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Woodworking machines — Safety —

Part 15: Presses

Machines à bois — Sécurité —

Partie 15: Presses

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Contents

Page

Foreword ..... **v**
Introduction ..... **vi**
1 Scope **1**
2 Normative references **2**
3 Terms and definitions **3**
4 List of significant hazards **12**
5 Safety requirements and measures for controls **14**
5.1 Safety and reliability of control systems 14
5.2 Control devices 14
5.3 Start 15
5.4 Safe stops 15
5.4.1 General 15
5.4.2 Normal stop 15
5.4.3 Operational stop 16
5.4.4 Emergency stop 16
5.5 Braking function of tool spindles 16
5.6 Mode selection 16
5.7 Spindle speed changing 16
5.7.1 Spindle speed changing by changing belts on the pulleys 16
5.7.2 Spindle speed changing by incremental speed change motor 16
5.7.3 Infinitely variable speed by frequency inverter 16
5.8 Failure of any power supply 16
5.9 Manual reset control 17
5.10 Enabling control 17
5.11 Machine moving parts speed monitoring 17
5.12 Time delay 17
6 Safety requirements and measures for protection against mechanical hazards **17**
6.1 Stability 17
6.1.1 General 17
6.1.2 Displaceable machines 18
6.2 Risk of break-up during operation 18
6.3 Tool holder and tool design 18
6.3.1 General 18
6.3.2 Spindle locking 18
6.3.3 Circular saw blade fixing devices 18
6.3.4 Flange dimensions for circular saw blades 19
6.4 Braking 19
6.4.1 Braking of tool spindles 19
6.4.2 Maximum run-down time 19
6.4.3 Brake release 19
6.5 Safeguards 19
6.5.1 Fixed guards 19
6.5.2 Interlocking moveable guards 19
6.5.3 Hold-to-run control 19
6.5.4 Two hand control 19
6.5.5 Electro-sensitive protective equipment (ESPE) 19
6.5.6 Pressure sensitive protective equipment (PSPE) 19
6.6 Prevention of access to moving parts 20
6.6.1 General 20
6.6.2 Guarding of tools 20
6.6.3 Guarding of drives 20
6.6.4 Guarding of shearing and/or crushing zones 20

6.7 Impact hazard ... 24
6.8 Clamping devices ... 24
6.9 Measures against ejection ... 25
6.9.1 General ... 25
6.9.2 Guards materials and characteristics ... 25
6.10 Work-piece support and guides ... 25

7 Safety requirements and measures for protection against other hazards ... 26
7.1 Fire ... 26
7.2 Noise ... 26
7.2.1 Noise reduction at the design stage ... 26
7.2.2 Noise emission measurement and declaration ... 27
7.3 Emission of chips and dust ... 27
7.4 Electricity ... 28
7.4.1 General ... 28
7.4.2 Displaceable machines ... 29
7.5 Ergonomics and handling ... 29
7.6 Lighting ... 29
7.7 Pneumatics ... 29
7.8 Hydraulics ... 29
7.9 Electromagnetic compatibility ... 29
7.10 Laser ... 29
7.11 Static electricity ... 29
7.12 Errors of fitting ... 29
7.13 Isolation ... 29
7.14 Maintenance ... 30
7.15 Extreme temperatures ... 30

8 Information for use ... 30
8.1 Warning devices ... 30
8.2 Marking ... 30
8.2.1 General ... 30
8.2.2 Additional markings ... 30
8.3 Instruction handbook ... 30
8.3.1 General ... 30
8.3.2 Additional information ... 31

Annex A (informative) **Performance level required ... 32**
Annex B (normative) **Tests for braking function ... 33**
Annex C (normative) **Stability test for displaceable machines ... 34**
Annex D (normative) **Impact test for guards ... 35**
Annex E (normative) **Noise test code ... 36**
Bibliography ... 42

Foreword

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

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

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

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

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see www.iso.org/iso/foreword.html.

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

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

This document is intended to be used in conjunction with ISO 19085-1:2017[1)], which gives requirements common to the different machine types.

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

1) This document refers to ISO 19085-1:2017 because it experienced delays in preparation. A new edition of this document is under preparation, which refers to ISO 19085-1:2021.

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 to be provided 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 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 possible 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 corresponding clauses of ISO 19085-1:2017, with no need for indication since they are specific to each part of the series.

This document refers to ISO 19085-1:2017 because it experienced delays in preparation. A new edition of this document is under preparation, which refers to ISO 19085-1:2021.

Woodworking machines — Safety —

Part 15: Presses

1 Scope

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

— cold presses;

— hot presses;

— bending presses;

— edge/face gluing presses;

— membrane presses;

— embossing presses;

where the pressing force is applied by hydraulic actuators pushing two flat or shaped surfaces against each other, 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.

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

a) device for hot gluing;

b) device for high-frequency gluing;

c) device for high-frequency shaping;

d) automatic work-piece loading and unloading system;

e) intermediate additional platens;

f) work-piece extractor;

g) work-piece clamping pressure beam;

h) split moveable platens.

The machines are designed to process work-pieces consisting of:

1) solid wood;

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

3) honeycomb board.

This document does not deal with any hazards related to:

— specific devices that differ from the list above;

— hot fluid heating systems internal to the machine other than electrical;

— any hot fluid heating systems external to the machine;

— operation of taking intermediate platens out and in again;

— the combination of a single machine being used with any other machine (as part of a line).

It is not applicable to:

— frame presses;

— membrane presses where the pressing force is applied by vacuum only;

— presses for producing chipboard, fibreboard, OSB;

— machines intended for use in potentially explosive atmosphere;

— machines manufactured before the date of its publication as an international standard.

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 3744:2010, *Acoustics — Determination of sound power levels and sound energy levels of noise sources using sound pressure — Engineering methods for an essentially free field over a reflecting plane*

ISO 11201:2010, *Acoustics — Noise emitted by machinery and equipment — Determination of emission sound pressure levels at a work station and at other specified positions in an essentially free field over a reflecting plane with negligible environmental corrections*

ISO 11202:2010, *Acoustics — Noise emitted by machinery and equipment — Determination of emission sound pressure levels at a work station and at other specified positions applying approximate environmental corrections*

ISO 11204:2010, *Acoustics — Noise emitted by machinery and equipment — Determination of emission sound pressure levels at a work station and at other specified positions applying accurate environmental corrections*

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

ISO/TR 11688-1:1995, *Acoustics — Recommended practice for the design of low-noise machinery and equipment — Part 1: Planning*

IEC 60204-1:2016, *Safety of machinery — Electrical equipment of machines — Part 1: General requirements*

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

IEC 61800-5-2:2016, *Adjustable speed electrical power drive systems — Part 5-2: Safety requirements — Functional*

ISO 7010:2019, *Graphical symbols — Safety colours and safety signs — Registered safety signs*

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

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 12100:2010, ISO 13849-1:2015, ISO 19085-1:2017, 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 https://www.electropedia.org/

3.1
cold press
machine used to laminate and/or join together flat panels, in which the pressing force is applied by hydraulic actuators pushing two cold flat platens against each other

Note 1 to entry: The moveable platen can be the top or the bottom one or both. Examples of different machine designs are illustrated in Figures 1 and 2 (safeguarding devices are not fully illustrated).

Note 2 to entry: The following devices can be provided:

— automatic panel loading and unloading;

— split moveable platens (see Figure 14).

3.2
hot press
machine used to laminate and/or join together flat panels, in which the pressing force is applied by hydraulic actuators pushing two hot flat platens against each other

Note 1 to entry: The moveable platen can be the top or the bottom one or both. Examples of different machine designs are illustrated in Figures 1 and 2 (safeguarding devices are not fully illustrated).

Note 2 to entry: The following devices can be provided:

— automatic panel loading and unloading;

— intermediate additional platens (see Figure 3).

Note 3 to entry: Platens heating systems can be by electrical resistance or hot fluid (e.g. diathermic oil, water). Fluid heating system can be internal to the machine or external.

3.3
bending press
machine with manual loading and/or unloading used to assembly and/or shape flat panels, in which the pressing force is applied by hydraulic actuators pushing two shaped surfaces against each other, and hot gluing process is by hot dies or high-frequency system

Note 1 to entry: An example of a bending press is illustrated in Figure 4 (safeguarding devices are not fully illustrated).

