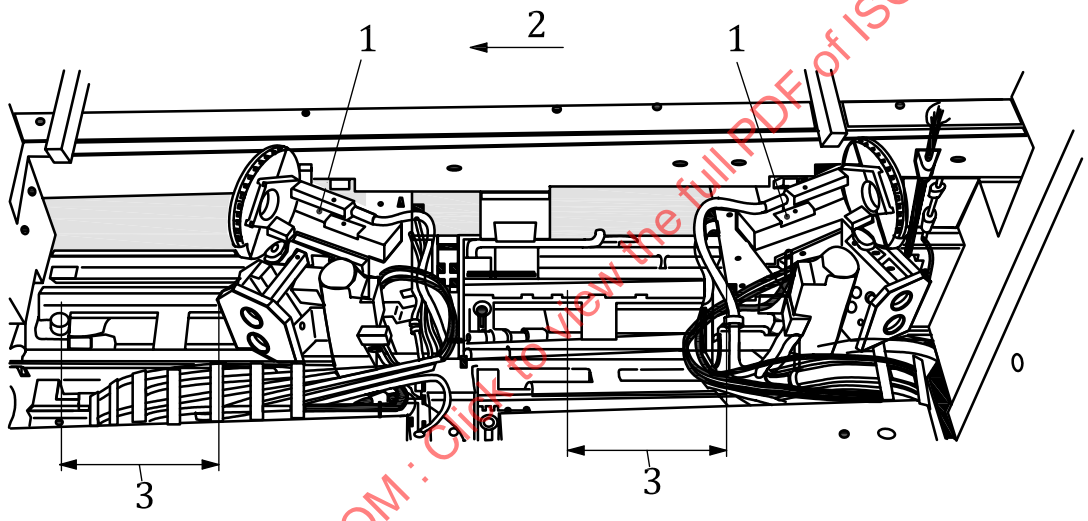
3.8
infrared banding unit
unit heating the edge using infrared radiation for edge banding, without addition of glue

3.9
workpiece heater
device to pre-heat the panel before the edge is banded to the panel

Note 1 to entry: Workpiece heater is different from the units heating the edge for adhesion activation

3.10
dynamic processing unit
unit which moves with the workpiece during processing and returns to its starting position ready for the following (succeeding) workpiece

Note 1 to entry: An example of dynamic processing unit is shown in Figure 3.



Key

1 dynamic processing unit (e.g. sniper saw)
2 feed direction
3 movement zone

Figure 3 — Example of a dynamic processing unit

3.11
external milling unit
<single-end machines> milling unit installed out of the integral enclosure at the panel side for grooving along the lower surface of the processed panel or for grooving/milling along the panel side opposite to the banded one

Note 1 to entry: An example of external milling unit for grooving along the lower surface of the processed panel or along the panel side opposite to the banded one in single-end machines is shown in Figure 4.

Note 2 to entry: An example of external milling unit for milling along the panel side opposite to the banded one in single-end machines is shown in Figure 5.

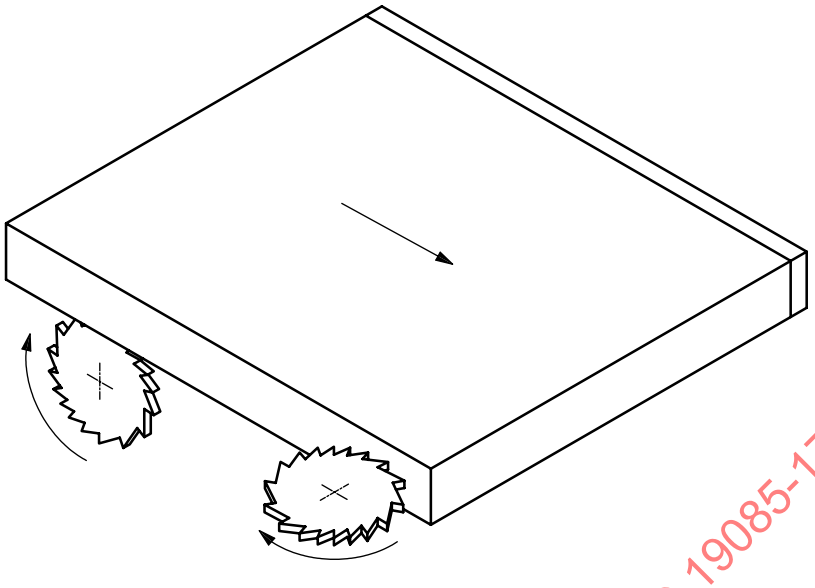
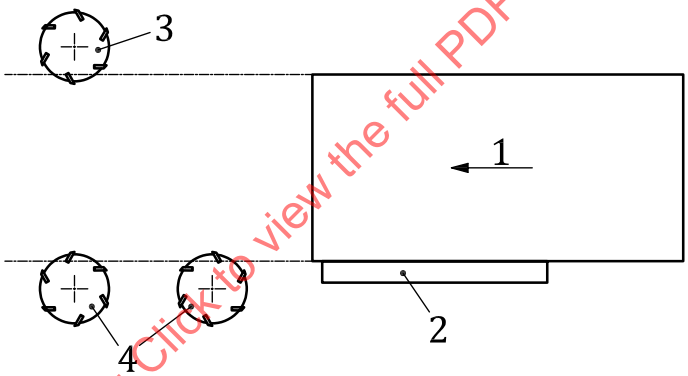


Figure 4 — Example of unit for grooving along the lower surface of the processed panel or along the panel side opposite to the banded one



Key

1	feed direction	3	external milling unit
2	workpiece guide	4	tools inside the integral enclosure

Figure 5 — Example of unit for milling along the panel side opposite to the banded one

3.12
external milling unit
<double-end machines> milling unit installed out of the integral enclosure between machines halves for grooving along the lower surface of the processed panel

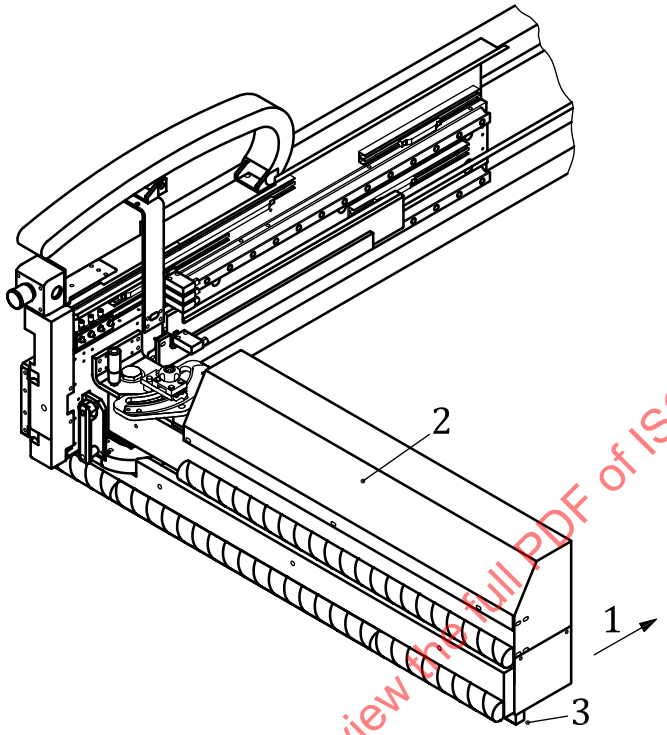
Note 1 to entry: An example of external milling unit in double-end machines is shown in Figure 8, key 7.

3.13
additional workpiece support
workpiece support with the purpose of facilitating manipulation and manual loading or unloading of panels

Note 1 to entry: An additional workpiece support can be installed at the infeed or at the outfeed side of the machine.

3.14
transversal infeed device
<single-end machines> power-driven device for transversal loading of panels at right angle respect to the feed direction

Note 1 to entry: An example of transversal infeed device is shown in Figure 6.



