
**Graphic technology — Safety
requirements for graphic technology
equipment and systems —**

**Part 3:
Binding and finishing equipment and
systems**

*Technologie graphique — Exigences de sécurité pour l'équipement et
les systèmes de technologie graphique —*

Partie 3: Équipement et systèmes de reliure et de finissage



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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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.

ISO 12643-3 was prepared by Technical Committee ISO/TC 130, *Graphic technology*.

This first edition, together with ISO 12643-1, cancels and replaces ISO 12649:2004.

ISO 12643 consists of the following parts, under the general title *Graphic technology — Safety requirements for graphic technology equipment and systems*:

- *Part 1: General requirements*
- *Part 2: Press equipment and systems*
- *Part 3: Binding and finishing equipment and systems*

The following parts are under preparation:

- *Part 4: Converting equipment and systems*
- *Part 5: Stand-alone platen presses*

Introduction

During the development of this part of ISO 12643, existing relevant standards of other countries were taken into consideration. An effort has been made to harmonize the requirements of all countries, recognizing that national standards or laws may dictate national requirements. In cases where it was known that there is a national requirement that differs from this part of ISO 12643, that has been noted.

This part of ISO 12643 was developed to harmonize the following U.S. and European safety standards:

- ANSI B65.2, *Binding and finishing systems*;
- ANSI B65.3, *Safety standard — Guillotine paper cutters, mill trimmers and integral handling equipment*;
- ANSI B65.4, *Safety standard — Three-knife trimmers including rotary, and single- and multiple-knife trimmers*;
- EN 1010-1, *Safety of machinery — Safety requirements for the design and construction of printing and paper converting machines — Part 1: Common requirements*;
- EN 1010-3, *Safety of machinery — Safety requirements for the design and construction of printing and paper converting machines — Part 3: Cutting machines*;
- EN 1010-4, *Safety of machinery — Safety requirements for the design and construction of printing and paper converting machines — Part 4: Bookbinding, paper converting and finishing machines*.

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Graphic technology — Safety requirements for graphic technology equipment and systems —

Part 3: Binding and finishing equipment and systems

1 Scope

This part of ISO 12643 provides requirements specific to binding and finishing equipment and systems. It is intended to be used in conjunction with the general requirements given in ISO 12643-1.

This part of ISO 12643 provides additional safety requirements for the design and construction of new equipment used to convert printed or blank substrates into cut, folded, collated, assembled, bound, or otherwise finished product. It can also be applicable to processes for preparing substrate for the printing process.

It is applicable to a wide range of equipment used in the binding and finishing process.

2 Normative references

The following referenced documents are indispensable for the application 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 12643-1, *Graphic technology — Safety requirements for graphic technology equipment and systems — Part 1: General requirements*

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

ISO 13849-1:1999¹⁾, *Safety of machinery — Safety-related parts of control systems — Part 1: General principles for design*

ISO 13852, *Safety of machinery — Safety distances to prevent danger zones being reached by the upper limbs*

ISO 14119, *Safety of machinery — Interlocking devices associated with guards — Principles for design and selection*

ISO 14120, *Safety of machinery — Guards — General requirements for the design and construction of fixed and movable guards*

ISO 14123-1, *Safety of machinery — Reduction of risks to health from hazardous substances emitted by machinery — Part 1: Principles and specifications for machinery manufacturers*

ISO 14123-2, *Safety of machinery — Reduction of risks to health from hazardous substances emitted by machinery — Part 2: Methodology leading to verification procedures*

EN 1539, *Dryers and ovens in which flammable substances are released — Safety requirements*

¹⁾ ISO 13849-1:1999 has been cancelled and replaced by ISO 13849-1:2006.

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 12643-1, ISO 13849-1:1999 and the following apply.

- 3.1**
anti-repeat device
mechanical or electromechanical mechanism to ensure that only one cutting cycle occurs for each manual activation or automatic cut if the primary stopping system or **single-cycle device (3.32)** fails
- 3.2**
automatic cutting sequence
programmed succession of clamping operations and/or cutting movements that is initiated by the operator and proceeds to a specified point without further intervention by the operator
- 3.3**
back-rounding and pressing machine
apparatus for processing book signatures, i.e. for rounding the spine and the trimmed front edge of book signatures and compressing the resulting signatures
- 3.4**
backgauge
movable device (automatic or manual) on a guillotine cutter, positioned square to the cutting table, and which is used to stop the stack of material to be cut when the material is pushed into the opening under the cutting blade by the operator, and to determine the dimensions of the cut
- 3.5**
backgauge drive
mechanism to position the **backgauge (3.4)** prior to the initiation of the cut
- 3.6**
backlining and head banding machines
equipment for the automatic production of hard cover books where the binding together of the signatures is rounded or flat, with glue, gauze, or paper
- 3.7**
book cover crease forming machine
(hard-cover bookbinding) apparatus for creating, under heat and pressure, a permanent bend in the cover of a hard-cover book, then pressing the entire cover surface
- 3.8**
book press
press used for flattening books after binding
- 3.9**
book signature press
power-operated press used for flattening book signatures, which are fed and aligned manually
- 3.10**
casing-in machine
(hard-cover bookbinding) apparatus for gluing the end papers of the book signatures to the interior surfaces of the book cover
- 3.11**
clamp
device using pressure to secure product so that it does not move during an operation

3.12**clamp drive**

mechanism by which the **clamp(s)** (3.11) of the paper cutter is/are forced against the material to be cut

3.13**coater**

finishing machine that applies a predetermined thickness of a liquid substance (e.g. glue, varnish, ink) on substrates made of paper or a similar material

3.14**counter-stacker**

machine for stacking of piles of leaflets, books, magazines or newspapers such that the successive layers are at 180°

3.15**cutting cycle**

⟨for machines with (a) manually driven **clamp(s)** (3.11)⟩ programmed succession of operations that begins when the knife drive is activated and ends when the knife returns to its retracted position

3.16**cutting cycle**

⟨for machines with (a) power-driven **clamp(s)** (3.11)⟩ programmed succession of operations that begins when high-pressure clamping is initiated and ends when the knife(s) and clamp(s) return to their retracted positions after a single clamp/knife stroke

3.17**cutting zone**

three-dimensional space through which any part of the knife(s) and/or **clamp(s)** (3.11) travel(s) during the entire **cutting cycle** (3.16)

3.18**gang stitcher**

machine for stitching folded sheets of paper, during the operation of which individual folded sheets are removed by feeding grippers and the open sheets are stacked on top of each other on a transport chain for subsequent back stitching

3.19**gathering machine**

apparatus that assembles sheets or folded sheets in a binding line

3.20**guillotine cutter**

power-driven machine having a single knife which is used primarily to cut paper products, stacks of paper, or other substrates as specified by the manufacturer

NOTE This definition includes equipment classified as mill trimmers.

3.21**high-pressure clamping**

operation of **clamps** (3.11) with a dynamic force in excess of 300 N for machines up to and including 1,6 m in width, or 500 N for machines greater than 1,6 m in width, when measured at 75 % of the clamp opening (e.g. with the clamp at 25 % of its maximum travel distance measured from the retracted position)

NOTE The 75 % value is to ensure the measurement is made at the position that approximates the size of an operator's hand.

3.22**inserting machine**

apparatus that inserts printed matter such as leaflets and magazines at a predetermined position in other printed products, such as newspapers or magazines

3.23

knife drive

mechanism by which the knife of the guillotine is forced through the material to be cut

3.24

laminator

paper-finishing machine that applies a solid material (e.g. foil, paper) on a substrate made of paper or a similar material

3.25

low-pressure clamping

⟨for machines with (a) power-driven **clamp(s)** (3.11)⟩ operation of clamps at a dynamic force not exceeding 300 N for machines up to and including 1,6 m in width, or 500 N force dynamic for machines greater than 1,6 m in width, when measured at 75 % of the clamp opening (with the clamp at 25 % of its maximum travel measured from the retracted position)

NOTE The 75 % value is to ensure the measurement is made at the position that approximates the size of an operator's hand.

3.26

manual clamping

operation of **clamps** (3.11) in which the dynamic and static forces and motion of the clamp are directly supplied by the operator

3.27

paper drill

machine used to drill holes into piles of paper

3.28

paper-embossing machine

machine for finishing paper surfaces by using cylinders to press a design, etc., in relief into the paper

3.29

paper-finishing machine

apparatus used for applying liquid or solid coating material on a substrate made of paper or a similar material

3.30

perfect binder

machine for the automatic production of brochures (soft-cover) or book signatures (hard-cover) where gathered folded sheets or single sheets are bound to form book or brochure signatures by applying glue on the pre-processed book back, and where book or brochure signatures are inserted into covers by gluing the cover on the back and/or sides

3.31

sheet-folding machine

apparatus to cut, perforate and/or crease single or multiple folds in single sheets of paper

3.32

single-cycle device

mechanism that ensures that only one cutting cycle occurs for each manual activation or automatic cut

NOTE See **anti-repeat device** (3.1).