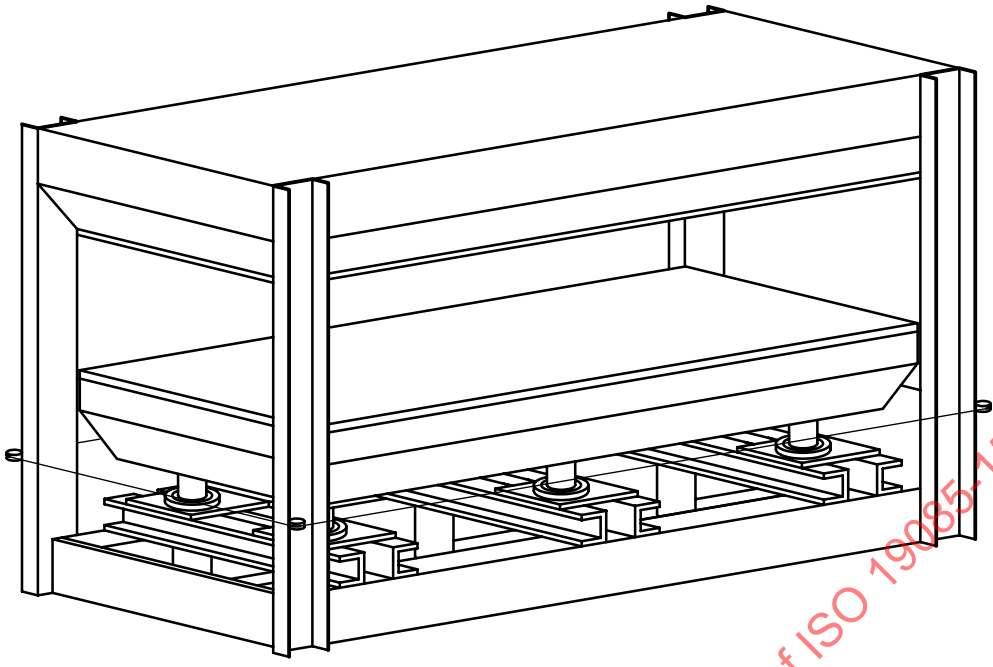


Figure 1 — Example of cold or hot press with bottom actuators

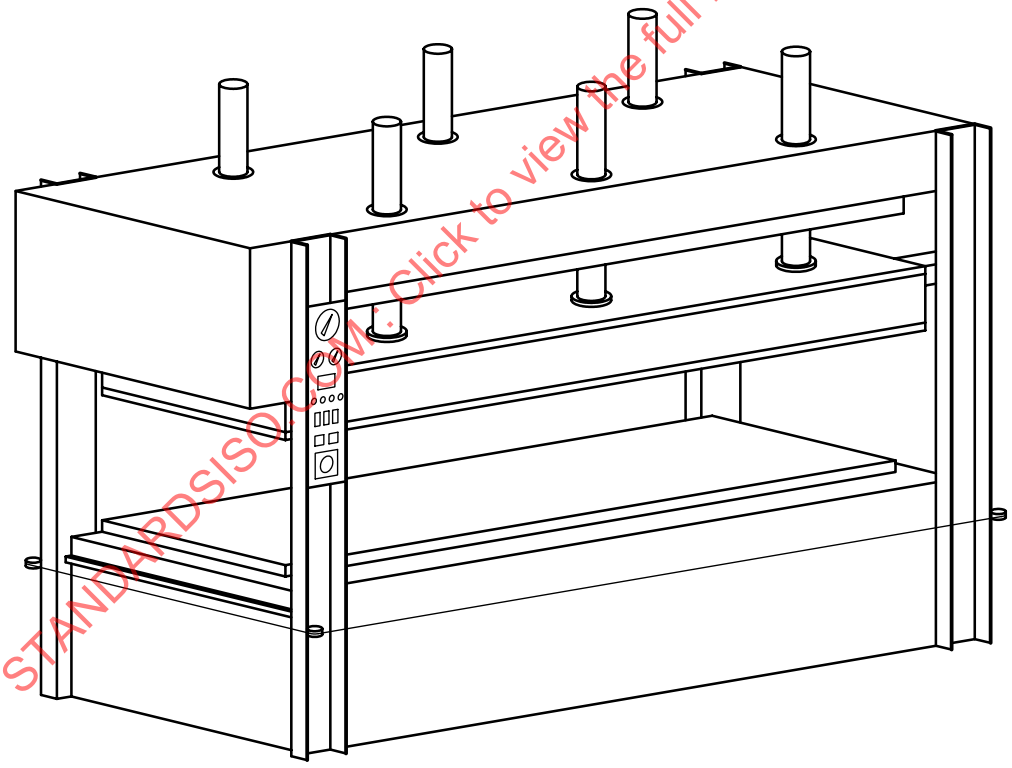


Figure 2 — Example of cold or hot press with top actuators

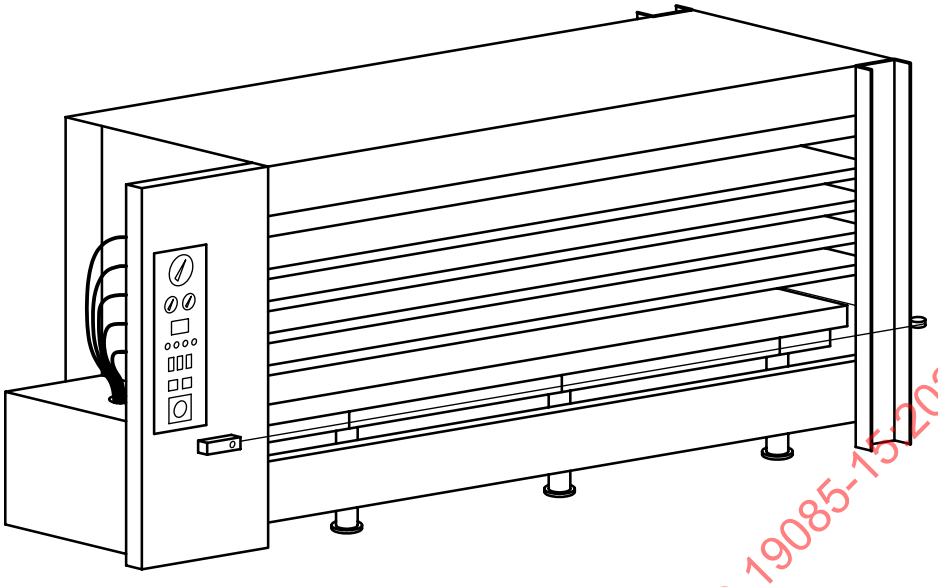


Figure 3 — Example of hot press with intermediate platens

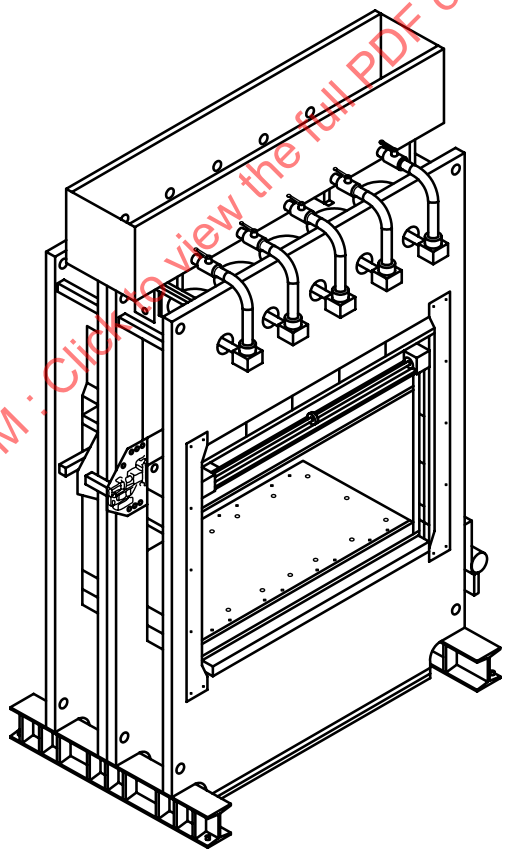


Figure 4 — Example of a bending press with top actuators

3.4
edge/face gluing press
machine used to join together solid wood bars, in which the pressing force is applied by hydraulic actuators vertically pushing two flat platens against each other, and horizontally pushing elements against each other, and hot gluing process is by hot platens or high-frequency system

Note 1 to entry: The following devices can be provided:

— work-pieces extractor;

— automatic panel loading and unloading system;

— *work-piece clamping pressure beam* (3.15).

Note 2 to entry: An example of edge/face gluing press is illustrated in Figure 5 (safeguarding devices are not fully illustrated).

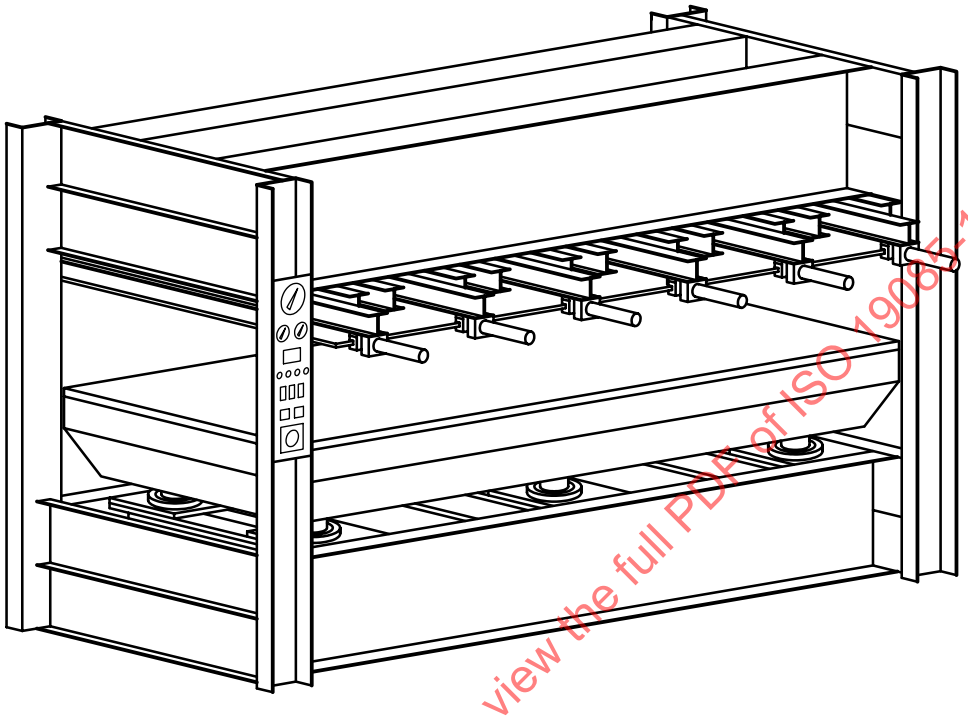


Figure 5 — Example of edge/face gluing press

3.5
membrane press
machine used to laminate or veneer flat or shaped work-pieces, in which the pressing force is applied through a membrane pushed onto the work-piece by compressed air from above and by vacuum from below, hermetically enclosed by two shells, of which the upper one is heated, pushed against each other by hydraulic actuators

Note 1 to entry: Automatic panel loading and unloading devices can be provided.

Note 2 to entry: Upper shell heating systems can be by electrical resistance or hot fluid (e.g. diathermic oil, water). Fluid heating system can be internal to the machine or external.

Note 3 to entry: An example of membrane press is illustrated in Figure 6 (safeguarding devices are not fully illustrated).

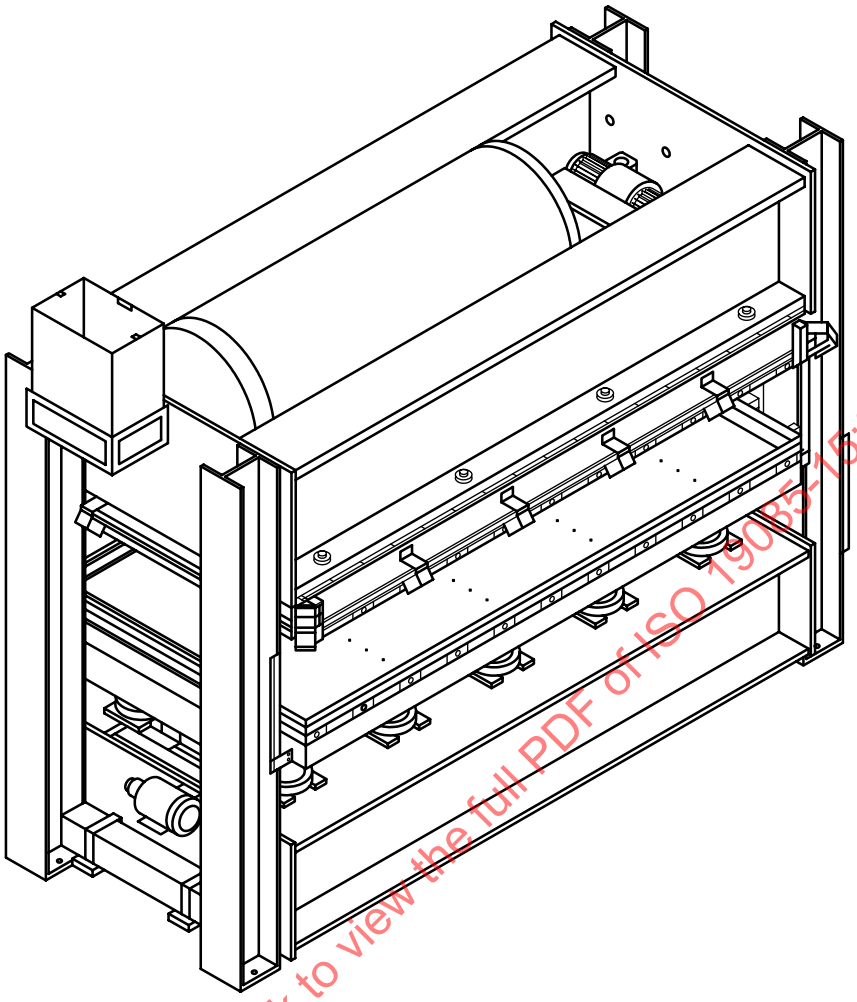


Figure 6 — Example of membrane press

3.6
embossing press
machine used to emboss work-pieces by a special mould/die fixed to the upper plate, in which the pressing force is applied by hydraulic actuators pushing two hot flat platens against each other

Note 1 to entry: The moveable platen can be the top or the bottom one or both. Examples of different machine designs are illustrated in Figures 1 and 2 (safeguarding devices are not fully illustrated).