Key
1 feed direction
2 moving arm
3 workpiece clamping device/pins

Figure 6 — Example of transversal infeed device

3.15
intermediate workpiece support
<double-end machines> retractable workpiece support positioned between the machine halves

3.16
automatic panel returner
<single-end machines> powered system bringing the panel from the machine end back to the loading position

Note 1 to entry: An example of automatic panel returner is shown in Figure 16

3.17
jog control
control device for momentary activation of a function or a movement

3.18
MODE 2
units' manual adjustment mode
condition with safeguards disabled for manual adjustment of processing units not containing rotating tools

3.19
MODE 3
fine adjustment mode
condition with safeguards disabled for fine adjustment of tools and other processing units

3.20
MODE 4
feed chains greasing mode
<double-end machines> condition with safeguards disabled for greasing workpiece feeding chains

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.

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.

Hold-to-run control devices shall be located so that the operator, when actuating them, can see the controlled movements.

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

Emergency stop controls 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;

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

d) inside each enclosure where MODE 2 and/or MODE 3 are provided, and positioned with a maximum distance of 2 m from each other;

e) at the loading area for glue and edges when outside a specific enclosure.

If the distance between two required emergency stop control devices is less than 1 m, only one emergency stop control device may be provided, but only if their positions are visible simultaneously from any other position.

As an exception to b), emergency stop control at the unloading position is not required on single-end machines with a maximum length of workpiece support of 2 m.

Verification: By checking the relevant drawings and/or circuit diagrams, 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, does not apply.

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), workpiece feeding shall only be possible when the intended tool spindles are running or the tools of all spindles not involved in the current operation cannot come into contact with the workpiece (the tools are removed from the spindles or the non-rotating spindles are retracted to a non-cutting position).

The SRP/CS for interlocking of workpiece feeding with spindle tool drives shall achieve PL_r = b.

As an exception no PL is required where direct ejection of milling tools or their parts can be excluded, i.e. where the axis of rotation is horizontal and perpendicular to the feed direction.

For spindle units that are adjusted manually, by hand wheel or power operated, see 7.3.2 f).

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

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

b) 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.

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.

4.4.2 Normal stop

ISO 19085-1:2021, 4.4.2, applies with the following additions.

Normal stop shall also disable the power module of the laser banding unit and the infrared banding unit.

The SRP/CS for disabling the power module of the laser banding unit upon normal stop shall achieve PL_r = c.

The SRP/CS for disabling the infrared banding unit upon normal stop shall achieve PL_r = c.

The following systems may remain powered when actuating normal stop:

— the heating system of the hot melt banding unit;

— the heating/cooling system of the hot air banding unit;

— the cooling system of the laser banding unit;

— the cooling system of the infrared banding unit.

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

4.4.3 Operational stop

ISO 19085-1:2021, 4.4.3, applies with the following additions.

Operational stop shall also disable the power module of the laser banding unit and the infrared banding unit.

The SRP/CS for disabling the power module of the laser banding unit upon operational stop shall achieve PL_r = c.

The SRP/CS for disabling the infrared banding unit upon operational stop shall achieve PL_r = c.

The following systems may remain powered when actuating operational stop:

— the heating system of the hot melt banding unit;

— the heating/cooling system of the hot air banding unit;

— the cooling system of the laser banding unit;

— the cooling system of the infrared banding unit.

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

4.4.4 Emergency stop

ISO 19085-1:2021, 4.4.4, applies with the following additions.

Emergency stop shall also disable the power module of the laser banding unit and the infrared banding unit and the heating system of the hot melt banding unit and of the hot air banding unit.

The SRP/CS for disabling the power module of the laser banding unit upon emergency stop shall achieve PL_r = c.

The SRP/CS for disabling the infrared banding unit upon emergency stop shall achieve PL_r = c.

The SRP/CS for disabling the heating system of the hot melt banding unit upon emergency stop shall achieve PL_r = c.

The SRP/CS for disabling the heating system of the hot air banding unit upon emergency stop shall achieve PL_r = c.

For machines equipped with banding units using hot air, infrared radiation, power-laser, if a cooling system is provided it may remain active even after emergency stop activation, until the banding units are cooled down. After the safe temperature is reached, the cooling system shall be shut off (no PL required).

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

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 Units' Manual adjustments mode (MODE 2)

For manual adjustments of processing units with movable guards with interlocking opened and/or AOPD that safeguards these units disabled, the units' adjustment mode (MODE 2) shall be implemented by applying the following requirements:

a) selecting the MODE 2 shall initiate stopping tool spindles and other processing units including the dynamic processing units, unless they are safeguarded by:

   1) a movable guard with interlocking with or without guard locking that is closed and locked and by a separating fixed guard (see Figure 7, key 1) leaving only the opening necessary to allow workpiece feeding; or

   2) safeguards including AOPD as defined in 5.6.4;

b) selecting the MODE 2 shall initiate retracting all not running tool spindles;

c) selecting the MODE 2 and during MODE 2 operation, movement of the feed and powered adjustments shall only be possible via a hold-to-run control or via jog control (no PL required) in combination with enabling control;

d) opening of movable guards with interlocking and guard locking shall be possible only with all the relevant spindles and movements stationary;

e) unexpected start of rotation, movements and adjustments of tools and other processing units shall be prevented. The SRP/CS for preventing unexpected start of these movements shall achieve PL_r = c;

f) AOPD preventing access between machine halves in double-end machines (see 5.6.5 and Figure 8, key 5) shall remain effective.

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

4.6.2 Fine adjustment mode (MODE 3)

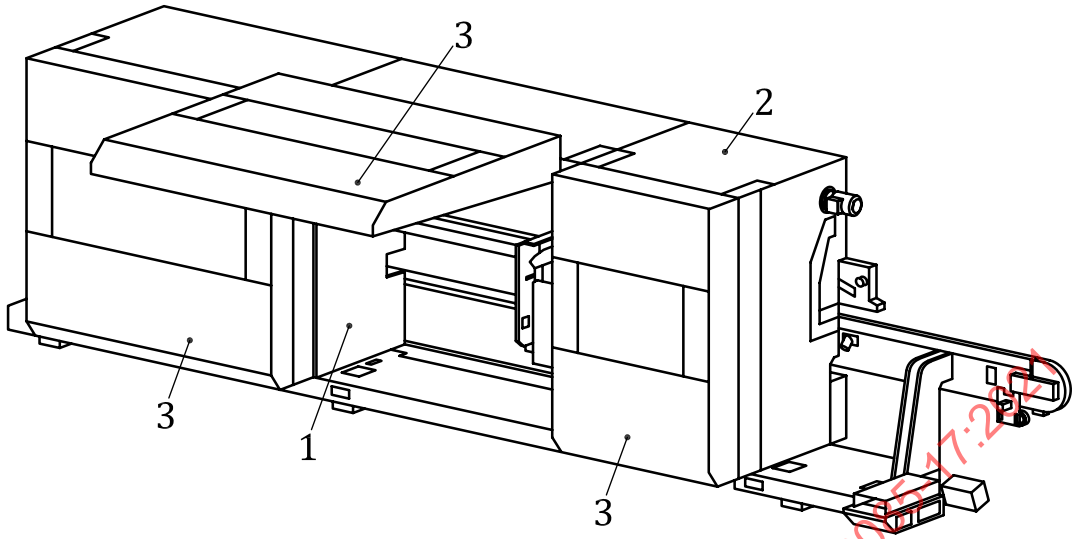
For fine adjustment of tools and other processing units whilst they and the feed are running and machining, the fine adjustment mode (MODE 3) shall be implemented by applying the following requirements:

a) selecting MODE 3 shall not initiate any unit adjustment and shall stop the dynamic processing units (spindles and movements), unless they are guarded by a movable guard with interlocking with guard locking that is closed and locked and by a separating fixed guard (see Figure 7, key 1) leaving only the opening necessary to allow workpiece feeding;

b) a single door at a time with a length of not more than 2,0 m may be opened for a maximum period of 3 min without causing a stop of the feed and of the tools (i.e. the interlocking of the door with the drive actuators is still active but the reaction is postponed by 3 min). The SRP/CS for the postponement of the interlocking shall achieve PL_r = c;

c) with a single door open, it shall not be possible to reach the running processing units in correspondence of the adjacent doors, with the exception of the opening necessary to allow workpiece feeding (see Figure 7, key 1);

d) a deterring/impeding device shall be fitted to prevent horizontal access to the non-cutting part of any rotating tool from inside the enclosure, with materials and properties according to 5.9.2;