3.33

stored energy

potential energy that may be released without actuation of the machine drive or controls

4 Effective date

This part of ISO 12643 applies to new machines manufactured after December 31 of the year following the year of issue of this part of ISO 12643.

5 Guarding of significant hazards

5.1 General

Guarding, consistent with operation of the machine, shall be provided in those areas where it is recognized that operators are exposed to significant hazards. The guarding requirements of ISO 12643-1 shall apply. See Annex A for a list of hazards associated with binding and finishing equipment and systems.

5.2 Safeguarding of crushing and shearing hazards

Automatic travel of movable components shall not create any significant mechanical hazards.

This can be achieved, for example, by limiting the force of the component movement. The following guidelines are suggested:

- a) 50 N or less where the likely contact surface of the guard is a blunt edge or projection and there is no risk of cutting or stabbing injuries; or
- b) 150 N or less where the likely contact surface of the guard is a plane such that there is no risk of a crushing injury.

Higher values can be chosen based upon risk analysis.

5.3 Interlocks

5.3.1 Exception for machine motion at inching speed

If a machine is operating at inching speed and under conditions defined in ISO 12643-1, motion may continue.

5.3.2 Exception for machine motion at production speed

This exception shall apply only to the specific machines identified in this part of ISO 12643, and does not apply to all equipment.

NOTE This exception might not comply with current European standards or the Machinery Directive.

There may be parts of the equipment that cannot be observed or adjusted with the guard closed, and it may be necessary for an authorized person to access this area with an interlocked guard open. Under these circumstances, alternative safety measures shall be taken. All adjustments shall be made from outside the hazardous area.

The following alternative safety measures shall be taken.

- a) A mechanical key lock shall be provided adjacent to the access area. There shall be only one key for this lock. The key for this lock shall be accessible only by an authorized person.
- b) The key lock shall operate as a hold-to-run device as follows:
 - 1) inserting the key shall initiate a timer that has a maximum setting of 2 min;
 - 2) turning the key shall override the guard interlock of only that guard, up to the preset time limit;

- 3) as long as the key is held in the turned position, the guard may be opened with machine motion at production speed until such time as the timer reaches the preset time limit;
 - 4) when the key is released, it shall automatically return to the neutral position and the guard interlock shall be automatically reactivated;
 - 5) if the key remains in the lock for more than 2 min, the interlock on the guard shall be automatically reactivated and the equipment safety system shall stop machine motion.
- c) The bypassing means shall meet the requirements of category 3 of ISO 13849-1:1999.
- d) When adjustments are necessary, they shall be performed from outside the hazardous area.
- e) A warning label identifying the possible existing hazards with the guard open shall be provided adjacent to the lock. The label shall clearly indicate that when the key is in the lock, the adjacent guard is overridden.

If a machine is provided with this alternative safety measure, information regarding its safe use shall be contained in the instruction handbook.

5.4 Guarding of hoppers and hopper feeders

5.4.1 Manually loaded hoppers

On machines using manually loaded hoppers, the hazard points on the separating elements of the hopper feeder shall be safeguarded in accordance with 5.4.4. The exception defined in 5.3.2 may be applied to the hopper feeder, if necessary.

5.4.2 Guarding of automatically fed hoppers

As an alternative to 5.4.1, on automatically fed hoppers where manual intervention during normal operation is not required and the material used makes access difficult, tunnel-type guards arranged with a safety distance of 550 mm from the nearest hazard point are considered adequate.

The exception defined in 5.3.2 may be applied to the hopper feeder, if necessary.

5.4.3 Protection of unused hoppers and hopper feeders

For hoppers that are not used and cannot be stopped, blanking boards shall be provided to safeguard the hazard points at the separating elements.

5.4.4 Separating elements on hopper feeders

Separating elements on feeders shall be so designed that their movement does not create hazard points.

This safeguarding can be accomplished, for example, by maintaining a distance of at least 25 mm or a force limit of 50 N between moving separating elements or between a moving element and a fixed object.

NOTE 1 Where blanks are fed from the bottom of a pile, safeguarding can be accomplished, for example, by residual-pile monitoring of feeders, which complies with category B of ISO 13849-1:1999.

The hazard points on separating elements outside the sidelays on feeders shall be safeguarded for every format size used. For hazard points within sidelays, residual-pile monitoring that complies with category B of ISO 13849-1:1999 shall be used.

NOTE 2 This safeguarding can be achieved, for example, by using accordion-type bellows or additional guards.

5.5 Guarding on binding and finishing machines

5.5.1 Hand-fed riveting, eyeletting and attaching machines

Hazard points between tools on riveting, eyeletting and attaching machines either shall be prevented by design or shall be safeguarded.

NOTE 1 This requirement is satisfied, for example, by

- observing a maximum distance of 4 mm between the tools in the open position; or
- ensuring that the closing force of the movable tool is less than 50 N; a stronger closing force is allowed to become effective only after a sensing device has confirmed that no part of a human body is located between the two tools.

NOTE 2 The sensing device function, for example, can be based on the fact that the work piece and a body part have different electrical resistances or different thicknesses.

Hazard points are safeguarded if guards are provided in accordance with ISO 13852, or the machine can be started only by two-hand control.

For machines that are not guarded by a fixed or movable guard, a work-piece support shall be provided and two-hand controls, in accordance with ISO 12643-1 shall be used. If the work piece needs to be held by hand outside the hazard zone, a hold-to-run control shall be provided for starting the machine instead of the two-hand control.

5.5.2 Hand-fed flat- and saddle-stitching machines

Adjustable guards shall be provided on flat-, saddle- and combined-stitching machines (see Figure 1 and Figure 2) for operational reasons. Instructions that describe the safe adjustment of the guards in a clear and easily understandable format shall be provided on the machine.

This marking requirement is satisfied, for example, by providing labels that illustrate the safety distances required for the various stitching thicknesses by means of sketches and measurements.

On combination stitching machines in the saddle-stitching mode, the guard for the upper tool shall extend to the height of the upper edge of the lower tool (upper edge of the saddle) and shall enclose the upper tool to prevent inadvertent access (see Figure 2).

Guarding may be either by two separate guards or a combined reversible guard. Combined reversible guards shall therefore be suitable for saddle stitching as well as for flat stitching.

5.5.3 Gang stitchers and drum stitchers

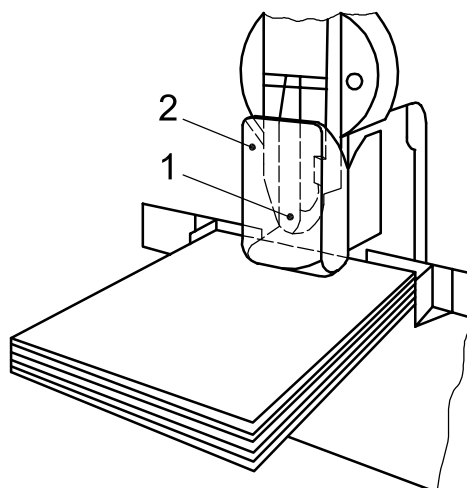
5.5.3.1 Feeders on gang stitchers and drum stitchers

Depending on the design, fixed guards, movable guards, residual pile monitoring or other means of guarding may be used (see Figure 3).

Where the bottom of the feeder on the transport channel side needs to remain open for functional reasons (see Figure 4), the lower edges of the guards on the transport channel side shall be extended as low as technically feasible.

EXAMPLE An example of a functional reason would be for the use of air vortexes.

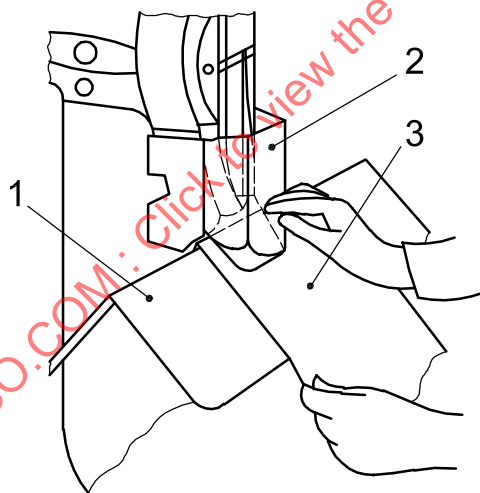
The exception defined in 5.3.2 may be applied to the feeder, if necessary.