Note 2 to entry: Automatic panel loading and unloading devices can be provided.

Note 3 to entry: Platens heating systems can be by electrical resistance or hot fluid (e.g. diathermic oil, water). Fluid heating system can be internal to the machine or external.

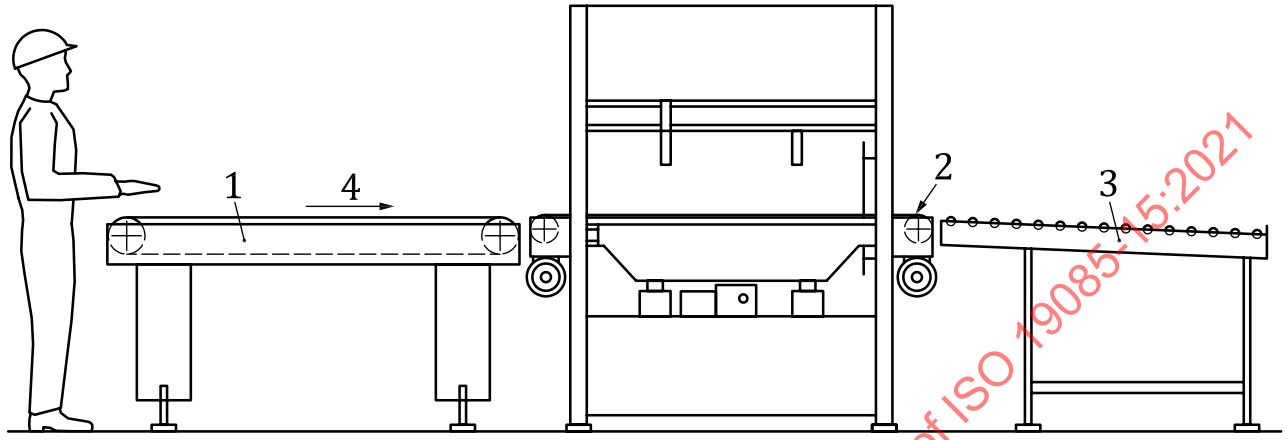
3.7
daylight
compartment between two consecutive pressing platens

3.8
automatic work-piece loading/unloading system
system for automatic feed of work-pieces into/out of the machine, whereby the work-piece is manually loaded/unloaded into/out of it

Note 1 to entry: Six usual types of automatic work-piece loading/unloading systems are considered in this document.

3.9
automatic work-piece loading/unloading system type 1
system consisting of an automatic belt/chain/roller conveyor for loading of work-pieces into the *daylight* (3.7), a feeding belt/chain/roller device applied to the bottom platen and idle roller conveyor or an automatic belt/chain/roller conveyor for unloading of work-pieces

Note 1 to entry: For an example, see Figure 7 (safeguarding devices are not fully illustrated).



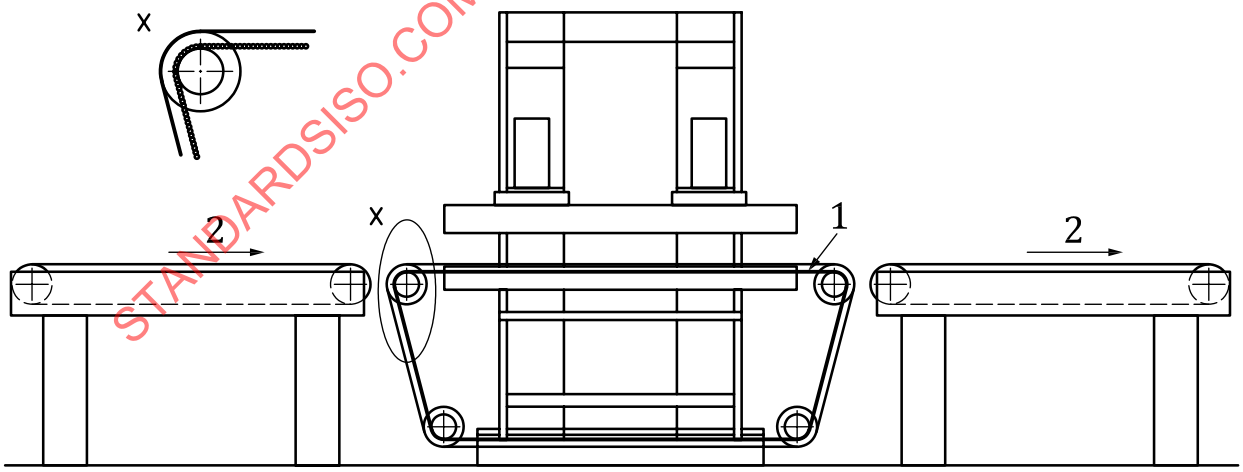
Key

1	automatic belt conveyor for loading	3	idle roller conveyor for unloading
2	feeding belt device applied to the bottom platen	4	feed direction

Figure 7 — Example of automatic work-piece loading/unloading system type 1

3.10
automatic work-piece loading/unloading system type 2
system similar to *automatic work-piece loading/unloading system type 1* (3.9) but with an automatic hybrid chain and belt feeding device applied to the platens

Note 1 to entry: For an example, see Figure 8 (safeguarding devices are not fully illustrated).



Key

1	hybrid chain and belt feeding device
2	feed direction

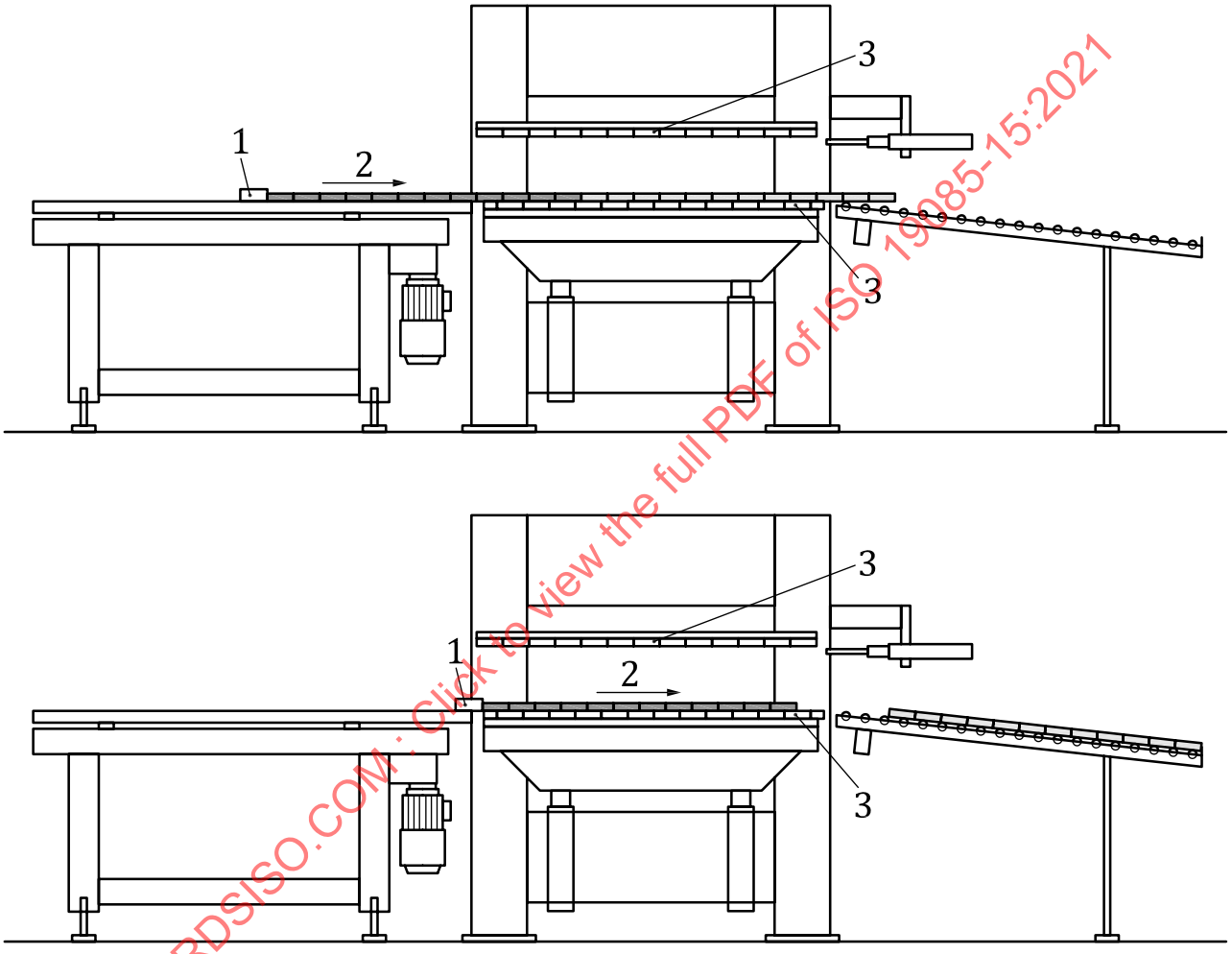
Figure 8 — Example of hybrid chain and belt device

3.11
automatic work-piece loading/unloading system type 3
system consisting of an automatic pusher for loading the of work-pieces into the *daylight* (3.7)

Note 1 to entry: Loading a work-piece into the daylight pushes out the work-piece already in the daylight.

Note 2 to entry: Unloading support can be either inclined idle roller conveyor or horizontal table.

Note 3 to entry: For an example with unloading inclined idle roller conveyor, see Figure 9 (safeguarding devices are not fully illustrated).