Key

1 separating fixed guard
2 machine half
3 door

Figure 7 — Example of separating fixed guard

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

4.6.3 Feed chains greasing mode (MODE 4)

For greasing the feed chains in double-end machines, the feed chains greasing mode (MODE 4) shall be implemented by applying the following requirements:

a) selecting the MODE 4 shall initiate stopping of all powered movements except the feed mechanism;

b) unlocking of movable guards with interlocking and guard locking shall be possible only with all relevant spindles and movements stationary;

c) unexpected start of rotation, movements and adjustments of tools and other processing units shall be prevented; the SRP/CS for preventing unexpected start of rotation, movements and adjustments shall achieve PL_r = c;

d) movement of the feed shall only be possible via a hold-to-run control or via jog control (no PL required) in combination with enabling control at a limited speed not greater than 10 m/min. No PL is required for limited feed speed monitoring;

e) AOPD preventing access between machine halves (see 5.6.5, Figure 8, keys 5 and 6) may be disabled only when all spindles and movements are stationary, e.g. by time delay or standstill detection; the SRP/CS for disabling this AOPD when all spindles and movements are stationary shall achieve PL_r = c;

f) Unexpected start of the movements of machine halves and workpiece intermediate support shall be prevented. The SRP/CS for preventing unexpected start of these movements shall achieve PL_r = c.

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 where milling tools can be mounted.

NOTE 1 See also 7.2.2 d) for the indication of the minimum n_{max}.

NOTE 2 The maximum rotational speed includes the rotational speed pre-selected by the manufacturer for spindles with fixed speed.

As an exception for tools installed inside integral enclosure, speed monitoring is not required when direct ejection of milling tools or their parts can be excluded, i.e. where the axis of rotation is horizontal and perpendicular to feed direction.

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.

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.

4.12 Time delay

ISO 19085-1:2021, 4.12, applies.

4.13 Teleservice

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.

Verification: By checking the relevant drawings, inspection of the machine and relevant functional testing 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, 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 5.3.2).

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 restart is prevented – this 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 shall consist of 2 independent systems both achieving PL_r = b.

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

Verification: By checking the relevant drawings, inspection of the machine, measurement 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 dimension for circular saw blades

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

The outer 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.

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.

Spindle rings shall be manufactured in 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.

5.4 Braking

5.4.1 Braking of tools

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

The requirements stated in ISO 19085-1:2021 apply also to sanding belts.

5.4.2 Maximum run-down time

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

For milling 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 20 s.

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

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

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 Movable guards with interlocking

ISO 19085-1:2021, 5.5.2.2, applies.

5.5.2.3 Movable guards with interlocking and guard locking

ISO 19085-1:2021, 5.5.2.3, applies with the following additions.

In normal processing mode (MODE 1) guard locking release shall only be possible after machines actuators (e.g. spindles, pneumatic and electrical actuators, feed) of the relevant section are brought to a safe stop and their unexpected start is prevented.

The SRP/CS for preventing unexpected start of spindles and feed shall achieve PL_r = c.

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

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, applies.

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 installed inside the integral enclosure

Access to the rotating tools, including sanding tools, shall be prevented by means of a guard or guards which make up an integral enclosure (see 7.2), other than through the slot between the chain beam and top pressure beam (for such slot, see 5.6.5).

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

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

5.6.2 Guarding of external milling units

A fixed guard and/or interlocked movable guard shall prevent access to the tool, except for the part of the tool involved in machining.

On single-end machines, where external milling units are used, access to their rotating tools shall be prevented by one or a combination of:

a) fixed and/or interlocked movable guards located at least at 850 mm from the tool periphery extending over a height of maximum 180 mm to minimum 1 400 mm from the floor level;

b) a fixed guard located at least at 850 mm from the tool periphery with a minimum height of 800 mm and a maximum distance from the floor of 180 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;

c) an AOPD with at least two beams at the heights of 400 mm and 900 mm above the floor level, installed at a minimum distance of 1 200 mm from the tool periphery.

On double-end machines, where external milling units are used, access to their rotating tools shall be prevented by the measures described in 5.6.5.

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

5.6.3 Guarding of sanding belts

Access to the sanding belt, other than to that part necessarily exposed for sanding the workpiece, 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, for changing or adjusting the sanding belt, cleaning or dust removal.

Fixed guards shall be provided to prevent shearing and crushing hazards between workpiece 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.

5.6.4 Guarding of the edge banding zone

Access to snipping knives, spiked rollers and pressure or loading rollers or soft-forming devices other than through the slot between the chain beam and the top pressure beam (for such slot, see 5.6.5) shall be prevented by one or a combination of the following measures:

a) fixed guards;

b) movable or dismountable guards interlocked with the corresponding drives. Where a dismountable interlocked guard is provided, it shall not be possible to re-mount it in a wrong way;

c) an AOPD meeting the following requirements:

   1) resolution not greater than 40 mm;

   2) bottom beam at not more than 40 mm from the floor or from the fixed guard preventing access to the danger area from below;

   3) top beam at least at 1 400 mm from the floor level;

   4) distance of at least 550 mm from hazard points;

   5) triggering the AOPD shall cause a safe stop of the relevant dangerous movements.

As an exception, fixed and moveable guards above may have an opening limited to the minimum necessary to allow the feed of all edges that can be processed. A graphical symbol drawing attention to the residual risk of shearing, e.g. ISO 7010, W024, shall be affixed close to the snipping knife device.

Hazards (e.g. trapping, shearing and crushing) due to the infeed of the edges shall be minimized by means of a deterring/impeding device preventing direct horizontal access to hazardous points.

The SRP/CS for interlocking tools drives with dismountable guards shall achieve PL_r = c.

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

5.6.5 Access between machine halves on double-end machines

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

These AOPDs shall:

a) activate a safe stop when actuated;

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

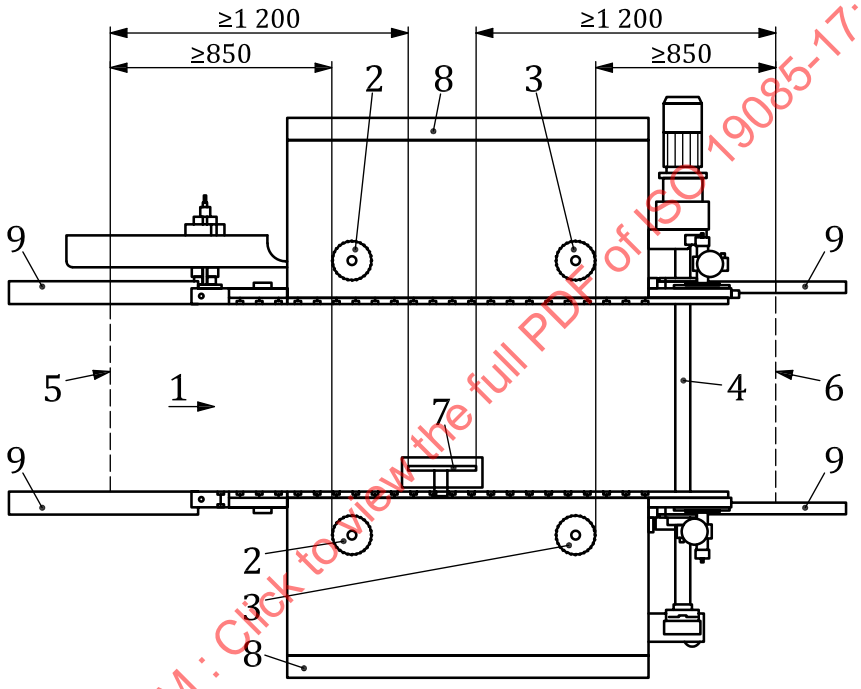
c) be positioned at a height of 400 mm above the floor level for the lower light beam and for the upper light beam at a height of 900 mm ± 100 mm above the floor level;

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 8).