Key

- 1 upper tool
- 2 guard

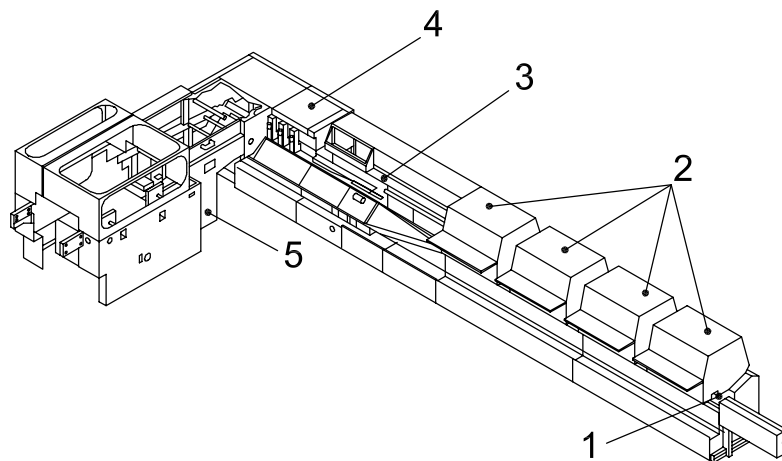
Figure 1 — Flat stitcher



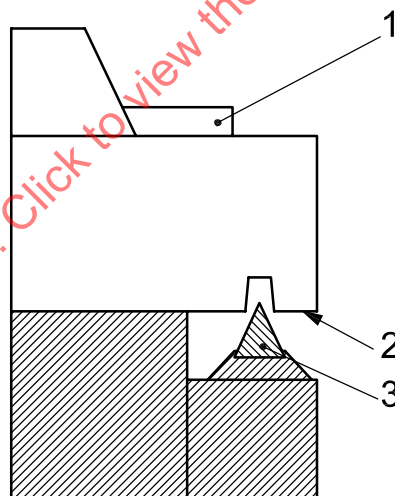
Key

- 1 upper edge of saddle
- 2 guard
- 3 work piece

Figure 2 — Saddle stitcher

**Key**

- 1 transport chain
- 2 feeder
- 3 thickness control
- 4 stitching unit
- 5 trimmer

Figure 3 — Gang stitcher**Key**

- 1 hopper
- 2 bottom of feeder
- 3 transport chain

Figure 4 — Feeder**5.5.3.2 Guarding stitching section of gang stitchers**

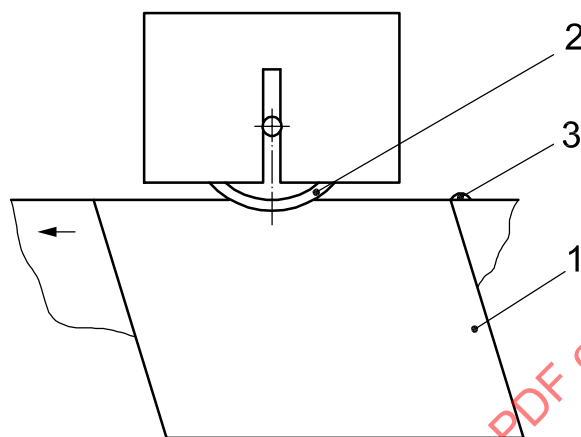
Hazard points on the stitching section shall be safeguarded by interlocked guards on the operator's side. The other side shall be guarded in accordance with ISO 12643-1. Guard apertures shall be in accordance with ISO 13852.

The transport pins shall be made of a flexible material to prevent a shearing hazard against the guard.

5.5.3.3 Caliper roll

Where an in-running nip exists on the caliper roll used for thickness control (see Figure 5), one of the following means of protection shall be used:

- maximum clamping force of 50 N with roller deflection at 20 mm; or
- guarding in accordance with ISO 12643-1.



Key

- 1 folded sheets
- 2 in-running nip of calliper roll
- 3 transport chain

Figure 5 — Caliper roll for thickness control

Hazard points on the caliper section shall be safeguarded by interlocked guards on the operator's side. The other side shall be guarded in accordance with ISO 12643-1. Guard apertures shall be in accordance with ISO 13852.

The transport pins shall be made of a flexible material to prevent a shearing hazard against the guard.

5.5.3.4 Transport-chain grippers on gang stitchers

A safety distance of at least 25 mm is required between transport-chain grippers and fixed machine parts.

5.5.3.5 Starting gang stitchers and drum stitchers with a guard open

Gang stitchers and drum stitchers may be started for make-ready by means of a two-hand control with interlocking guards in the open position and at a speed greater than 10 m/min, provided that the requirements of the exception in ISO 12643-1 are met.

5.5.3.6 Trimmer on gang stitchers and drum stitchers

The trimmer on gang stitchers and drum stitchers shall be safeguarded in accordance with 5.11.

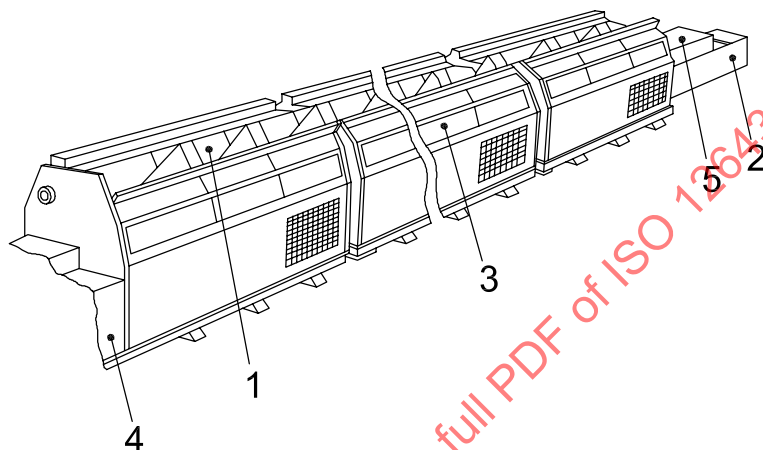
5.5.4 Gathering machines

Gathering machines shall be guarded in accordance with 5.5.4.1 through 5.5.4.2. The exception defined in 5.3.2 may be applied, if necessary.

5.5.4.1 Guarding transport chains

For safeguarding the hazard points on the manual feeding unit, a minimum distance of 25 mm is required between the transport chain and fixed machine parts. Where the minimum distance cannot be achieved and maintained, trip bars meeting the requirements of ISO 12643-1 may be used for safeguarding. Hazard points that can be reached from the manual feeding section in the following feeder shall be safeguarded by fixed or interlocking tunnel-type guards having a minimum length of 300 mm (see Figure 6).

Hazard points on the gathering device (transport device) shall be safeguarded by fixed or interlocking guards.



Key

- 1 hopper
- 2 manual feeding
- 3 gathering device (transport device)
- 4 following machines
- 5 tunnel guard

Figure 6 — Gathering machine (plan view)

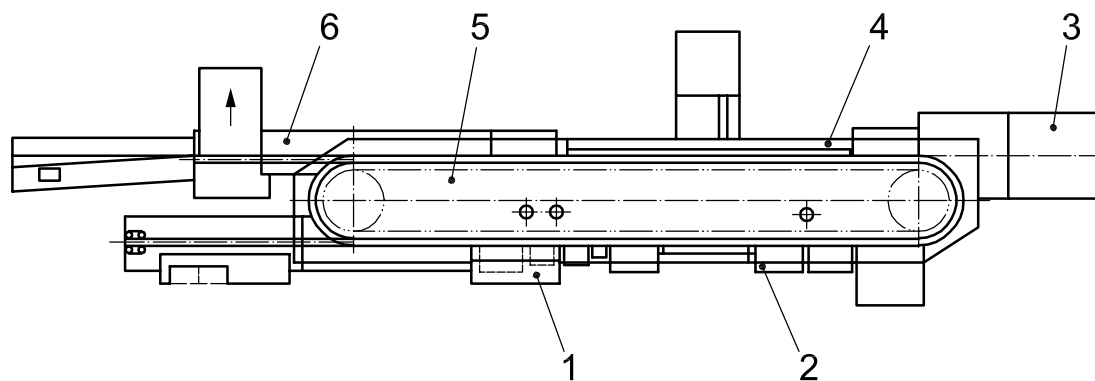
5.5.4.2 Starting gathering machines with a guard open

Gathering machines may be started for make-ready by means of a two-hand control with interlocking guards in the open position and at a speed greater than 10 m/min, provided that the requirements of the exception in ISO 12643-1 are met.

5.5.5 Perfect binders

5.5.5.1 Guarding book carriage hazards

The hazard points existing between book carriages and between the book carriage and the machine frame, as well as during cover pressing, shall be guarded in accordance with ISO 12643-1. Depending upon the design, fixed guards, movable guards or other means of guarding may be used (see Figure 7).