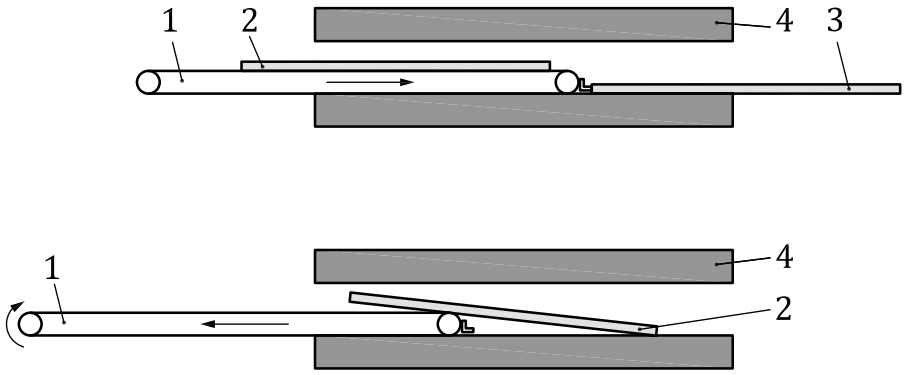
Key
1 automatic pusher
2 feed direction
3 platens

Figure 9 — Example of automatic work-piece loading/unloading system type 3

3.12
automatic work-piece loading/unloading system type 4
system consisting of an automatic sliding belt conveyor for loading of work-pieces into the *daylight* (3.7)

Note 1 to entry: When the sliding belt conveyor loads a work-piece into the daylight, at the same time it pushes out any work-piece already in the daylight.

Note 2 to entry: For an example, see Figure 10.



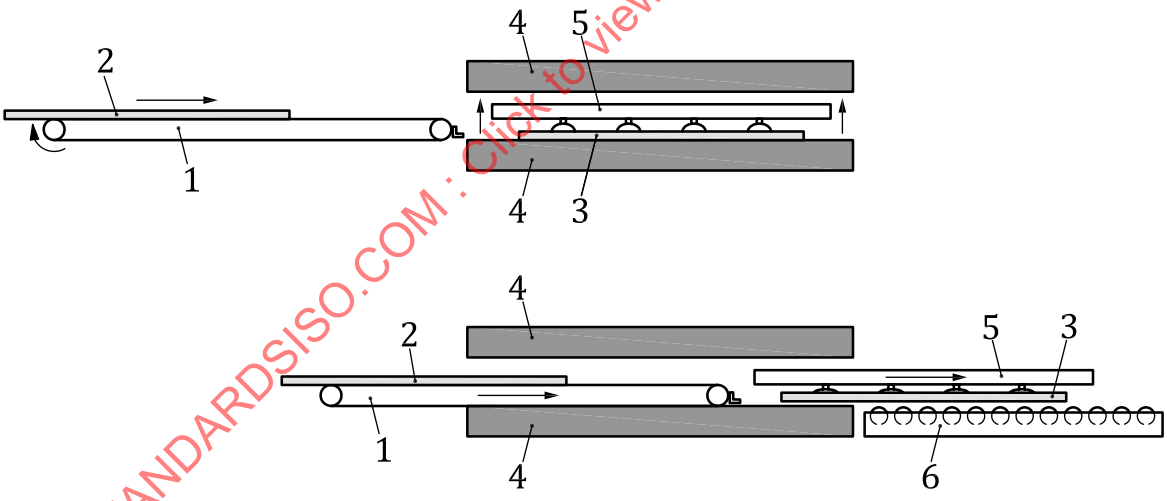
Key

1 sliding belt conveyor
2 loaded work-piece
3 unloaded work-piece
4 platens

Figure 10 — Example of automatic work-piece loading/unloading system type 4

3.13
automatic work-piece loading/unloading system type 5
system consisting of an automatic sliding belt conveyor for loading of work-pieces in the *daylight* (3.7) in combination with a vacuum system for unloading work-pieces onto a roller conveyor

Note 1 to entry: For an example, see Figure 11.



Key

1 sliding belt conveyor
2 loaded work-piece
3 unloaded work-piece
4 platens
5 vacuum system for unloading
6 unloading roller conveyor

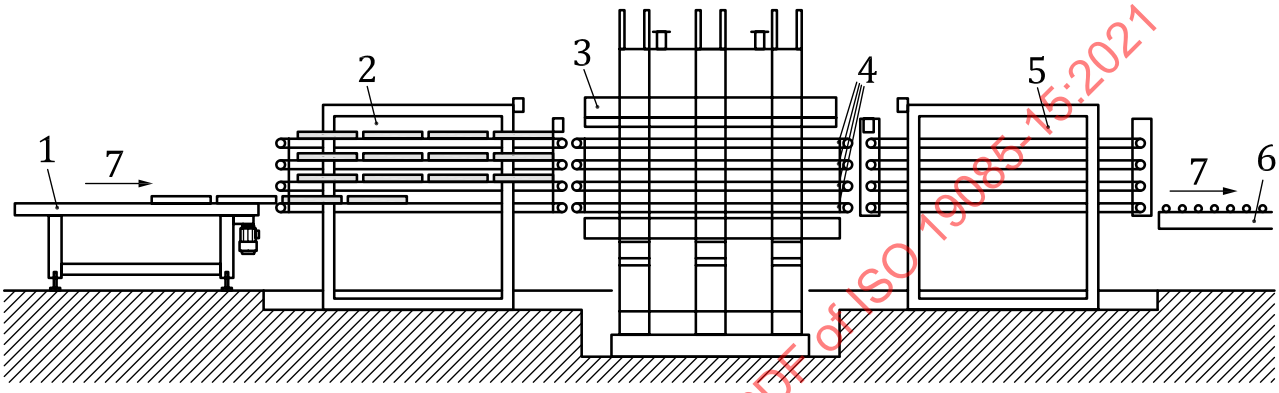
Figure 11 — Example of automatic work-piece loading/unloading system type 5

3.14
automatic work-piece loading/unloading system type 6
system consisting of an automatic belt/roller multi-conveyor for loading of work-pieces in a multi-daylight machine, a feeding belt/chain/roller device applied to the platens and an automatic belt/roller multi-conveyor for unloading of work-pieces

Note 1 to entry: Each conveyor of the multi-conveyor can move up and down in order to align with *daylights* (3.7).

Note 2 to entry: Multi-conveyors are loaded/unloaded by single automatic belt/roller conveyors.

Note 3 to entry: For an example, see Figure 12 (safeguarding devices are not fully illustrated).



Key

1	single load belt conveyor	5	automatic belt multi-conveyor for unloading
2	automatic belt multi-conveyor for loading	6	roller conveyor for unloading
3	multi-daylight machine	7	feed direction
4	feeding belt devices applied to the platens		

Figure 12 — Example of automatic work-piece loading/unloading system type 6

3.15
work-piece clamping pressure beam
beam to clamp the work-piece in position before the platens close, from the top and/or from the sides/edges

Note 1 to entry: For an example, see Figure 13.

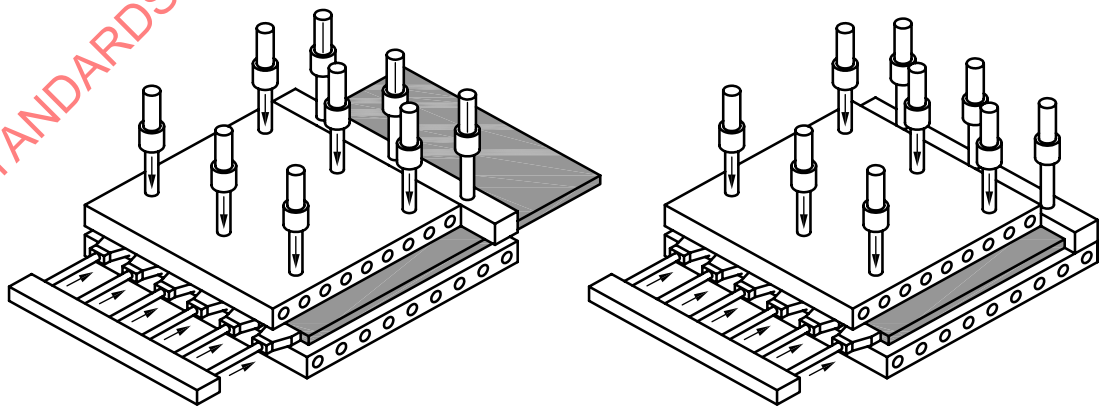


Figure 13 — Examples of automatic work-piece clamping pressure beam

3.16
split movable platen
sectioned platen covering the whole working area and moveable independently, to process smaller work-pieces of different heights in the same time

Note 1 to entry: The split platens can be top or bottom.

Note 2 to entry: For an example, see Figure 14 (safeguarding devices are not fully illustrated).

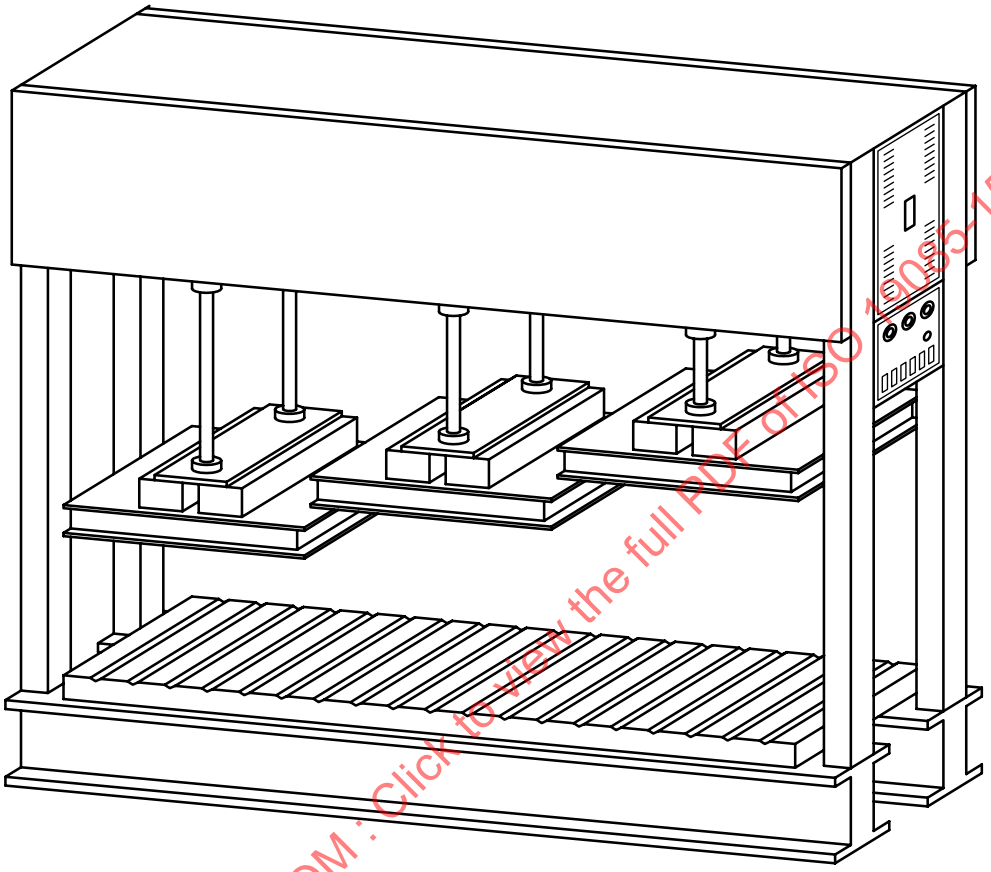


Figure 14 — Example of cold press with split moveable platens

3.17
control power-on
control that after activation enables providing power to machines actuators, also on a lower control level, e.g. by the PLC