The outfeed end AOPD shall in any case be positioned downstream from and parallel to the feed shaft where this is provided (see Figure 8, key 6).

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

Dimensions in millimetres



Key

1	feed direction	6	outfeed end AOPD
2	first tools	7	milling unit for grooving installed outside the integral enclosure
3	last tools	8	integral enclosure
4	feed shaft	9	workpiece support
5	infeed end AOPD		

Figure 8 — AOPDs positions to prevent access between machine halves

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

5.6.6 Access to hazard points through the slot between chain beam and top pressure beam

On double-end machines, the requirements of 5.6.5 apply.

On single-end machines, [also see 7.2.2 e)] the slot between the chain beam and top pressure beam shall meet the following requirements:

— where the maximum slot 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 maximum slot 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, and along the top pressure beam length a safety horizontal distance of 1 m shall be kept perpendicular to the pressure beam direction by the deterring effect of the workpiece support.

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

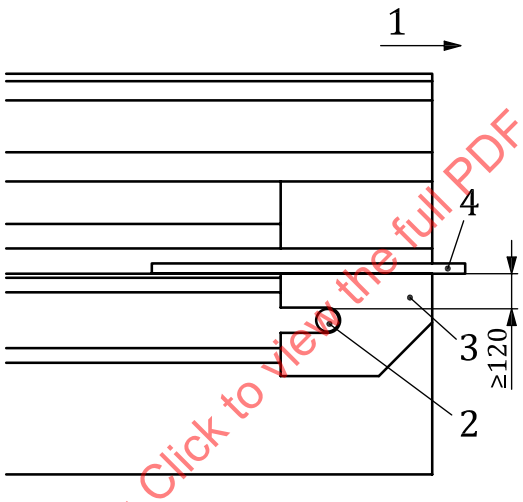
5.6.7 Guarding of drives

Access to the drives (which are e.g. for the tools and the feed mechanism) shall be prevented by a combination of fixed guards (see 5.5.1) and interlocking movable guards (see 5.5.2).

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

The feed cross drive shaft (if any) shall be positioned at a vertical distance of at least 120 mm below the workpiece lower surface (see Figure 9) and no fixed guard is required.

Dimensions in millimetres



Key

1	feed direction	3	workpiece support
2	feed cross-drive shaft	4	workpiece

Figure 9 — Feed cross drive 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.

5.6.8 Safeguarding of the feed mechanisms

5.6.8.1 General

Access to chains and pressure devices shall be prevented by the enclosure required in 5.6.1 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 workpiece.

As an exception, on machines equipped with top pressure belts, access to the crushing, shearing and drawing-in hazard points due to the top pressure belts and their intermediate hold-down devices shall be prevented by the enclosure required in 5.6.1, except for the slot between chain beam and top pressure beam (for such slot, see 5.6.6) (see Figure 10). A graphical symbol shall be affixed close to the intermediate hold-down devices of the top pressure belts, drawing attention to the residual risk of drawing-in (see ISO 7010, W024).

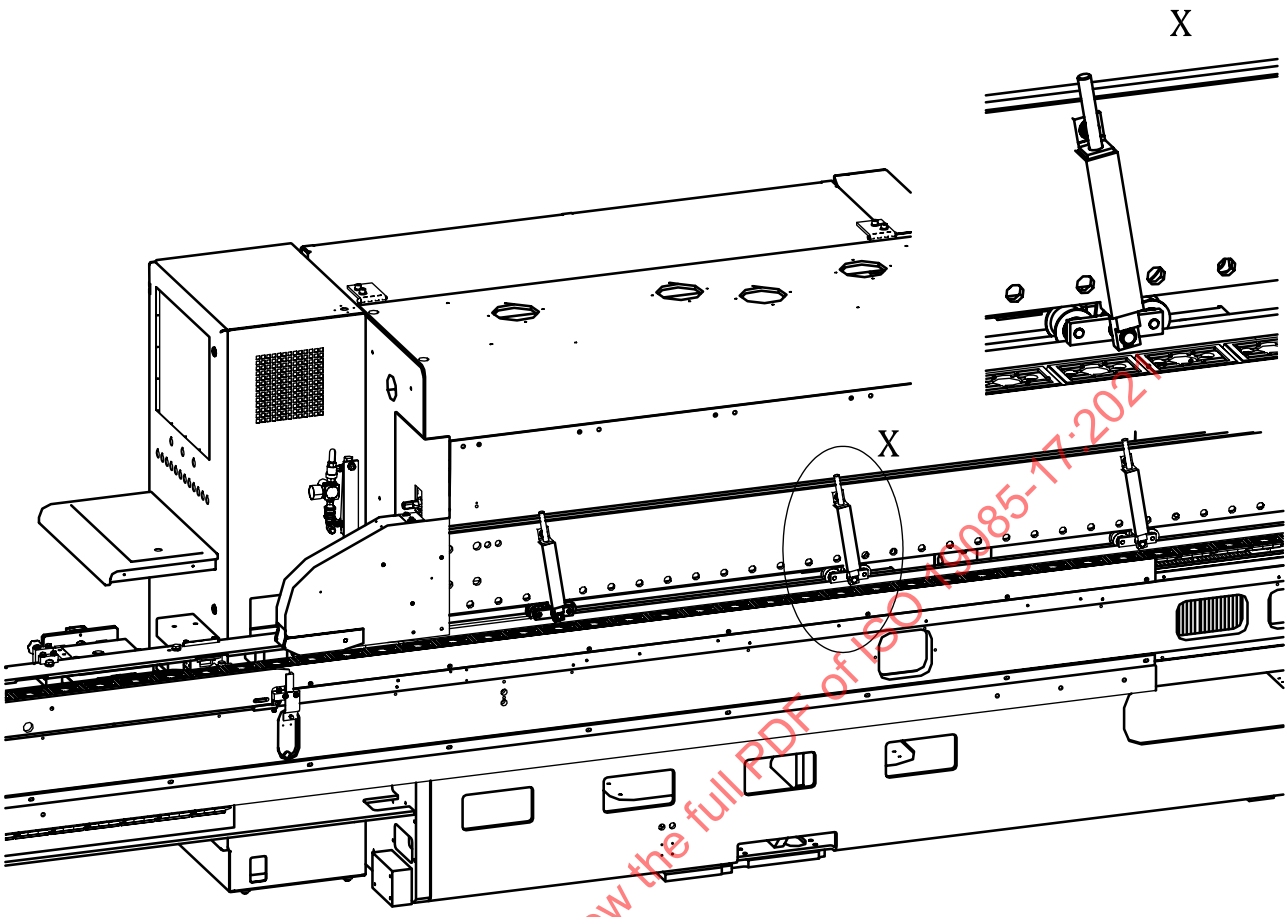


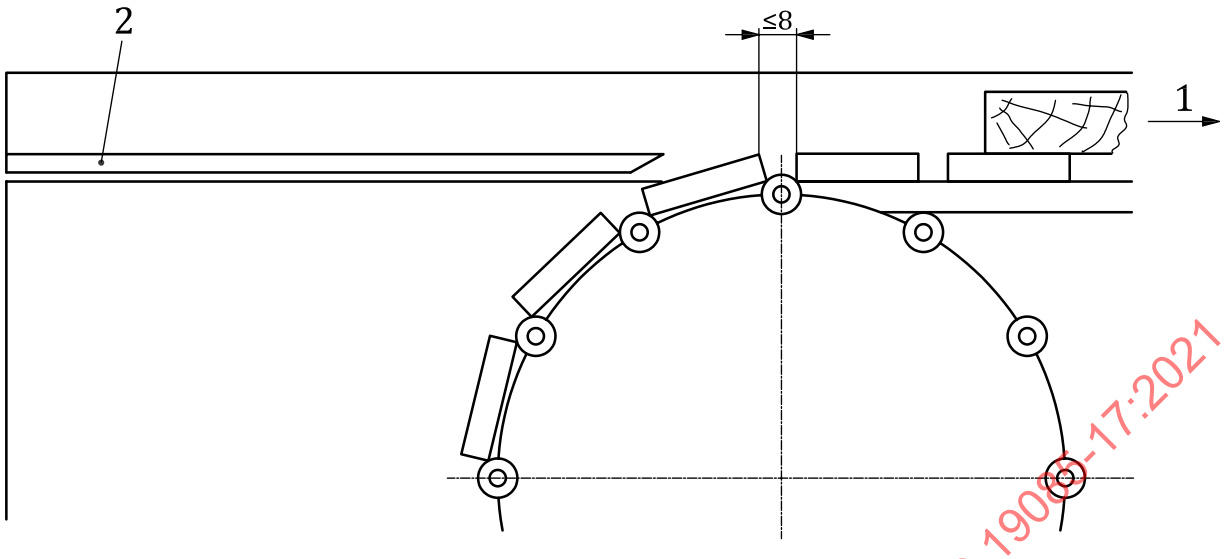
Figure 10 — Example of pressure belts and their intermediate hold-down devices