**Key**

- | | |
|----------------|------------------|
| 1 milling unit | 4 pressing unit |
| 2 gluing unit | 5 book carriages |
| 3 cover feeder | 6 delivery |

Figure 7 — Perfect binder (plan view)**5.5.5.2 Hazards in the gluing unit**

The hazard points existing in the gluing unit (glue rollers, glue applicators) and the hazard points that may exist between materials and machine parts (book backs and clamps, book backs and glue rollers, etc.) shall be guarded in accordance with ISO 12643-1. Depending upon the design, fixed guards, movable guards, or other means of guarding may be used.

Guarding in accordance with ISO 12643-1 shall be provided to protect personnel from hot glue spray, both during production and when routinely accessing other nearby areas. The guards adjacent to the hot glue mechanism shall be interlocked so that the hot-glue spray mechanism is deactivated when the guard is open.

5.5.5.3 Glue pans

The glue pans for hotmelt shall be provided with a temperature control and maximum-temperature monitoring in accordance with category 1 of ISO 13849-1:1999. Any hazardous hotmelt vapour shall be exhausted both from the perfect binder and from outside the machine for pre-melters, unless protection from exposure to the vapour is provided by other means.

Perfect binders using polyurethane hotmelt glues for binding shall be designed such that the machine does not emit hazardous concentrations of isocyanates, or they are removed by an exhaust system. The requirements of ISO 14123-1 and ISO 14123-2 shall be met.

Contact with hot surfaces of the hotmelt pan shall be prevented by guarding or by insulation.

5.5.5.4 UV radiation dryers

Where radiation UV dryers are used, the maximum values of emitted radiation shall comply with ISO 12643-1.

Where the machine operates with an automatic feed and routine and regular manual intervention is not required, tunnel-type guards with a safety distance of 550 mm from the nearest hazard point are considered adequate.

5.5.5.5 Delivery area

It shall be ensured that the book-carriage (clamp) hazards of the delivery of the perfect binder cannot be accessed. The safety distance shall be a minimum of 550 mm.

5.5.5.6 Starting perfect binders with a guard open

Perfect binders may be started for make-ready by means of a two-hand control with interlocking guards in the open position and at a speed greater than 10 m/min, provided the requirements of the exception in ISO 12643-1 are met.

Where functional circumstances require the cover to be fed manually during set-up of the perfect binder, the machine may be started when the interlocking guards are in the open position with a hold-to-run control and a maximum speed of 10 m/min.

5.5.5.7 Milling head cutter (saw)

On high-speed binding lines, where inertia may prevent effective stopping of the milling head cutter when the interlocking guard covering the book carriages (clamps) is opened, exposure to hazards caused by motion of the saw shall be limited by preventing access to the hazardous area until motion has stopped.

5.5.5.8 Additional requirements for hand-fed perfect binders

Where there is a risk of injury if the operator's hand goes beyond the book clamp loading area, there shall be a sensing device that will stop machine motion before injury occurs.

The cover-scoring blades shall be guarded with fixed or interlocking guards.

The milling-head cutter shall be protected against unintended access by the use of self-adjusting plates that open to allow a book block to pass over the saw, then automatically close.

5.5.6 Paper drills

5.5.6.1 Single-head hand-fed paper drills

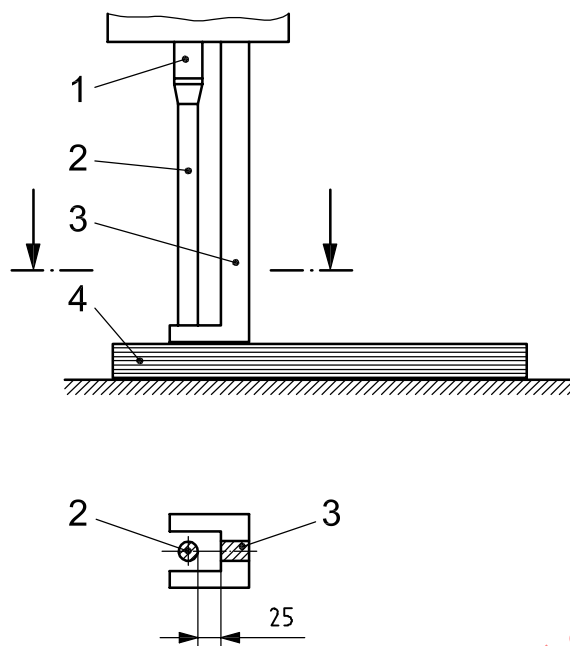
On single-head paper drills with manual feeding, the stroke of the drill or work piece shall be under hold-to-run control (hand-controlled or foot-controlled) or hand-operated. In addition, a hold-down device (see Figure 8 and Figure 9) shall be provided on the drill in order to prevent persons from coming into unintentional contact with the drill from the front. When the hold-to-run control is released, the drill or work piece shall retreat to its start position.

The distance between the hold-down device and the chuck jaw shall be at least 25 mm (see Figure 8).

5.5.6.2 Guarding the trapping hazard on multi-head drilling machines

On multi-head drilling machines, the trapping hazard existing on drills and chuck jaws shall be safeguarded by a fixed or interlocking guard (cover). On multi-drill machines, hazard points on the chuck jaws shall be protected by the use of fixed or interlocking guards (see Figure 8 and Figure 9). The distance between the hold-down device or guard (cover) and the chuck jaw shall be at least 25 mm.

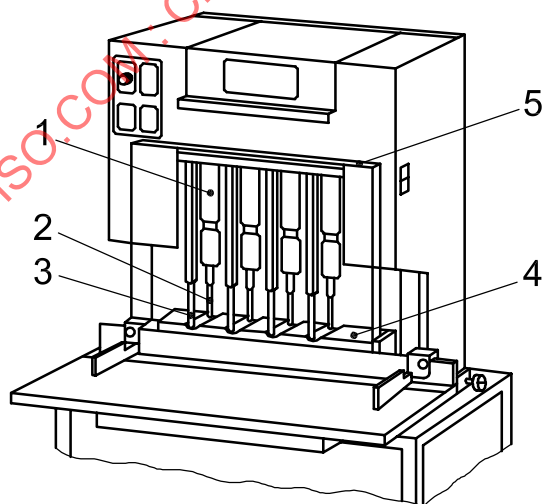
Dimensions in millimetres



Key

- 1 chuck jaws
- 2 drill
- 3 hold-down device
- 4 material

Figure 8 — Paper drill



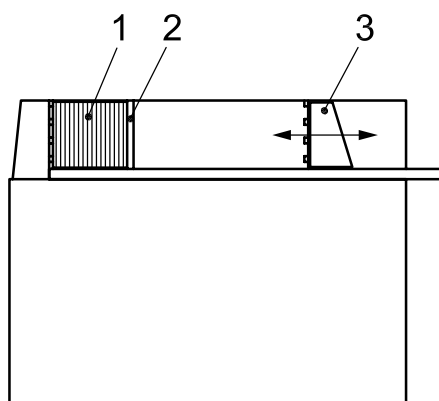
Key

- 1 chuck jaws
- 2 drill
- 3 hold-down device
- 4 material
- 5 guard (cover)

Figure 9 — Multi-head paper drill

5.5.7 Book-signature presses

On book signature presses, the hazard point between the moving pressing plate and the intermediate plate positioned against the material supply shall be safeguarded by using a hold-to-run control (see Figure 10).



Key

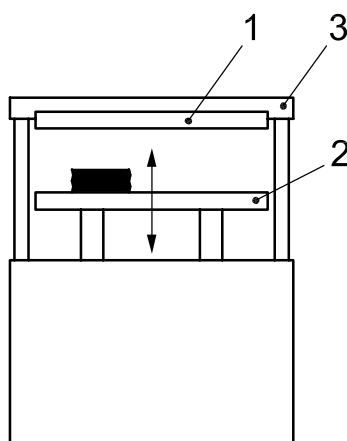
- 1 book signatures
- 2 intermediate plate
- 3 pressing plate

Figure 10 — Book signature press

5.5.8 Book press

The hazard points between the movable pressing plate and the fixed pressing plate or the forming bar, if any, shall be safeguarded. One means of safeguarding this area is by use of a trip device in accordance with ISO 12643-1 (see Figure 11).

NOTE This device is used to press air out of the signature.



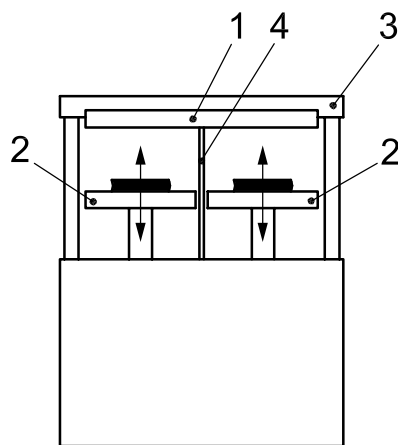
Key

- 1 trip device
- 2 movable pressing plate
- 3 fixed pressing plate

Figure 11 — Book press

On book presses where several pressing plates can be moved individually, the hazard points between the movable pressing plates shall be safeguarded. One means of safeguarding this area is by fitting a guard between the pressing plates (see Figure 12).