3.18
jog control
control device for momentary activation of a function or a movement

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 Clause 1 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 hazardous 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	6.3, 6.7, 7.5
	b) relative location		6.1, 6.2, 6.6
	c) mass and velocity (kinetic energy of elements in controlled or uncontrolled motion)		5.7, 5.11, 6.6
	d) mechanical strength		5.4, 6.3
	— Accumulation of energy inside the machinery due to		
	g) liquids and gases under pressure	6.2.10, 6.3.5.4	7.7, 8
1.1	Crushing hazard		6.6
1.2	Shearing hazard		6.6
1.3	Cutting or severing hazard		6.3, 6.5, 6.7
1.4	Entanglement hazard		6.3, 6.5, 6.6, 6.10
1.5	Drawing-in or trapping hazard		6.6
1.6	Impact hazard		6.7
1.8	Friction or abrasion hazard		6.5
1.9	High pressure fluid injection or ejection hazard	6.2.10	6.9, 7.7, 7.8
2	**Electrical hazards** due to		
2.1	Contact of persons with live parts (direct contact)	6.2.9, 6.3.5.4	7.4, 7.13
2.2	Contact of persons with parts which have become live under faulty conditions (indirect contact)	6.2.9	7.4, 7.13
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, Annex E
4.2	Accidents due to Interference with speech communication, acoustic warning signals.	6.2.2.2, 6.3	7.2, Annex E
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 hazard	6.2.4	7.1, 7.3
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	5.2, 7.5, 8.3

Table 1 *(continued)*

No.	Hazards, hazardous situations and hazardous events	ISO 12100:2010	Relevant subclause in this document
8.2	Hand-arm or foot-leg anatomy	6.2.8.3	5.2, 7.5, 8.3
8.4	Local lighting	6.2.8.6	7.6, 8.3
8.6	Human error, human behaviour	6.2.8.1, 6.2.11.8, 6.2.11.10, 6.3.5.2, 6.4	8.3
8.7	Design, location or identification of manual controls	6.2.8.7, 6.2.11.8	5.2
8.8	Design or location of visual display units	6.2.8.8, 6.4.2	5.2
9	**Combination of hazards**	6.3.2.1	5.6, 5.7
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
10.2	Restoration of energy supply after an interruption	6.2.11.4	5.2, 6.3, 7.7, 7.8, 7.13, 7.14
10.3	External influences on electrical equipment	6.2.11.11	7.4, 7.11, 7.14
10.6	Errors made by the operator (due to mismatch of machinery with human characteristics and abilities, see 8.6)	5.4.9, 6.2.8, 6.2.11.8, 6.2.11.10, 6.3.5.2, 6.4	5.2, 7.5, 6.3
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, 5.10
13	**Failure of the power supply**	6.2.11.1, 6.2.11.4	5.9
14	**Failure of the control circuit**	6.2.11, 6.3.5.4	5.10
15	**Errors of fitting**	6.2.7, 6.4.5	7.12, 8.3
16	**Break-up during operation**	6.2.3	6.3
17	**Falling or ejected objects or fluids**	6.2.3, 6.2.10	6.9
18	**Loss of stability/overturning of machinery**	6.3.2.6	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.

The main electrical control devices of the machine for control power-on, jog, normal stop, two-hand control and integrated feed shall be located together on the main control panel in a position from where the loading position can be seen.

Additional control devices for automatic movements, i.e. start (not including reset function), jog, normal stop and two-hand control may be duplicated/provided on additional control panels or hand-held control sets with cable connection, taking into account the requirements of 5.4.4 for emergency stop. Control devices for reset function and control power-on shall not be fitted on hand-held control sets.

Where an additional two-hand control device is provided, a key selector shall be provided to enable only one two-hand control device at a time. The SRP/CS for selection of the active two-hand control device shall achieve PL_r = c.

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

a) at the main control panel and any auxiliary control panel;

b) at hand-held control set;

c) adjacent to all hold-to-run control devices;

d) at the work-piece manual loading and unloading positions, at both sides of the opening for work-piece.

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

5.3 Start

ISO 19085-1:2017, 5.3, is replaced by the following text.

A control power-on device shall be provided and be protected against unintended actuation, e.g. shrouded. Control power-on activation shall only be possible if all relevant safeguards are in place and functional; this is achieved by the interlocking arrangement described in 6.6.

Automatic movements (including those controlled by jog) and enabling high-frequency output (on machines with high-frequency system) shall only be possible after control power-on activation.

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

For closing and opening movements of the platens, see 6.6.4.

Where whole body access in the work-zone is foreseen, closure of interlocking movable guards or moving away from a triggered ESPE or PSPE shall not lead to an automatic restart of hazardous 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 automatic start of movements may occur at the same time.

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

Internal electric heating system switch ON may be independent from control power-on.

The SRP/CS for internal electrical heating system start/restart (including fluid recirculation pump) shall achieve PL_r = b.

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 high-frequency system, activating the normal stop shall also disable the high-frequency output. The SRP/CS for disabling the high-frequency output in the normal stop condition shall achieve PL_r = c.

Fluid recirculation pump of the heating system and resistances of the internal heating systems may remain active in normal stop condition.

5.4.3 Operational stop

ISO 19085-1:2017, 5.4.3, does not apply.

5.4.4 Emergency stop

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

The trip wire required in 6.6.4 may also be used as an emergency stop control device. In this case, the trip wire shall be red.

On machines with high-frequency system, activating the emergency stop shall also disable the high-frequency output. The SRP/CS for disabling high-frequency output in the emergency stop condition shall achieve PL_r = c.

The fluid recirculation pump of the heating system and resistances of the internal heating systems may remain active in an emergency stop condition.

5.5 Braking function of tool spindles

ISO 19085-1:2017, 5.5, does not apply.

5.6 Mode selection

ISO 19085-1:2017, 5.6, does not apply.

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, does not apply.

5.7.3 Infinitely variable speed by frequency inverter

ISO 19085-1:2017, 5.7.3, does not apply.

5.8 Failure of any power supply

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

On machines with high-frequency system, in case of return of interrupted power supply, the automatic enabling of the high-frequency output shall be prevented.

The SRP/CS for prevention of unexpected enabling of the high-frequency output shall achieve PL_r = c.

In case of return of interrupted power supply, the automatic restart of the hot fluid recirculation pump of the platens heating system shall not be prevented.

NOTE For restart of the internal electrical heating system, see 5.3.

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.

5.10 Enabling control

ISO 19085-1:2017, 5.10, does not apply.

5.11 Machine moving parts speed monitoring

ISO 19085-1:2017, 5.11, is replaced by the following text.

The control for speed monitoring shall ensure that, as soon as the real speed exceeds the speed limit, the drive shall be stopped automatically in stop category 0 according to IEC 60204-1:2016, 9.2.2.

For software requirements, see ISO 13849-1:2015, 4.6.

For limited speed monitoring of PDS(SR) (power drive system, safety-related), IEC 61800-5-2:2016, 4.2.3.4 (safely limited speed, SLS) applies.

The SRP/CS for limited speed monitoring of machine moving parts shall achieve PL_r = b.

5.12 Time delay

ISO 19085-1:2017, 5.12, applies.

6 Safety requirements and measures for protection against mechanical hazards

6.1 Stability

6.1.1 General

ISO 19085-1:2017, 6.1.1, applies with the following additions.

Unintended dangerous movements of the machine or part of it caused by gravity, pressure, etc., shall be avoided, for example by mechanical blocking devices or hydraulic load retaining valves capable of withstanding the maximum load for which the machine is designed.

On machines with manual loading and unloading, intermediate platens shall be individually guided in their descent to avoid their inclination and consequent disengagement.

All necessary appliances shall be provided to enable the user to prevent unexpected vertical movements of platens during maintenance and cleaning, e.g. mechanical platen lock (see Figure 15) or a manually activated locking device activated in a positive mode (see Figure 16). Locking by friction only is not allowed. Any appliance shall remain linked to the machine when not in use.

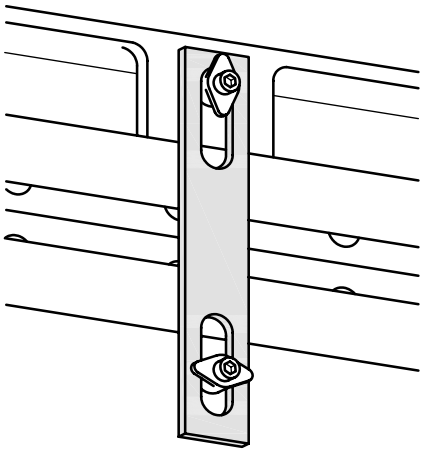


Figure 15 — Example of mechanical platen lock

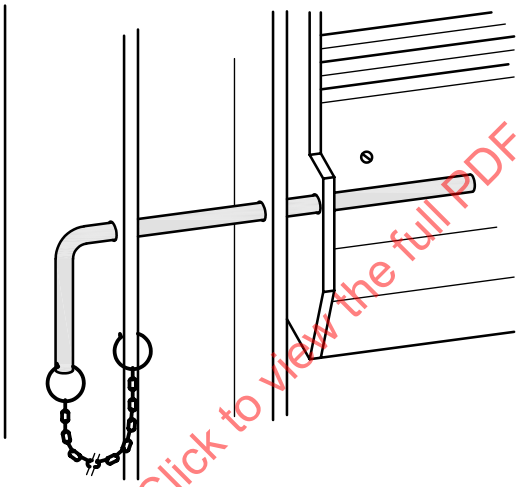


Figure 16 — Example of manually activated locking device (bolt)

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, does not apply.

6.3 Tool holder and tool design

6.3.1 General

ISO 19085-1:2017, 6.3.1, does not apply.

6.3.2 Spindle locking

ISO 19085-1:2017, 6.3.2, does not apply.

6.3.3 Circular saw blade fixing devices

ISO 19085-1:2017, 6.3.3, does not apply.

6.3.4 Flange dimensions for circular saw blades

ISO 19085-1:2017, 6.3.4, does not apply.

6.4 Braking

6.4.1 Braking of tool spindles

ISO 19085-1:2017, 6.4.1, does not apply.