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

5.6.8.2 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 minimized by adequate design of the chain, e.g. by limiting opening between chain pads to 8 mm maximum where accessible from above (see Figure 11), or provision of a fixed guard to prevent direct access from above.

Dimensions in millimetres



Key

1 feed direction

2 workpiece support

Figure 11 — Example of adequate feed chain design

Access to the trapping points of each top pressure beam shall be prevented either by:

a) a fixed guard on each top pressure beam, which moves vertically with the top pressure beam. and shall meet the following additional requirements:

   1) the width of this fixed guard shall extend at least over the full width of the top pressure beam;

   2) the bottom edge of this fixed guard shall be no more than 4 mm above the surface of the workpiece during normal feeding; or

b) a mechanically actuated trip device (PSPE, see Figure 12) which shall meet the following additional requirements:

   1) the width (see Figure 12, key w_s) of the sensor of each trip device shall extend at least over the full width of the top pressure beam;

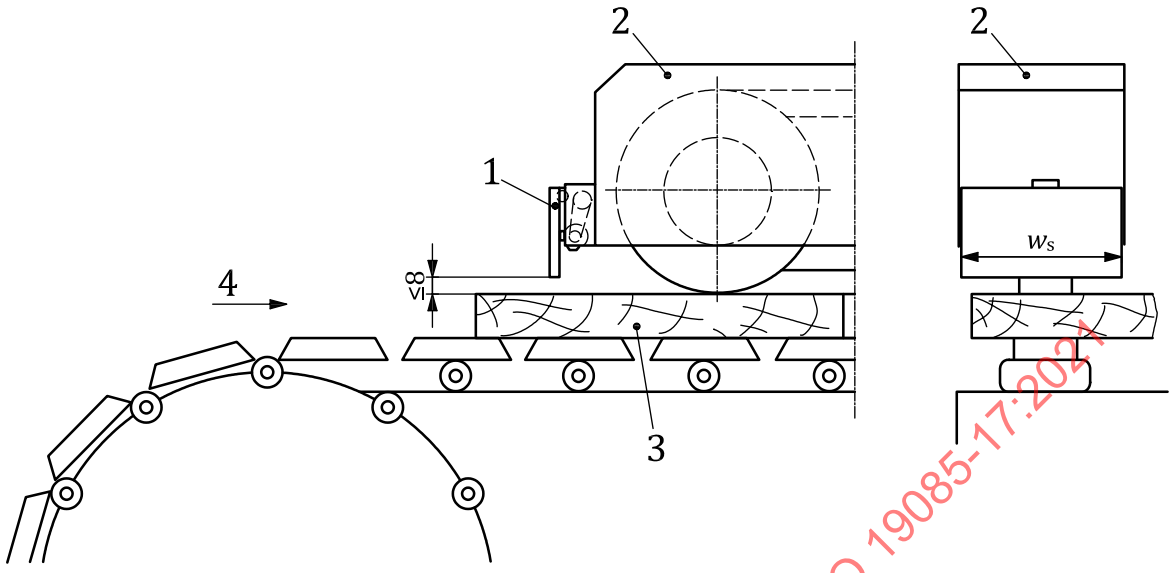
   2) the bottom edge of the trip device shall be no more than 8 mm above the surface of the workpiece during normal feeding;

   3) with regard to the gap between the trip sensor and the workpiece, the horizontal distance from the trip sensor to the internal 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 workpiece 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;

   4) the trip device shall not in itself create a trapping hazard.

In addition, a label shall be attached warning of residual risk of finger trapping and shearing in case of workpieces with openings and/or uneven surface [see 7.2.2, h)].

Dimensions in millimetres



Key

1	trip device sensor	4	feed direction
2	top pressure beam	w_s	width of sensor ($w_s \geq$ width of top pressure beam)
3	workpiece		

Figure 12 — Trip device at the infeed end of the machine

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

5.6.8.3 Outfeed end of the machine

At the outfeed end, the hazard of being drawn in between the chain or belt and a fixed part of the machine shall be reduced by using a workpiece support or a suitable extension to the casing, such that the gap between the support or extension itself and the chain or belt is maximum 8 mm.

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

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

5.6.9 Safeguarding of machine half movement on double-end machines

5.6.9.1 Crushing between machine halves during closing movement

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

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 14); triggering AOPD during closing movement of the machine halves shall cause a safe stop of the machine halves; and

2) a PSPE (see Figure 13) which complies with the following:

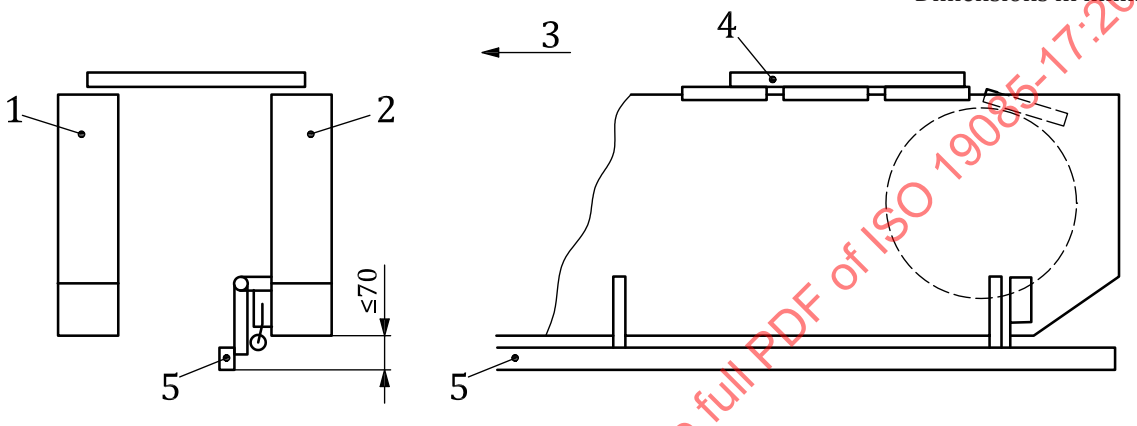
   i) it shall extend at least over the full length of the machine half;

   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 Ø 80 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.