If the hazard is safeguarded by fitting a guard between the pressing plates, clearance between the guard and moving pressing plates shall not exceed 6 mm (see Figure 12).



Key

- | | | | |
|---|------------------------|---|----------------------|
| 1 | trip device | 3 | fixed pressing plate |
| 2 | movable pressing plate | 4 | guard |

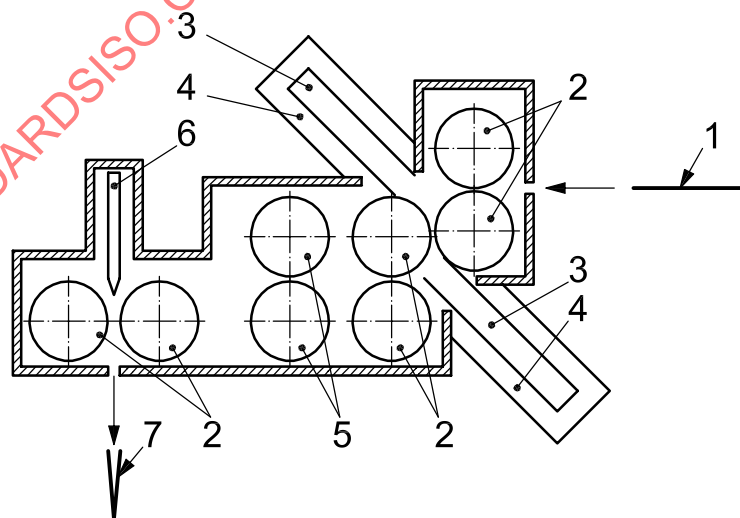
Figure 12 — Book press with two movable pressing plates

5.5.9 Sheet-folding machines

5.5.9.1 Guarding hazard points at the folding rollers

The hazard points at the folding rollers shall be protected by fixed or interlocking guards. Adjustments should be made from outside the guards. Safeguarding may also be accomplished by using a device with a guarding function (see Figure 13).

NOTE An example of a safeguarding device is a buckle plate, as shown in Figure 13.



Key

- | | | | | | | | |
|---|----------------|---|-----------------|---|--------------------------|---|--------------|
| 1 | unfolded sheet | 3 | buckle plate | 5 | cutting, creasing device | 7 | folded sheet |
| 2 | folding roller | 4 | sound enclosure | 6 | folding knife | | |

Figure 13 — Sheet-folding machine

5.5.9.2 Hazard points on cutting, creasing and perforating devices

Hazard points on the cutting, creasing and perforating devices shall be guarded in accordance with ISO 12643-1. Fixed guards, movable guards, or other means of guarding may be used, depending on the design.

5.5.9.3 Safeguarding crushing points between folding knives and folding rollers

The crushing points between folding knives and folding rollers shall be guarded in accordance with ISO 12643-1. Fixed guards, movable guards, or other means of guarding may be used, depending on the design.

5.5.9.4 Safeguarding in-running nips on feeding and delivery belts

In-running nips on the feeding and delivery belts shall be guarded in accordance with ISO 12643-1. Fixed guards, movable guards, or other means of guarding may be used, depending on the design (see ISO 12643-1).

5.5.9.5 Machine motion with a guard open

When interlocked guards are in the open position, the machine may be operated by two-hand control at production speed provided that the requirements of ISO 12643-1 are met, with the further exception that a selector switch is not required.

NOTE The selector switch is not necessary because a sheet-folding machine is operated in a single mode by one person.

5.5.10 Book-production lines for the production of hard-cover books

5.5.10.1 General

Book production lines may be started for make-ready with interlocking guards in the open position by means of a two-hand control and at a speed no greater than 20 m/min, provided that the requirements of the exception in ISO 12643-1 are met.

NOTE Hold-to-run control speeds in production lines differ due to cycle variations so that a continuous machine speed can result in individual elements having higher speeds at the various stages of the process.

5.5.10.2 Safeguarding in-running nips on conveyor belts

The in-running nips on the belts of a feeding and delivery conveyor shall be guarded in accordance with ISO 12643-1. Fixed guards, movable guards, or other means of guarding may be used, depending on the design. Access from the conveyor belts to any hazard point in the machine shall be prevented (see ISO 12643-1).

5.5.10.3 Safeguarding hazard points on preheater

The hazard points on the preheater device shall be guarded in accordance with ISO 12643-1. Fixed guards, movable guards, or other means of guarding may be used, depending upon the design.

EXAMPLE Hazard points might be created by preheating rollers, hot parts and transport mechanisms.

Where the preheater is accessible, a pictogram warning of hot parts shall be posted in the vicinity of the preheater.

With the guards in the open position, the preheater shall operate only under hold-to-run control that meets the requirements of ISO 12643-1.

5.5.10.4 Safeguarding hazard points in glue sections

The hazard points in the glue sections shall be protected by fixed or interlocking guards. Safe glue replenishment should be possible during the production run.

Where hotmelt is used, the hotmelt pans shall be provided with temperature control and limit temperature monitoring.

EXAMPLE 1 Hazard points might exist, for example, at in-running nips between glue rollers and at in-running nips between book signatures and glue rollers.

EXAMPLE 2 Safe glue replenishment might be provided, for example, by a piping system or by a method of replenishment from outside the safety devices.

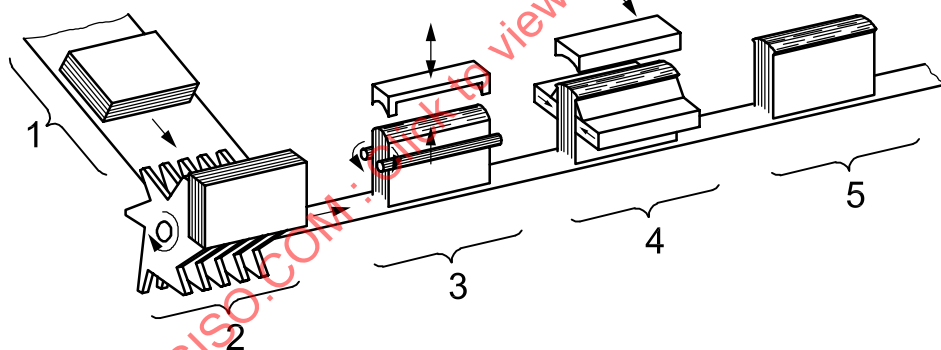
5.5.11 Back-rounding and pressing machines

5.5.11.1 Safeguarding in-running nips on feed and delivery belts

In-running nips on the feed and delivery belts shall be safeguarded (see ISO 12643-1). Access from the conveyor belt to any hazard point inside the machine shall be prevented. A safety distance of 550 mm is recommended.

5.5.11.2 Safeguarding hazard points on tipping section

Hazard points in the tipping section (see Figure 14) shall be protected by fixed or interlocking guards.



Key

- 1 feeding of book signatures
- 2 tipping of book signatures
- 3 pre-forming section
- 4 back-rounding and pressing section
- 5 delivery

Figure 14 — Back-rounding and pressing section (principle)

5.5.11.3 Safeguarding hazard points on pre-forming, back-rounding and pressing sections

Hazard points in the pre-forming, back-rounding and pressing sections (see Figure 14) shall be protected by fixed or interlocking guards.

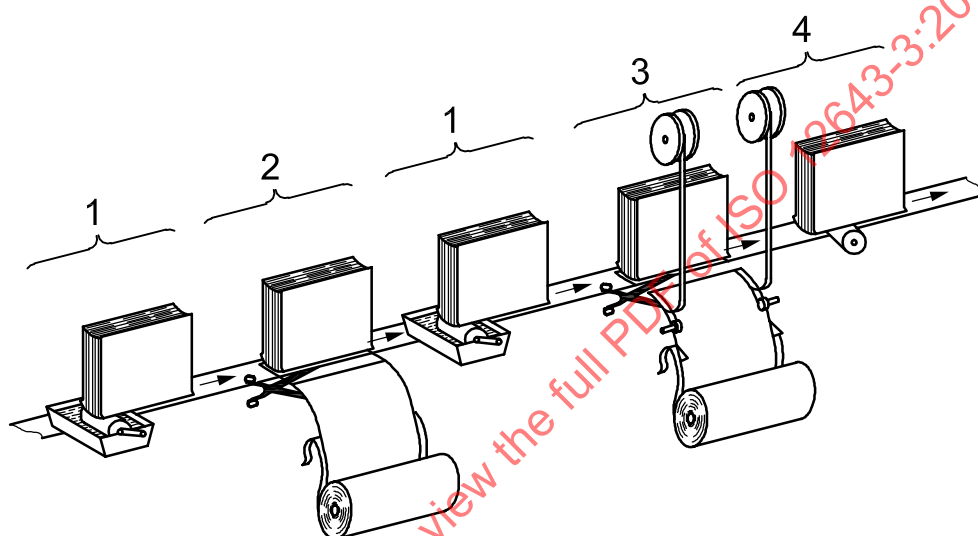
5.5.12 Backlining and head banding machines

5.5.12.1 Safeguarding in-running nips

Where book signatures are transported between vertically mounted conveyor belts, the in-running nip between the two conveyor belts on the feeding side shall be safeguarded by a tunnel-type guard at least 550 mm long.