6.4.2 Maximum run-down time

ISO 19085-1:2017, 6.4.2, does not apply.

6.4.3 Brake release

ISO 19085-1:2017, 6.4.3, does not apply.

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, does not apply.

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, applies.

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, does not apply.

6.6.3 Guarding of drives

ISO 19085-1:2017, 6.6.3, is replaced by the following text.

Where AOPDs or interlocking moveable guards according to 6.6.4 are not provided, racks shall be locally guarded by fixed guards that leave a maximum opening of 8 mm (see Figure 17).

Dimensions in millimetres

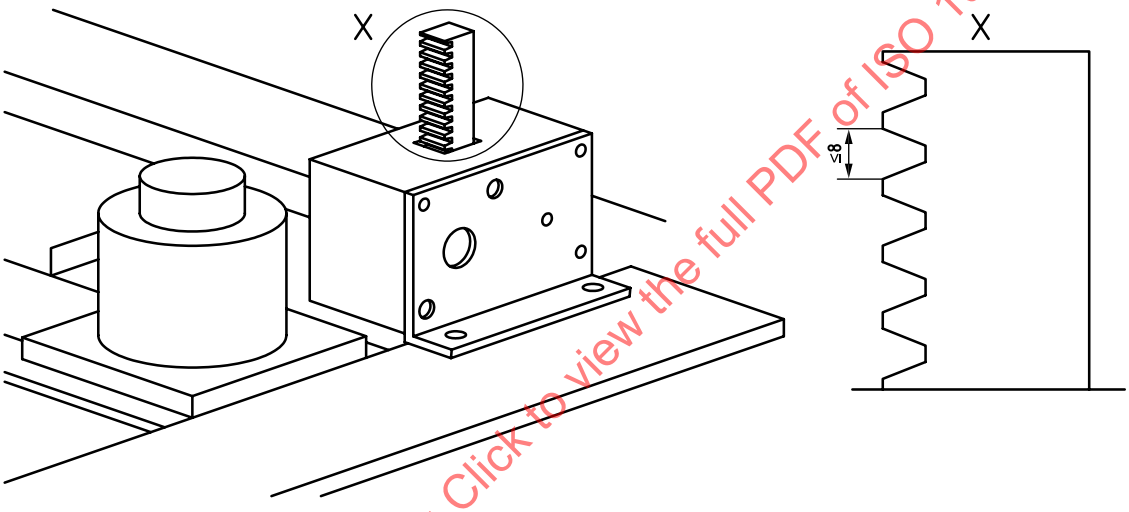


Figure 17 — Example of guarding of the rack

Verification: By checking the relevant drawings and/or circuit diagrams, measurement, inspection 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, subdivided into further specific subclauses.

6.6.4.1 Safeguarding of cold and hot presses with manual loading and unloading

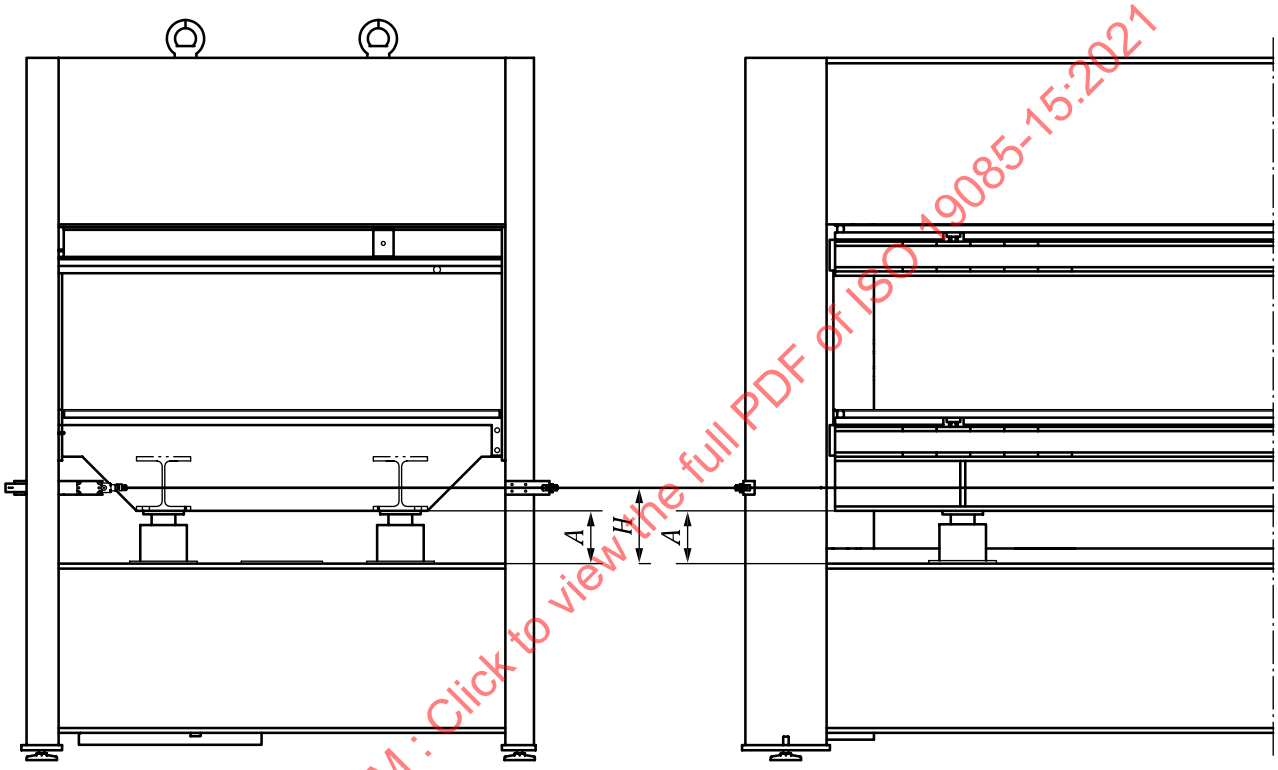
Crushing and shearing hazards between machine moving and fixed parts shall be prevented as follows:

a) in machines where the control for the closing movement is manual (opening movement is either manual or automatic), by a hold-to-run control device for manually controlled movements in combination with a trip wire (PSPE). In addition, where the opening is automatic, the opening speed shall be limited to 4 m/min according to 5.11. The trip wire shall extend along the external perimeter of the machine at a height, *H*, between 200 mm and 250 mm over the lower beam of the machine (see Figure 18). Triggering the trip wire shall cause an emergency stop according to 5.4.4. A minimum gap, *A*, of 120 mm shall be provided between the lower platen in its lowest position and the lower beam of the machine. Releasing the hold-to-run control device shall stop the movement of the platen and cut power to the relevant actuator;

b) in machines where both closing and opening movements are automatic (as part of the pressing cycle) and in machines provided with split movable platens, either by:

1) a combination of fixed guards and AOPD with a resolution not greater than 40 mm, positioned over the full height of the opening of the machine and at a minimum distance of 200 mm from any crushing and shearing point. Triggering the AOPD shall stop the movement of the platen and cut power to the relevant actuator. A manually operated reset control device for reactivating the AOPD shall be provided; or

2) a combination of fixed and interlocking moveable guards. A manually operated reset control device for resetting the interlocking of this moveable guard shall be provided.



Key

H height of the trip wire above the lower beam

A minimum gap between the lower plate in its lowest position and the lower beam

Figure 18 — Example of trip wire

6.6.4.2 Safeguarding of bending presses with manual loading and unloading

6.6.4.2.1 Machines with high-frequency system

Crushing and shearing hazards between machine moving and fixed parts shall be prevented by a combination of fixed guards and interlocking moveable guards, which shall:

— have a minimum height of 2 000 mm from the floor level or be equal to the maximum height of the machine if this is greater than 2 000 mm; and

— extend down to a maximum distance of 20 mm from the floor level.

6.6.4.2.2 Machines without high-frequency system

The requirements of 6.6.4.1 apply.

6.6.4.3 Safeguarding of edge/face gluing presses with manual loading and unloading

6.6.4.3.1 Machines with high-frequency system

The requirements of 6.6.4.2.1 apply.

In addition, crushing and shearing hazards between moving parts of horizontal pushing elements and fixed parts of the machine shall be prevented by fixed guards.

6.6.4.3.2 Machines without high-frequency system

The requirements of 6.6.4.1 apply.

In addition, crushing and shearing hazards between moving parts of horizontal pushing elements and fixed parts of the machine or the work-piece shall be prevented by a two-hand control device.

6.6.4.4 Safeguarding of membrane presses with manual loading and unloading

The requirements of 6.6.4.1 apply.

6.6.4.5 Safeguarding of embossing presses with manual loading and unloading

The requirements of 6.6.4.1 apply.

6.6.4.6 Safeguarding of machines with automatic work-piece loading/unloading systems type 1, type 2 and type 3

Crushing/shearing hazards between fixed and moving parts of the machine shall be prevented:

a) at loading and unloading sides, by conveyors extending at least 850 mm from the crushing and shearing points, in combination with:

   1) below the conveyors, fixed guards or impeding devices made in such a way that remaining gaps are not higher than 300 mm, placed at a distance of at least 850 mm from the crushing and shearing points;

   2) above the conveyors, fixed guards extending from above the work-piece passage up to at least 1 800 mm;

b) at the other two sides of the machine, by fixed guards with a minimum height of 1 800 mm and a maximum distance from the floor of 180 mm, laterally extending at least 850 mm beyond crushing/shearing points to prevent lateral access.

On machines with high-frequency system, the guards' height and distance above the floor shall be according to 6.6.4.2.1.

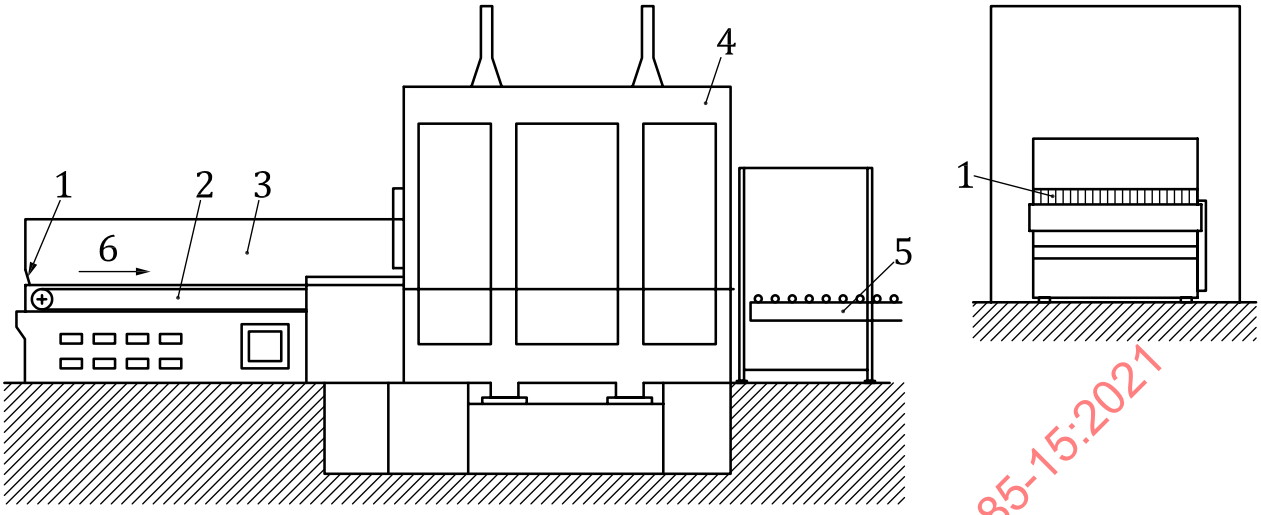
6.6.4.7 Safeguarding of machines with automatic work-piece loading/unloading system type 4

The requirements of 6.6.4.6 apply for all sides except the infeed side.