Dimensions in millimetres



Key

1 fixed chain beam
2 moving chain beam
3 feed direction
4 workpiece
5 trip device sensor extending over full length of chain beam

Figure 13 — Trip device on moving chain beam

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 14); triggering AOPD during closing movement of the machine halves shall cause a safe stop of the machine halves; and

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

      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;

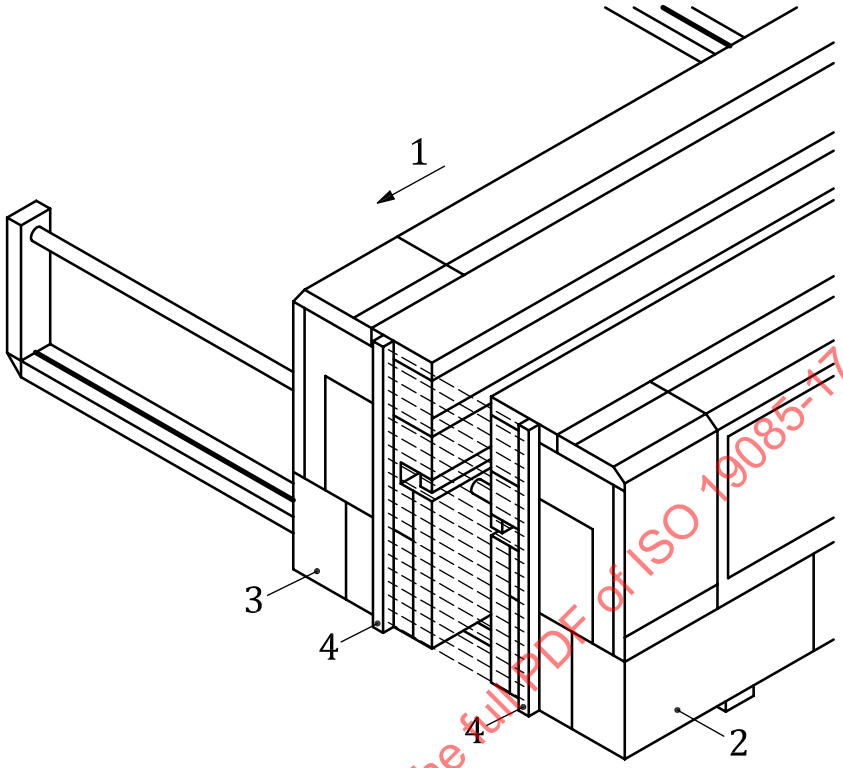
      iii) triggering AOPD shall cause a safe stop of the machine half;

      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 does not need to achieve any 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 does not need to achieve any PL_r).



Key

1	feed direction	3	movable half
2	fixed half	4	AOPD

Figure 14 — AOPD at the out-feed end

In a) and b), a reset control device 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.

5.6.9.2 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 solutions:

a) a mechanically actuated trip device (PSPE) which complies with the following:

   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 Ø 80 mm according to ISO 13856-2:2013;

   3) triggering PSPE during opening movement of the machine half 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:

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

2) the residual movement after actuation shall not be greater than the distance between the AOPD and the machine half;

3) triggering AOPD during opening movement of the machine half shall cause a safe stop of the machine half;

c) a limiting device, which prevents the machine half from 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 does not need to achieve any 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 does not need to achieve any PL_r).

In a) and b), a reset control device 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.

5.7 Impact hazard

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

As an exception, the workpiece feed speed may exceed 25 m/min.

Machines with feed speed exceeding 40 m/min shall be provided either with:

— an outfeed table, designed for unloading perpendicularly to the feed direction; or

— a mechanical system for unloading and/or workpiece transfer.

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

5.8 Clamping devices

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

The requirements stated in ISO 19085-1:2021 apply to the clamping pins of the transversal infeed device for loading of panels, with the addition of the following alternative option.

A two-stage clamping system, with a maximum clamping force at the clamping device of 50 N for the first stage, followed by the second stage at full clamping force actuated by one of the following ways:

— The same manual control as the first stage, after minimum 1 s;

— a separate control device from the one for the first stage;

— automatically after an AOPD safeguarding the clamping pins is not triggered any more (no manual reset is necessary). Such AOPD shall have a resolution not greater than 30 mm and be positioned in a way that prevents the operator to stay in between the AOPD and the clamping pins without triggering the AOPD.

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

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 at least of class A.

As an exception, guards to prevent ejection from sanding belts, where separately guarded from milling tool, may be of class B.

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

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, applies

5.9.3 Devices to minimize ejection of rigid edges

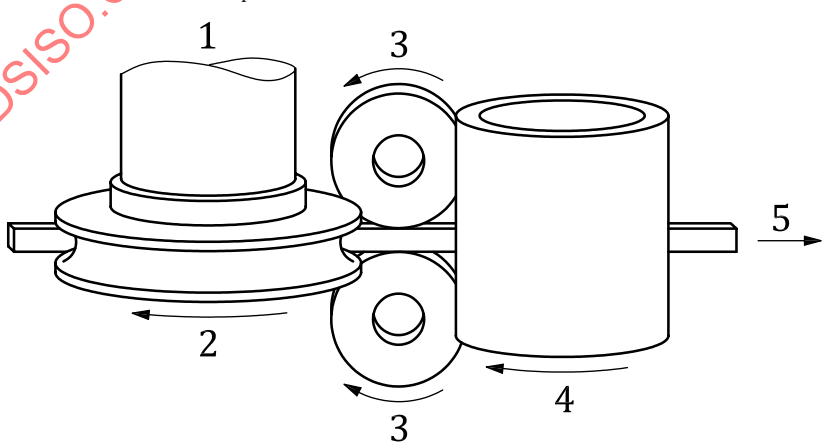
Subclause specific to this document.

Where climb cutting milling units, mounted after the gluing units, are used for rigid edges thicker than 5 mm in bars/laths/sticks (not rolled), the machine shall be designed to prevent rigid edges from being ejected from the machine.

To reduce the ejection of rigid edges, one of the following anti-ejection systems shall be provided and positioned between the climb cutting milling unit and the outfeed of the machine:

a) a pressure device as shown in Figure 15; or

b) at least two other work units, with rotating tools cutting against the feed, which shall be in working position and running while the climb cutting milling unit is working. The SRP/CS for the interlocking between the climb cutting milling unit and the subsequent units running and in working position shall achieve PL_r = c.



Key

1	motor	4	solid roller
2	milling tool	5	feed direction
3	soft faced rollers (upper and lower)		

Figure 15 — Pressure device installation at the outfeed end of the machine

As an exception, an anti-ejection system is not required where using grooving tools having a kerf of 10 mm or less and groove depth is not more than ¾ of the rigid edge thickness or 15 mm, whichever is less.

If a pressure device incorporating pressure rollers is used, it shall meet the following requirements:

1) it shall incorporate two rollers each having a surface (e.g. rubber) that will not damage the workpiece and shall press against its upper and lower faces and the banded solid edge;

2) it shall incorporate one roller having a hard surface (e.g. steel) which shall press horizontally against the banded solid edge;

3) the force exerted by the rollers described in 1) shall be at least 50 N and be applied at right-angles to the upper and lower surfaces of the banded solid edge and for the roller described in 2) shall be at least 300 N and be applied at right-angles to the banded solid edge.

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

5.9.4 Height adjustments of feed mechanism

Subclause specific to this document.

For manual height adjustment of the feed mechanism, by hand wheel or power operated, instructions shall be given as per 7.3.2 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 if a means of detecting that any workpiece entered the in-feed of the machine has passed the tools is provided. The SRP/CS for interlocking of upward automatic height adjustment 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.

5.10 Workpiece supports and guides

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

5.10.1 General

The workpiece shall be guided and supported by the chain/belt beam and the top pressure beam.

A support for overhanging workpieces shall be provided. Hand/arm/head shearing or crushing hazards between the overhanging workpieces and this support shall be minimized by positioning the bars or structure carrying this support at a gap of more than 120 mm below the top of the feed chain or fixed table.

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

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

5.10.2 Additional workpiece support at the outfeed

Shearing and crushing hazards between the workpiece and the additional workpiece support installed at the outfeed shall be prevented by providing a distance to the hazard points not lower than 850 mm from external accessible sides of the additional outfeed workpiece support.

Entanglement points between powered belts and fixed parts of the device and pulleys shall be prevented providing a distance to the hazard points not lower than 850 mm from external accessible sides of the additional out-feed workpiece support.

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

5.10.3 Transversal infeed device

Shearing and crushing hazards e.g. during return movement of the transversal infeed device shall be prevented by at least one of the following solutions:

a) a minimum gap between fixed parts of the machine and infeed device of 120 mm;

b) a PSPE with a maximum tripping force of 150 N with test probe Ø 80 mm according to ISO 13856-2:2013;

c) limiting the force of the transversal infeed device towards the fixed parts of the machine to a maximum of 150 N.

The SRP/CS for limiting the power-operated movement force 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.