5.5.12.2 Safeguarding hazard points on glue section

In the glue section (see Figure 15), hazard points (e.g. glue rollers) shall be protected by guards.



Key

- 1 glue section
- 2 gauzing section
- 3 head-banding section
- 4 counter-pressure section

Figure 15 — Backlining and head banding machine (principle)

5.5.12.3 Safeguarding gauze section hazards

The cutting point at the gauze-cutting knife (see Figure 15) shall be protected by fixed guards. The in-running nips on the rollers of the gauze section (unwinding) shall be safeguarded in accordance with ISO 12643-1.

5.5.12.4 Safeguarding head-banding section hazards

The hazard points inside the head-banding section (see Figure 15) and the cutting points at the cutting knives and at the rotary knives on the unwinding unit of the head banding section shall be protected by fixed or interlocking guards.

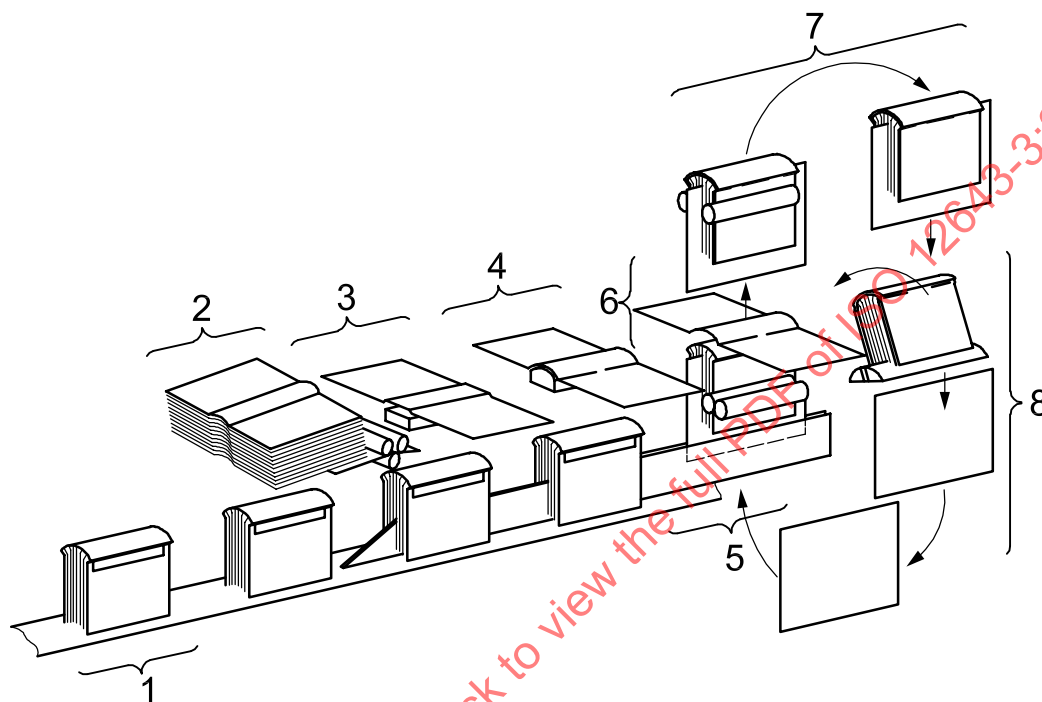
5.5.12.5 Safeguarding counter-pressure section hazards

The hazard points at the counter-pressure sections (see Figure 15) shall be protected by fixed or interlocking guards.

5.5.13 Casing-in (case binding) machines

5.5.13.1 Safeguarding hazard points between book transport and fixed machine parts

The hazard points between book-transport fingers and fixed parts of the machine shall be guarded in accordance with ISO 12643-1. Fixed guards, movable guards, or other means of guarding may be used, depending upon the design (see Figure 16). A tunnel-type guard 550 mm long is considered an adequate guard for the book-signature feed point.



Key

- | | |
|-------------------------|----------------------------|
| 1 feeding | 5 gluing section |
| 2 book cover feeder | 6 casing-in section |
| 3 cover bending section | 7 counter-pressure section |
| 4 forming section | 8 delivery |

Figure 16 — Casing-in machine (principle)

5.5.13.2 Safeguarding hazard points at delivery

The hazard points (e.g. crushing points at the transport device) at the delivery (see Figure 16) shall be guarded in accordance with ISO 12643-1. Fixed guards, movable guards, or other means of guarding may be used depending on the design. Hazard points inside the machine shall not be accessible from the delivery side. A safety distance of 550 mm is considered adequate.

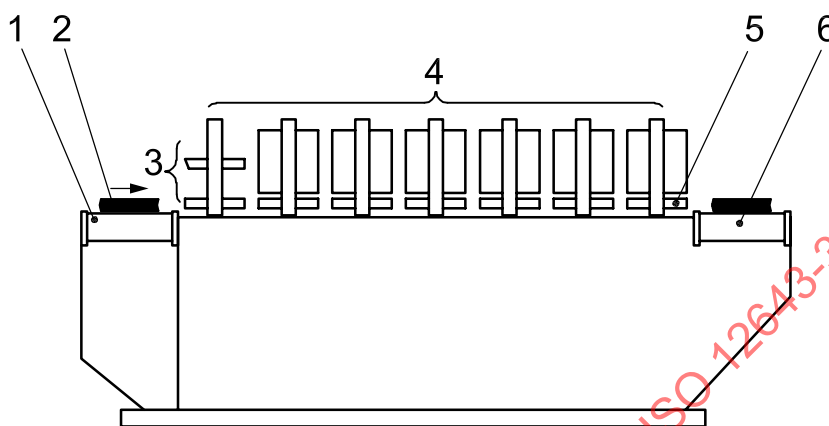
5.5.14 Book-cover crease-forming machines (presses)

5.5.14.1 Safeguarding in-running nips

In-running nips on the feed and delivery belts shall be guarded in accordance with ISO 12643-1. Fixed guards, movable guards, or other means of guarding may be used, depending on the design. It shall not be possible for a person to reach a hazard point inside the machine from the delivery. A safety distance of 550 mm is considered adequate.

5.5.14.2 Safeguarding hazard points in tipping section

The hazard points (e.g. crushing points created by the tipping and transport device) in the tipping section (see Figure 17) shall be guarded in accordance with ISO 12643-1. Fixed guards, movable guards, or other means of guarding may be used, depending upon the design.



Key

- | | |
|-------------------|-----------------------|
| 1 feeding belt | 4 pressing section |
| 2 book signature | 5 crease-forming rail |
| 3 tipping section | 6 delivery belt |

Figure 17 — Book-cover crease-forming machine (press)

5.5.14.3 Safeguarding hazard points at pressing section

The crushing points at the pressing section (e.g. between books and crease-forming devices) shall be guarded in accordance with ISO 12643-1. Fixed guards, movable guards, or other means of guarding may be used, depending upon the design (see Figure 17). Pictograms warning of hot parts shall be posted in the vicinity of accessible heated book-cover crease-forming devices.

5.5.14.4 Motion with a guard open

Book-cover crease-forming machines may be started for make-ready by means of a two-hand control with interlocking guards in the open position and at a speed greater than 10 m/min but no more than 20 m/min, provided the requirements of the exception in ISO 12643-1 are met. A hold-to-run speed greater than 10 m/min may be needed to ensure that the book in the machine does not burn during the glue melting process.

5.6 Inserting and collating machines

Machines with automatic feeders may be started for make-ready by means of a two-hand control with interlocking guards in the open position and at a speed greater than 10 m/min, provided the requirements of ISO 12643-1 are met.