In addition, for the infeed side, the crushing/shearing hazard caused by the infeed sliding belt conveyor shall be prevented by a combination of (see Figure 19):

— fixed guards, extending from maximum 180 mm up to at least 1 800 mm above the floor level; and

— an AOPD for safeguarding the work-piece passage, with a resolution not greater than 20 mm and positioned at a minimum distance of 100 mm from any crushing and shearing point (i.e. between the sliding belt conveyor and the fixed parts of the machine). Triggering the AOPD shall stop the movement of the sliding belt conveyor and cut power to the relevant actuator.



a) Lateral view **b) Infeed side view**

Key

1	AOPD at infeed opening	4	press
2	infeed sliding belt conveyor	5	outfeed roller
3	fixed guards at the sides of the sliding belt conveyor	6	feed direction

Figure 19 — Example of machine with automatic work-piece loading/unloading system type 4

6.6.4.8 Safeguarding of machines with automatic work-piece loading/unloading system type 5

The requirements of 6.6.4.6 apply for the sides not for infeed and outfeed.

In addition, for the infeed and outfeed sides, the crushing/shearing hazard caused by the infeed sliding belt conveyor and by the outfeed vacuum system shall be prevented by a combination of:

— fixed guards, extending from maximum 180 mm up to at least 1 800 mm above the floor level; and

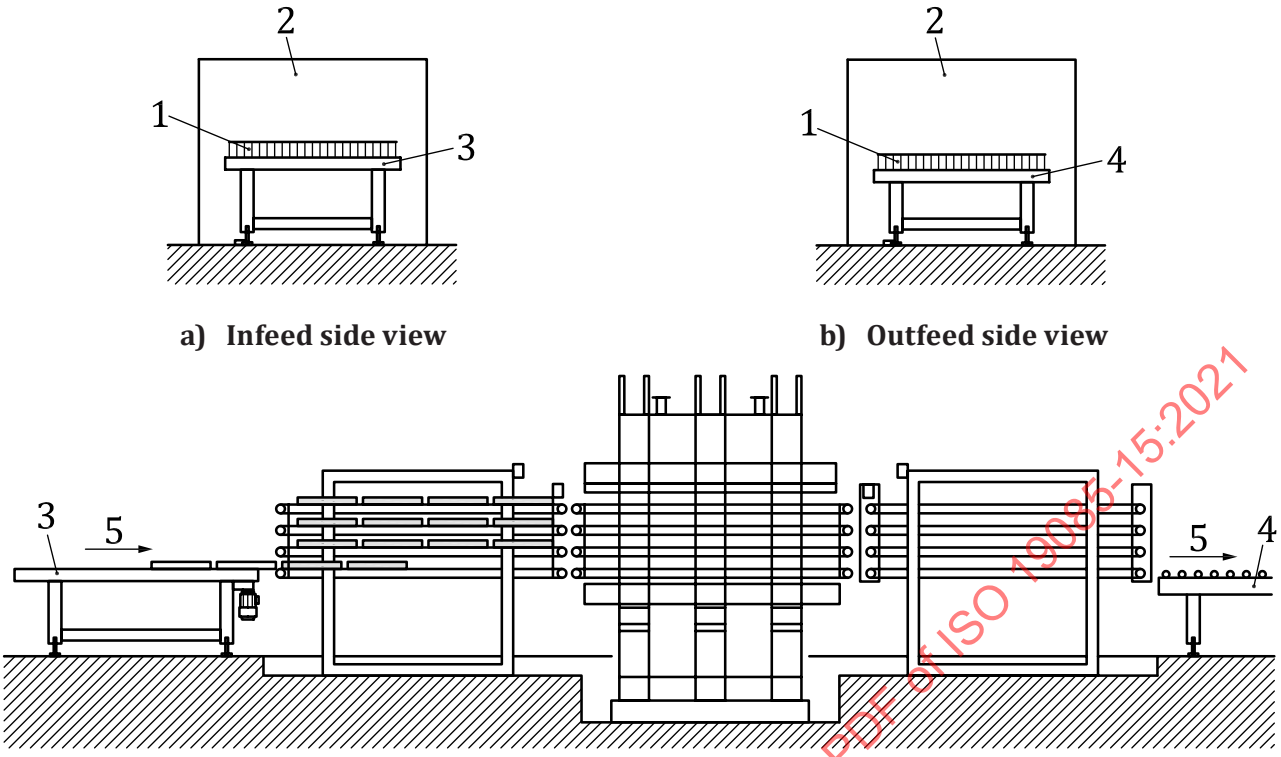
— an AOPD for safeguarding the work-piece passage, with a resolution not greater than 20 mm and positioned at a minimum distance of 100 mm from any crushing and shearing point (i.e. between the sliding belt conveyor or the vacuum system and the fixed parts of the machine). Triggering the infeed AOPD shall stop the movement of the sliding belt conveyor and cut power to the relevant actuator; triggering the outfeed AOPD shall stop the movement of the vacuum system and cut power to the relevant actuator.

6.6.4.9 Safeguarding of machines with automatic work-piece loading/unloading system type 6

The requirements of 6.6.4.6 apply for lateral sides of the machine including integrated loading and unloading multi-conveyors.

In addition, an access opening e.g. a door shall be provided for maintenance and servicing purposes and be interlocked with any hazardous movement. A reset control device according to 5.9 shall be provided and located as stated in 5.2.

In addition, access to the crushing/shearing points of the multi-conveyors from infeed and outfeed sides shall be prevented by fixed guards extending from 180 mm up to at least 1 800 mm above the floor level, in combination with an AOPD at the infeed and outfeed for safeguarding the work-piece passage in these guards (see Figure 20, key 1).



a) Infeed side view

b) Outfeed side view

c) Lateral view

Key

1	AOPD	4	roller conveyor for unloading
2	fixed guards	5	feed direction
3	single load belt conveyor		

Figure 20 — Example of machines with automatic work-piece loading/unloading system type 6

The height of these openings shall be lower than the distance between two consecutive layers of the multi-conveyor.

This AOPD shall have a resolution not greater than 20 mm and be positioned over the full height of these openings and at a minimum distance of 100 mm from any crushing and shearing point. Triggering the AOPD shall stop the vertical movement of the multi-conveyor and cut power to the relevant actuator.

6.7 Impact hazard

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

Where impact hazard due to contact between forearm, hand or fingers only and moving machine parts or moving work-pieces is not avoided by design of the machine or by the measures in 6.6, the speed of these movements shall not exceed 40 m/min (speed monitoring according to 5.11).

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

6.8 Clamping devices

ISO 19085-1:2017, 6.8, does not apply.

6.9 Measures against ejection

6.9.1 General

ISO 19085-1:2017, 6.9.1, does not apply.

6.9.2 Guards materials and characteristics

6.9.2.1 Choice of class of guards

ISO 19085-1:2017, 6.9.2.1, does not apply.

6.9.2.2 Guards of class A

ISO 19085-1:2017, 6.9.2.2, does not apply.

6.9.2.3 Guards of class B

ISO 19085-1:2017, 6.9.2.3, does not apply.

6.10 Work-piece support and guides

ISO 19085-1:2017, 6.10, applies with the following additions:

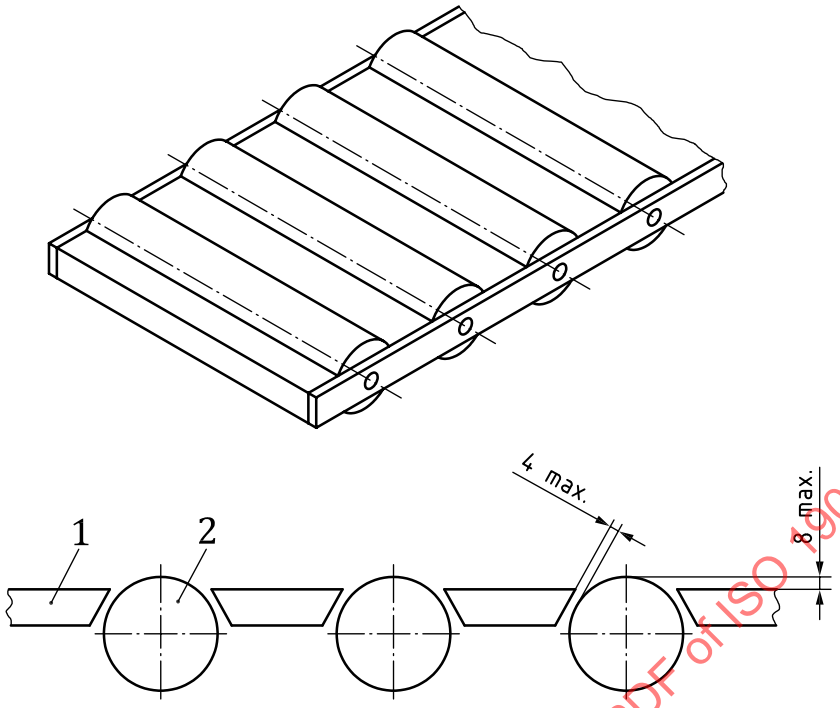
In machines with automatic work-piece loading/unloading systems (of all types), the following additional requirements shall apply:

a) If an idle roller conveyor for unloading is mounted inclined, it shall be equipped with a mechanical end-stop for the work-piece.

b) Automatic belt/chain/roller conveyors for unloading work-piece shall be provided with an AOPD at their end that, when triggered, stops the work-piece feed. A manually operated reset control device for reactivating the AOPD shall be provided. Requirements stated in 5.9 and 6.5.5 do not apply and the SRP/CS for interlocking AOPD with automatic conveyor feed and the related manual reset shall achieve at least PL_r = b.

In machines with automatic loading/unloading system types 4 and 5, crushing and shearing hazards between unloading roller conveyor and work-piece shall be prevented by filling the gaps between the rollers with 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 ≤4 mm. The infill plates between the rollers shall have a maximum depth below the top of the rollers of 8 mm (see Figure 21).