5.10.4 Automatic panel returner

On single-end machines fitted with an automatic panel returner, the following requirements apply (see Figure 16).

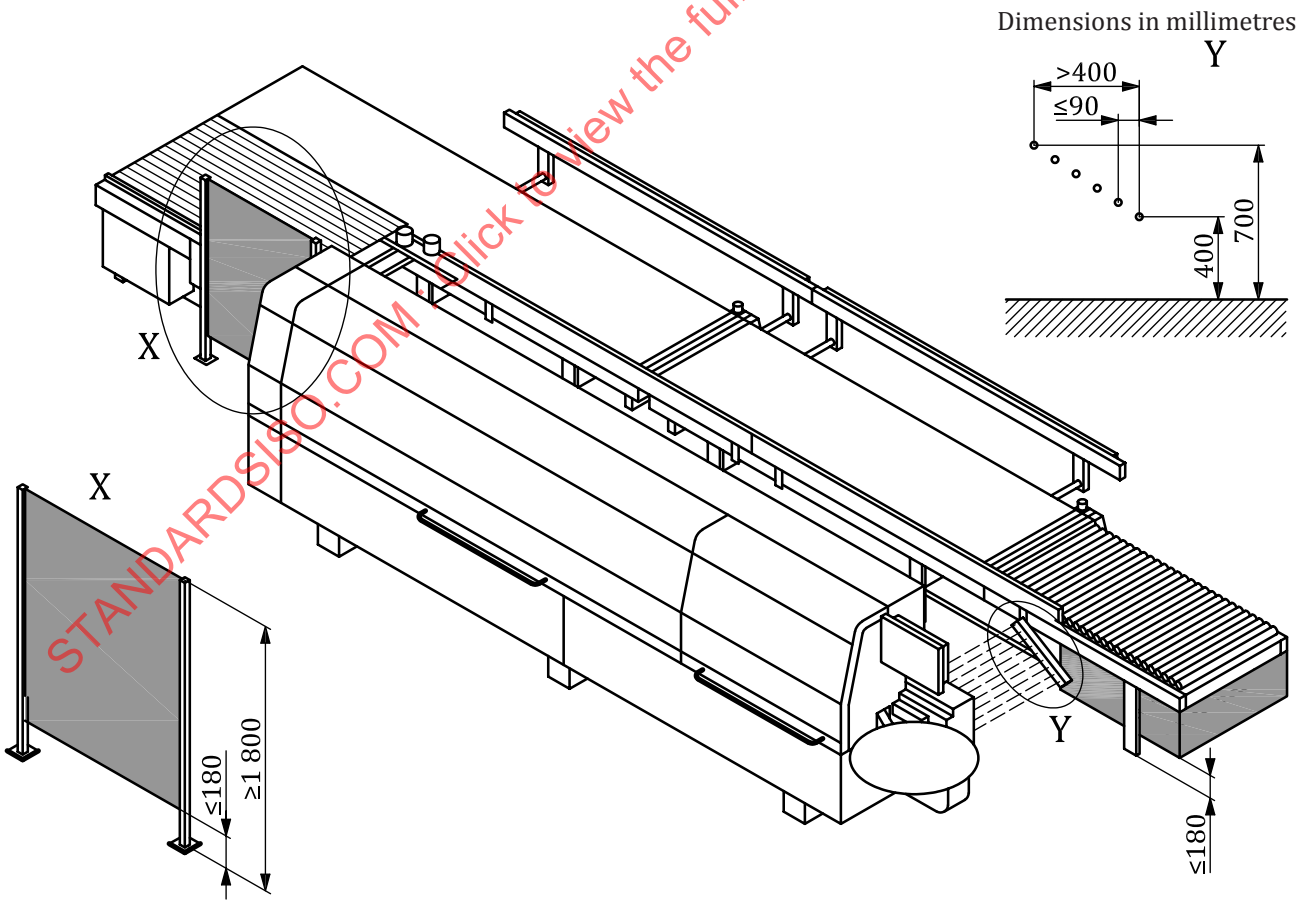


Figure 16 — Example of automatic panel returner with AOPD

The access to the shearing and crushing points shall be prevented, e.g. by fixed guards with a minimum height of 1 800 mm and a maximum distance from the floor of 180 mm, providing a distance of at least 850 mm from shearing and crushing points.

Access to the hazardous points through the gap (if any) between the workpiece returner and the machine shall be prevented by fixed guards below the workpiece returner's external sides positioned in such a way that remaining gaps are not higher than 180 mm and ladder effect is avoided, and by one of the following safeguards, positioned at the infeed:

a) an AOPD mounted inclined meeting the following requirements:

   1) the external ray at the infeed side of the machine shall be mounted at a height of 400 mm above the floor level;

   2) the external ray at the opposite of the infeed side of the machine shall be mounted at a height of 700 mm above the floor level;

   3) the horizontal distance between external rays shall be not less than 400 mm;

   4) the pitch between two consecutive rays shall be equal to or less than 90 mm, measured on the horizontal projection;

   5) when the AOPD is triggered, the machine feed and any panel 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; and

b) a moveable guard with interlocking, extending in height from a maximum of 180 mm above the floor level up to at least 700 mm or the level of the workpiece support, whichever the less.

Verification: By checking the relevant drawings, 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 with the following additions.

Overheating of a stationary workpiece or parts of the machine and of stationary edge materials shall be avoided by interlocking the workpiece heaters (e.g. infrared lamps), the heating systems of the hot air banding unit and the infrared banding unit with the feed.

The SRP/CS for the interlocking of workpiece heaters with feed shall achieve PL_r = c, or, as an exception for infrared lamps only, PL_r = b.

The SRP/CS for interlocking of the heating system of hot air banding unit with feed shall achieve PL_r = c.

The SRP/CS for the interlocking of infrared banding unit with the feed shall achieve PL_r = c.

As an alternative for hot air banding units, the heating system may not be interlocked with feed if the hot air flow is reduced and/or deviated away from the edge material when feed stops.

The SRP/CS for reduction and/or deviation of the hot air flow when the feed stops shall achieve PL_r = c.

A flammable substance shall not be sprayed in an area at a temperature higher than the substance flash point. The SRP/CS for the interlocking between the flammable substance spray unit and the heat source 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.

6.2 Noise

6.2.1 Noise reduction at the design stage

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

The machine shall be provided with noise enclosure. If this noise enclosure is part of the guarding system, the interlocking and/or interlocking with guard locking shall meet the requirements in 5.6.1. 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 7.3.2 i)].

Verification: By checking the relevant drawings, measurement, inspection of the machine and confirmation from the component manufacturer.

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.

6.4 Electricity

ISO 19085-1:2021, 6.4, applies.

6.5 Ergonomics and handling

ISO 19085-1:2021, 6.5, applies with the following additions.

The height of the workpiece support 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.

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

6.6 Lighting

ISO 19085-1:2021, 6.6, applies.

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 additions.

On machines equipped with laser banding unit, with laser risk class higher than 2M according to IEC 60825-1:2014, the requirements given in IEC 60825-1:2014, 4.2 to 4.10, and the following apply.

Laser equipment in machinery shall comply with the requirements of ISO 11553-1:2005.

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

As an alternative to workpiece detection, thermal sensors shall be provided and placed in order to prevent overheating of the area surrounding the target of the laser beam if the edge is not fed. The SRP/CS for the interlocking of laser emission with edge feed and overheat detection shall achieve PL_r = b.

On single-end machines, the slot for the panel passage shall be covered by a curtain or brushes to prevent the sight of the area where the laser is working.

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

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.

6.16 Extreme temperatures

Subclause specific to this document.

Where there are hazards caused by contact of a hand with any hot surfaces, the requirements of ISO 13732-1:2006, 5.3, shall apply (where inadvertent contact means 1 s or less and voluntary contact, e.g. with a handle, means more than 30 s).

Wherever possible, the access to the hot areas shall be prevented by proper safeguarding, e.g. housings or isolation.

On machines equipped with hot air banding unit, an exhaust duct shall be provided and connected to the hot air banding unit.