5.7 Counter-stackers

5.7.1 Safeguarding divert gates (waste separator)

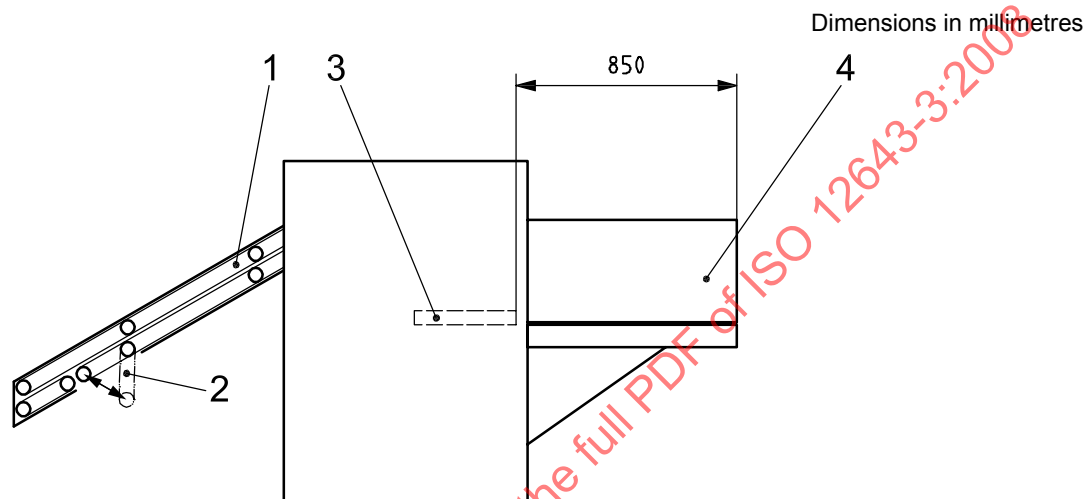
The crushing point on the divert gate shall be safeguarded (see Figure 18).

Note This safeguarding can be achieved, for example, by limiting the closing force (see 5.2).

5.7.2 Safeguarding hazard points at turntable

The hazard points at the turntable shall be guarded in accordance with ISO 12643-1. Fixed guards, movable guards, or other means of safeguarding may be used, depending upon the design. Safety distances shall comply with ISO 13852. At least one side of the turntable shall be protected by an interlocking guard in order to allow access for the removal of jams.

On the side where the stacked material is delivered, access to the turntable shall be prevented by a fixed or interlocked tunnel-type guard, or other means of safeguarding. If a fixed or interlocked tunnel-type guard is used, the safety distance to the hazard point shall be at least 850 mm (see Figure 18).



Key

- 1 feeding belt
- 2 divert gate
- 3 turntable
- 4 delivery tunnel with delivery belt

Figure 18 — Counter-stacker

5.7.3 Pneumatic system

When an interlocking guard is opened or the emergency stop device is activated, the pneumatic system of the counter-stacker, including any accumulators, shall be depressurized in order to prevent inadvertent hazardous movement of the counter-stacker.

5.8 Paper-embossing machines

5.8.1 Safeguarding in-running nips on guide rollers

The in-running nips between guide rollers and between guide rollers and fixed machine parts shall be safeguarded by providing a minimum separation of 120 mm, or by fixed or interlocking guards.

5.8.2 Stretch rollers and counter rollers

Stretch rollers and counter rollers shall have a minimum separation of 120 mm (clearance between the two rollers).

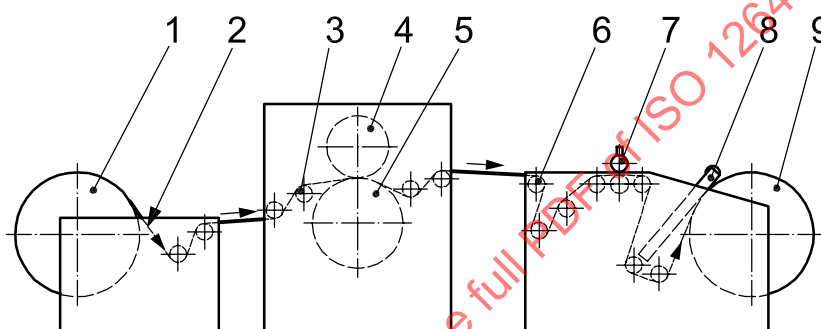
5.8.3 Safeguarding movement of counter-roller

The movement of the counter roller when travelling into and out of position shall be safeguarded.

If speed limitation is used as the safeguard, movement of the counter roller shall be limited to 5 m/min under hold-to-run, or to a non-hazardous speed of less than 0,5 m/min. An emergency stop button shall be available in the vicinity.

5.8.4 Warning of heated parts

Where embossing rollers are heated (see Figure 19), a pictogram shall be posted or near the machine warning the operator of hot machine parts. Hot pipes shall have adequate insulation up to a height of 2,7 m above the operator platform. In the case where the operator is standing on the floor, rather than on a raised platform, the floor is considered to be the "platform" for this requirement.



Key

1 unwinding unit	4 embossing roller	7 cutting unit
2 paper web	5 counter roller	8 drive roller
3 stretch roller	6 guide rollers	9 rewinding unit

Figure 19 — Paper-embossing machine

5.9 Finishing machines

5.9.1 Coaters

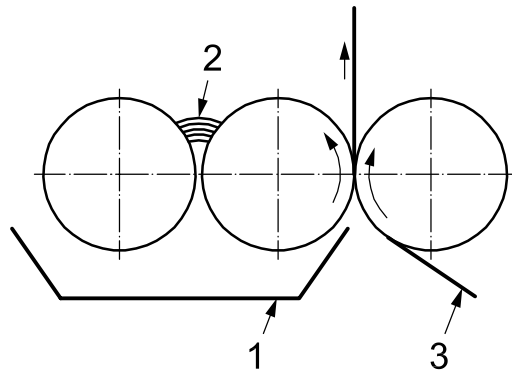
5.9.1.1 Safeguarding reel-unwinding and reel-rewinding units

Reel-unwinding and reel-rewinding units shall be safeguarded in accordance with ISO 12643-1.

5.9.1.2 Safeguarding in-running nips

The in-running nip between guide rollers and between guide rollers and fixed machine parts shall be safeguarded by providing a minimum separation of 120 mm, or by fixed or interlocking guards.

The in-running nip on the dosing gap shall be guarded (see Figure 20).



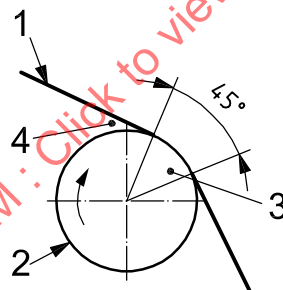
Key

- 1 collecting pan
- 2 dosing gap
- 3 material web

Figure 20 — Dosing gap

The in-running nips in the coating unit between coating roller and cooling roller/coating roller shall be protected by fixed or interlocking guards.

The in-running nips between the coated, tear-resistant material web and guide rollers that can be accessed in the machine from passageways and that have a wrapping angle of 45° or more shall be protected by fixed guards (see Figure 21).

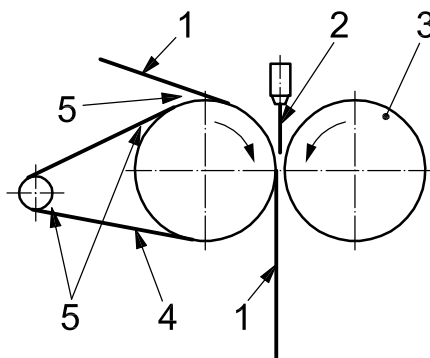


Key

- 1 coated web
- 2 guide roller
- 3 wrapping angle
- 4 in-running nip

Figure 21 — Wrapping angle on guide rollers

The in-running nips on the PTFE belt shall be safeguarded (see Figure 22).

**Key**

- 1 material web
- 2 polyethylene (PE)
- 3 cooling roller
- 4 polytetrafluoroethylene (PTFE) belt
- 5 nip point

Figure 22 — Coating with polyethylene**5.9.1.3 Safeguarding hot material and surfaces**

Contact with hot melt material used for coating shall be prevented by fixed guards.

5.9.1.4 Exhaust equipment

Where coatings that emit hazardous vapours are being used, the machine shall be equipped with exhaust equipment at the point of application.

NOTE Because the requirements for exhaust equipment vary with the substances used, it is not possible to specify technical requirements in this part of ISO 12643.

5.9.1.5 Safeguarding movement of rollers

The traversing movement of the coating rollers or coating roller and cooling roller shall be safeguarded. This safeguarding can be achieved, for example, by operating at a speed of 5 m/min under hold-to-run control, or by the use of interlocking guards.

5.9.1.6 Explosion prevention

For a list of explosion zones for electrical apparatus, see Annex B.

5.9.1.7 Continuous-flow dryers on coating devices**5.9.1.7.1 Flammable substances**

Where coating material that may emit flammable substances is being used during the drying process, the requirements of EN 1539 shall apply.