Dimensions in millimetres



Key

1 infill plate

2 roller

Figure 21 — Safeguarding of gaps between the rollers

7 Safety requirements and measures for protection against other hazards

7.1 Fire

ISO 19085-1:2017, 7.1, applies with the following additions.

Diathermic oil heating system shall be equipped with a thermostat that cuts power to the electrical resistor when the maximum oil temperature (i.e. oil combustibility point minus 20 °C) is reached. The SRP/CS for interlocking electrical resistor with maximum diathermic oil temperature shall achieve PL_r = b.

7.2 Noise

7.2.1 Noise reduction at the design stage

ISO 19085-1:2017, 7.2.1, is replaced by the following text.

Machinery shall be designed and constructed in such a way that risks resulting from the emission of airborne noise are reduced to the lowest level, taking account of technical progress and the availability of means of reducing noise, in particular at source.

When designing woodworking machinery, the information and technical measures to control noise at the source given in ISO/TR 11688-1:1995 shall be taken into account. The success of the applied noise reduction measures is assessed on the basis of the actual noise emission values in relation to other machines of the same type with comparable non-acoustical technical data.

NOTE ISO/TR 11688-2:1998 provides useful information about noise generation mechanisms in machinery.

The most relevant noise sources of presses for wood are: hydraulic pumps; pneumatic system; axes' drives.

The following list of technical measures for noise reduction at the source just gives examples of technical measures at the design stage, but is not meant to be complete:

a) Choice of low-noise machine components

b) reduction of vibrations through the static and dynamic balancing of rotating parts;

c) reduction of vibrations within the machine by reducing both the mass of the moving parts and their acceleration;

d) choice and design of low-noise transmission components, e.g. gears, pulleys, belts, bearings, clutch;

e) design of the machine structure to take into account vibration damping and by avoidance of structural resonance;

f) exhausts remote from operating positions;

g) choice and design of the mounts for the drives;

h) choice and design of cooling fans with optimum clearance and possible inclusion of overspeed limiters;

i) sound deadening and vibration damping of hydraulic circuits, pumps and drives;

j) choice and design of low rotational speed components;

Alternative measures with identical or higher effectiveness may be used.

The following list gives examples for noise reduction by protective devices:

1) encapsulation of machine parts;

2) machine enclosure;

3) partial enclosures;

4) screens;

5) mufflers/silencers.

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

7.2.2 Noise emission measurement and declaration

ISO 19085-1:2017, 7.2.2, is replaced by the following text.

The measurement of noise emission is the way to determine the residual risk due to noise.

Annex E shall be applied for noise emission measurement and declaration.

Verification: By checking the relevant documents, measurements and performing the test in Annex E.

7.3 Emission of chips and dust

ISO 19085-1:2017, 7.3, does not apply.

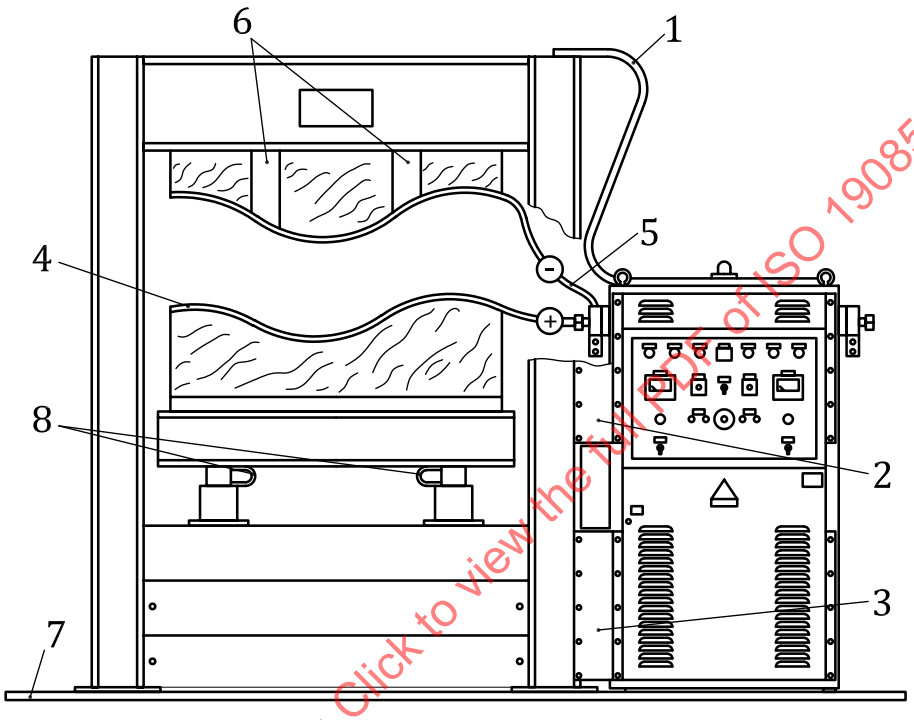
7.4 Electricity

7.4.1 General

ISO 19085-1:2017, 7.4.1, applies with the following additions.

Machines with high-frequency system (including their related high-frequency generator) shall fulfil the following additional requirements:

a) the machine shall be installed on a conductive sheet or plate without any connection to the bonding circuit of the machine (see Figure 22, key 7);



Key

1, 2, 3, 6, 8	conductive straps	5	negative terminal
4	positive terminal	7	conductive sheet

Figure 22 — Example of machine with high-frequency system

b) the moveable platen shall be connected to the frame of the machine with conductive straps minimum 50 mm wide (see Figure 22, key 8);

c) the upper part of the high-frequency generator cabinet shall be connected to the upper part of the machine frame with a conductive strap minimum 700 mm wide (see Figure 22, key 1);

d) the fixed part of the die or fixed platen, in case of edge/face gluing presses, shall be connected to the machine frame using four conductive straps minimum 200 mm wide, two on the front side and two on the rear side (see Figure 22, key 6);

e) the front and the rear of the high-frequency generator cabinet shall be connected to the frame of the machine with two straps minimum 700 mm wide (see Figure 22, keys 2, 3);

f) the fixed and moveable guards according to 6.6.4.2.1 shall be made of a metal grid with maximum pitch of 20 mm (to make a Faraday cage) with a solid transparent plate, e.g. of PMMA (to prevent access with any conductive piece);

g) opening interlocking movable guards shall also disable the high-frequency output. The SRP/CS for interlocking movable guards with high-frequency output shall achieve PL_r=c.

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 additions.

The height of the work-piece support should normally be between 800 mm and 1 100 mm above the floor level. As an exception, for multi daylight presses, this height should normally be between 600 mm and 1 500 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, does not apply.

7.11 Static electricity

ISO 19085-1:2017, 7.11, does not apply.

7.12 Errors of fitting

ISO 19085-1:2017, 7.12, does not apply.

7.13 Isolation

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

On machines where the platen heating system uses a heating fluid provided by an external source on the premises, a lockable isolation valve shall be provided.

7.14 Maintenance

ISO 19085-1:2017, 7.14, applies.

7.15 Extreme temperatures

Subclause specific to this document.

Access to hot surfaces of the heating system shall be prevented by fixed guards of wire mesh or insulating materials, except for the loading and unloading zones, where 8.2.2 b) applies.

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

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) for cold and hot presses provided with intermediate platens, the graphical symbol ISO 7010:2019, W024, shall be placed on the loading and unloading sides of the machine to warn of the residual risk of crushing fingers and hand between intermediate platens and their supports;

b) for all accessible sides of hot platens and other hot surfaces, the graphical symbol ISO 7010:2019, W017, shall be placed nearby to warn of hot surfaces;

c) for machines with high-frequency system, a safety sign indicating the emitted radiation, which shall be selected according to EN 12198-1:2000+A1 where relevant;

d) for machines with a high-frequency system, the graphical symbol ISO 7010:2019, P007, shall be placed on the machine to prohibit people with active implanted cardiac devices from staying near the machine;

e) the graphical symbol ISO 7010:2019, M002, shall be placed at the isolation valve of the external heating fluid to signify that the instruction manual must be read before operating the valve;

f) other product marks, as necessary (for example, the CE mark in the EU).

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

8.3 Instruction handbook

8.3.1 General

ISO 19085-1:2017, 8.3.1, applies with the following additions.

Point o) replaced by: the noise emission declaration shall be made according to E.8.1.

An example of noise emission declaration is given in E.8.2.

8.3.2 Additional information

ISO 19085-1:2017, 8.3.2, is replaced by the following text.

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

a) reasonably foreseeable misuse includes processing materials other than those indicated on the instruction handbook;

b) warning regarding residual risk shall also include:

   1) that the intermediate platens can remain stuck to the top after the lower platen starts its descent;

   2) contact with hot platens;

c) information that the maximum length of the work pieces to be processed shall not exceed the minimum free space at the out-feed end of the machine minus 500 mm;

d) instruction for safe use, which shall also include:

   1) work-pieces to be adequately supported during feeding, e.g. using additional support for long pieces;

   2) shutting down the machine while unattended, except for programmed heating of platens;

e) instruction to block the platens for maintenance beneath them;

f) nature, pressure, temperature of the external heating fluid at the isolation valve.

Annex A
(informative)

Performance level required

This annex replaces ISO 19085-1:2017, Annex A, and gives a quick-view summary of the performance level required (PL_r) for each safety function (see Table A.1). However, for full requirements and detailed explanations, refer to Clauses 5, 6 and 7.

Table A.1 — Safety functions and Performance Level (PL) required

Area		Safety function	PL_r	Subclause of ISO 19085-1:2017	Subclause of this document
Start	1	Control power-on	c		5.3
	2	Prevention of unexpected start/restart	c	5.8	
	3	Selection of the active two-hand control device	c		5.2
	4	Prevention of unexpected enabling of the high-frequency output	c		5.8
	5	Internal electric heating system start/stop	b		5.3
Stop	6	Normal stop	c	5.4.2	
	7	Disabling high-frequency output in the Normal stop condition			5.4.2
	8	Emergency stop	c	5.4.4	
	9	Disabling high-frequency output in the emergency stop condition			5.4.4
Control functions	10	Manual reset	c	5.9	
	11	Machine moving parts speed monitoring	b		5.11
	12	Time delay	c	5.12	
Safeguards	13	Hold-to-run	c	6.5.3	
	14	Two hand control	c	6.5.4	
	15	Interlocking with ESPE	c	6.5.5	
	16	Interlocking with PSPE	c	6.5.6	
	17	Interlocking of movable guards	c	6.5.2.2	
	18	Interlocking of movable guards with high-frequency output	c		7.4.1
Unloading conveyors	19	Interlocking AOPD with automatic conveyor feed	b		6.10
	20	AOPD manual reset	b		6.10
Heating system	21	Interlocking electrical resistor with maximum diathermic oil temperature	b		7.1

Annex B
(normative)

Tests for braking function

ISO 19085-1:2017, Annex B, does not apply.