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

6.17 Substances

Subclause specific to this document.

See 6.3 and in addition, an extraction outlet above the gluing unit shall be provided for connection to a dedicated extraction system.

For the limit temperature of the glue, especially Polyurethane (PU), see 7.3.2 m).

A vacuum-meter shall be provided to detect the lack of depression, and it shall be interlocked with the laser source. The SRP/CS for the interlocking of the vacuum loss detection with laser source power shall achieve PL_r = c.

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

6.18 Artificial optical radiation

Subclause specific to this document.

Where heating lamps are provided, the machine shall be designed to minimize the spread and reflection of their radiation.

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

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

b) on machines where more than one separate pneumatic isolators are provided (e.g. one for each machine half and/or hot air edge banding unit), a warning label shall be placed in proximity of each pneumatic supply disconnection device warning that the other pneumatic supplies are not isolated by isolation of the current pneumatic supply disconnection device;

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

d) for each spindle requiring speed monitoring according to 4.7.3, a label positioned close to the spindle, stating the minimum n_{max} (maximum rotational speed) of the tools that are allowed to be mounted (see Figure 17);

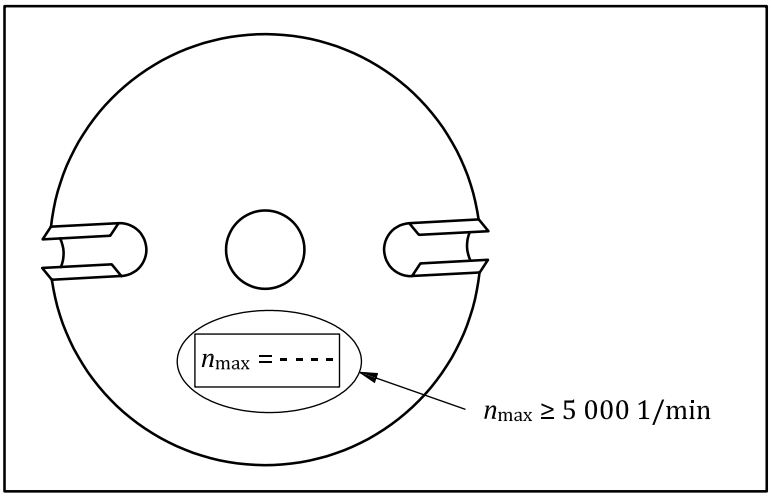


Figure 17 — Example of label for spindles

e) on single-end machines, a pictogram shall be affixed drawing attention to the residual risk as required in 5.6.4, 5.6.6 and 5.6.8.1;

f) where using PU glue, a warning not to exceed its limit temperature, placed at the heating system control;

g) where the machine is fitted with heating lamps, a warning symbol for artificial optical radiation (AOR) according to EN 12198;

h) a label at the infeed warning to take care when machining workpieces with openings with dimensions greater than 8 mm or with uneven surfaces as per 5.6.8.2;

i) a label close to hot surfaces warning regarding the residual risk and the necessity to wear personal protective equipment, according to ISO 7010, W017;

j) a label on the housing of the laser source, with a pictogram according to IEC 60825-1:2014, warning that opening the guard gives access to a class 4 laser according to IEC 60825-1:2014;

k) the labels given in IEC 60825-1:2014, from 5.1 to 5.7 and 5.9, to be applied on laser banding units.

7.3 Instruction handbook

7.3.1 General

ISO 19085-1:2021, 7.3.1, applies.

7.3.2 Additional information

ISO 19085-1:2021, 7.3.2, applies with the following additions.

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

a) foreseeable ways in which the machine shall not be used include machining sparks-generating metals, wrong choice of the material of edging tapes;

b) information that the maximum length of the workpieces to be machined shall not exceed the free space at the outfeed end of the machine minus 500 mm;

c) on single-end machines the information that the maximum width of the workpieces to be machined shall not exceed the free space at the side of the workpiece support minus 500 mm;

d) on double-end machines information that at the side of the moving machine half a minimum free space of 500 mm between the moving machine half and other fixed adjacent machines, part of the building or stocks of material, etc., shall be ensured, when crushing/shearing hazard is not prevented by measures given in 5.6.9.2;

e) instruction that only saw-blades and milling tools manufactured in accordance with the requirements of EN 847-1:2017 and EN 847-2:2017 shall be used;

f) where relevant, information on how to avoid contact between the tools which are adjusted manually and other parts of the machine;

g) on machines with manual height adjustment (by hand-wheel or power-operated), information to avoid rising up the feed mechanism while tools are rotating and workpieces or parts of it are still in 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 restraint device or by validating the operation of the relevant work programme in the numeric control system;

i) instruction that hearing protectors shall be worn during fine adjustment with noise enclosures open;

j) information that the gluing unit when using PU glue shall be connected to a dedicated extraction system, separate from the CADES if the amount of the melted glue is higher than 2,5 kg;

k) information that, after machine shut off, substances are still emitted by the gluing unit until it cools down;

l) for machines equipped with hydrostatic tool fixing system, 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;

m) when using PU glue, explanation that its limit temperature shall not be exceeded, because it generates carcinogenic substances;

n) maximum dimensions (kerf width and depth) of the groove when grooving solid edges with milling units running in climb cutting mode and located after the gluing units;

o) if relevant, instruction not to shut off the machine with a cooling system for the banding units by the electrical main switch until the safe temperature is reached;

p) information that, after machine shut off, the gluing unit and pre-melt unit remain hot for long time;

q) information that maintenance of the laser banding unit is only permitted by qualified personnel;

r) information for correct managing of suitable edge materials with characteristics compatible with the settings of the laser banding unit and of the infrared banding unit;

s) information for correct adjustment of the height of the pressure beam to accommodate the work-piece to be machined.

Annex A
(informative)

List of significant hazards

ISO 19085-1:2020, 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 edge banding 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 subclause 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 can 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
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	6.16
3.2	Damage to health by hot or cold working environment	6.2.4	6.16

Table A.1 *(continued)*

No.	Hazards, hazardous situations and hazardous events	ISO 12100:2010	Relevant subclause of this document
4	**Hazards generated by noise**, resulting in		
4.1	Hearing loss (deafness), other physiological disorders (loss of balance, loss of awareness)	6.2.2.2, 6.3	6.2, 7.1, 7.3
4.2	Interference with speech communication, acoustic signals.		
6	**Hazards generated by radiation**		
6.5	Laser	6.3.4.5	6.10
7	**Hazards generated by materials and substances** (and their constituent elements) processed or used by the machinery		
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 level required

ISO 19085-1:2020, 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 required (PL_r)

Area		Safety function	PL_r	Subclause in ISO 19085-1	Subclause in this document
Start	1	Prevention of unexpected control power-on	c	4.3.2	
	2	Interlocking of control power-on with safeguards	c	4.3.2	
	3	Interlocking of feed start with tool spindle drives	b		4.3.3
	4	Interlocking of feed start with spindle retraction	b		4.3.3
Stop	5	Normal stop (braking function excluded)	c	4.4.2	
	6	Monitoring of the stand-still condition	c	4.4.3	
	7	Emergency stop (braking function excluded)	c	4.4.4	
	8	Disabling the power module of the laser banding unit upon safe stop (normal, operational, emergency)	c		4.4.2, 4.4.3, 4.4.4
	9	Disabling the infrared banding unit upon safe stop (normal, operational, emergency)	c		4.4.2, 4.4.3, 4.4.4
	10	Disabling the heating system of hot melt banding unit upon emergency stop	c		4.4.4
	11	Disabling the heating system of hot-air banding unit upon emergency stop	c		4.4.4
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	Postponement of interlocking with doors open	c		4.6.2
	18	Prevention of unexpected start of rotation, movements and adjustments of tools and other processing units	c		4.6.1, 4.6.3
	19	Prevention of unexpected start of the movements of machine halves and workpiece intermediate support	c		4.6.3
	20	Disabling the AOPD preventing access between machine halves when all spindles and movements are stationary	c		4.6.3
Spindle speed	21	Speed monitoring	c	4.7.3	