NOTE National requirements can supersede the use of EN 1539. For example, in the United States, NFPA 86^[8] applies.

5.9.1.7.2 Safeguarding hazard points on dryers

The hazard points when closing the upper and the lower part of the dryer shall be safeguarded. This safeguarding can be achieved, for example, by hold-to-run control.

The automatic closing movement of the dryer shall be safeguarded. Automatic closing shall be possible only for the last 300 mm of the aperture.

NOTE Examples of safeguarding methods include the use of trip bars, light curtains, etc.

5.9.1.7.3 Prevention of ignition of web material

Ignition of the material web when passing through the continuous flow dryer shall be prevented. This can be achieved in case of a stoppage of the machine or the coating unit, for example, by adequately reducing the performance of the continuous flow dryer and maintaining the material web at an adequate distance from the source of radiation by an air wiper.

5.9.1.7.4 Surface temperature of accessible parts

The surface temperature of parts, which are accessible from the outside, shall not exceed the maximum values in accordance with ISO 13732-1.

5.9.1.7.5 Safety check valves

Where hydraulic or pneumatic cylinders are provided for opening the dryer, overridable safety rated check valves shall be fitted to the lifting cylinders.

5.9.1.7.6 Protection from falling shut

To prevent the dryer from falling shut during inspection operations, mechanical devices shall be provided to secure the dryer open.

NOTE For example, the dryer can be prevented from falling shut by means of struts which are inserted during inspection.

5.9.2 Laminators

5.9.2.1 Reel-unwinding and reel-rewinding units

Reel-unwinding and reel-rewinding units shall be safeguarded in accordance ISO 12643-1.

5.9.2.2 Safeguarding in-running nips

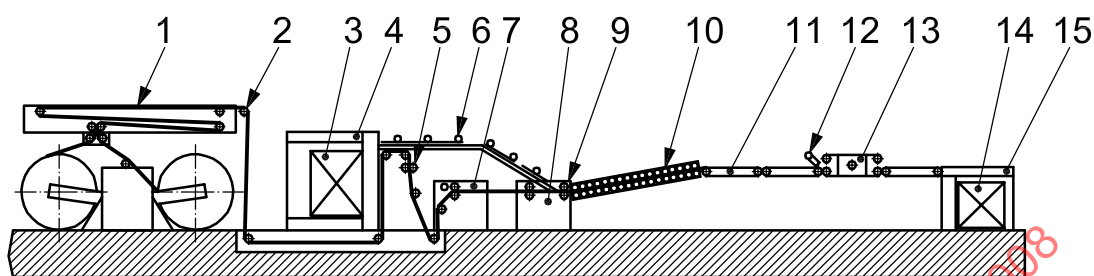
The in-running nips between guide rollers and between guide rollers and fixed machine parts shall be safeguarded. This safeguarding can be achieved, for example, by providing a minimum distance of 120 mm or by fixed or interlocking guards.

The in-running nips between the foil-laminated tear-resistant web and guide rollers that can be accessed in the machine from passageways and that have a wrapping angle of 45° or more (see Figure 21) shall be protected by fixed or interlocking guards.

The in-running nip on the laminating rollers shall be protected by fixed or interlocking guards. Where the thickness of the laminated material is 18 mm or more, the opening width shall be a maximum of 30 mm and the distance from the guard opening to the nip shall be a minimum of 200 mm.

The in-running nips on the rolls that feed sheets (see Figure 23) shall be safeguarded. This safeguarding can be achieved, for example, by ensuring that the rolls have a displacement of at least 25 mm or roller contact is by their own mass.

In-running nips on the glue rollers (see Figure 23) and on the dosing gap (see Figure 20) shall be protected by interlocking guards.



Key

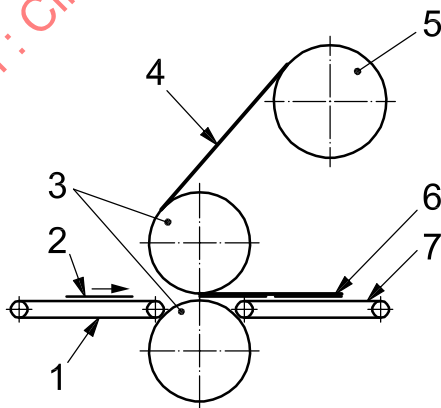
1 unwinding unit	6 transport rolls	11 transport belt
2 guide roller	7 glue unit	12 package stop
3 stack in feeder	8 sheeter	13 turning belt
4 feeder	9 laminating rollers	14 stack in delivery
5 rotary knife	10 pressing belt	15 delivery

Figure 23 — Web-fed laminator for sheet material

5.9.2.3 Safeguarding traversing movement of laminating rollers

During make-ready and cleaning, the traversing movement of the laminating rollers (see Figure 24) shall be safeguarded.

NOTE This safeguarding can be achieved, for example, by a speed of 5 m/min or less under hold-to-run control or interlocking guards.



Key

1 feeding belt	5 unwinding unit
2 substrate (single sheets)	6 laminated single sheets
3 laminating roller	7 delivery belt
4 foil web	

Figure 24 — Foil laminator

5.9.2.4 Safeguarding opening and closing movement of laminating rollers

The opening and closing movement of the laminating rollers shall be safeguarded where the travel path is more than 6 mm.

NOTE This safeguarding can be achieved, for example, by providing hold-to-run control at a speed of 5 m/min or less, or by using interlocking guards.

5.9.2.5 Safeguarding heated lamination rollers

Where hot foil is used for lamination, guards shall be used to prevent contact of personnel with the heated lamination rollers.

5.9.2.6 Safeguarding cutting devices

Cutting devices, including rotary knives (see Figure 23), shall be safeguarded by the use of interlocking guards in accordance with the requirements of ISO 12643-1 for guarding rotary tools.

5.9.2.7 Safeguarding feeders and delivery in laminators

The feeder and delivery for the laminating material shall be safeguarded in accordance with the requirements of ISO 12643-1 for guarding feeding units and delivery units.

5.9.2.8 Sheeters on laminating machines

5.9.2.8.1 Safeguarding in-running nips

The in-running nip between pressing rollers or guide rollers and a pressing belt (see Figure 23) shall be safeguarded.

NOTE This safeguarding can be achieved, for example, by fixed guards or by ensuring that the pressure rollers are held in position by their own mass and have a displacement of at least 120 mm.

On pressing belts, the in-running nip between the upper and the lower pressing belt on the infeed point shall be safeguarded.

One of the following measures is considered to be adequate:

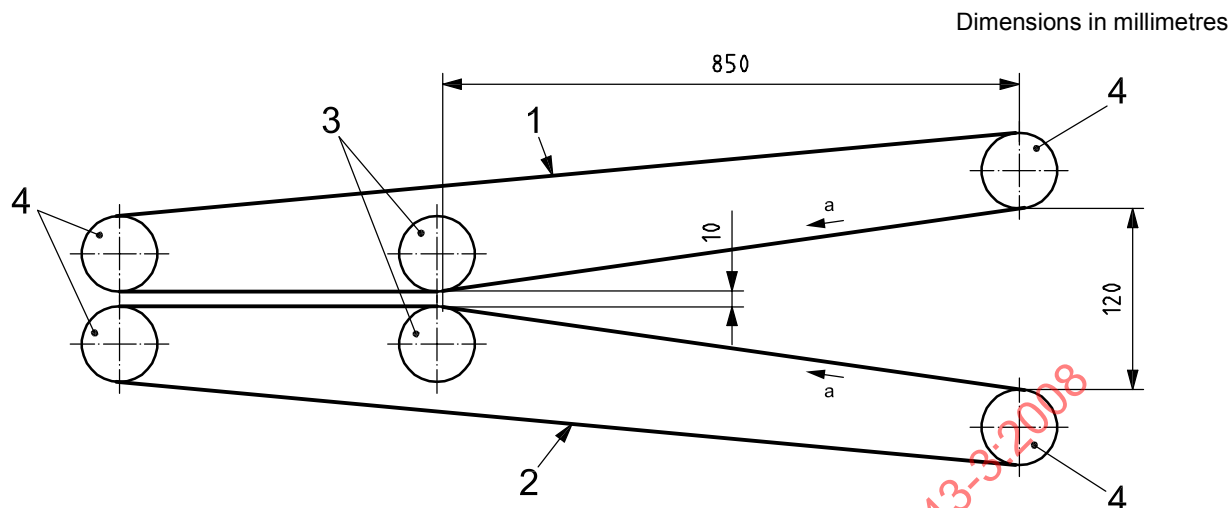
- a) guards;
- b) where the pressure belt entrance opening is 120 mm, the safety distance shall be 850 mm, measured from the point of entrance of the pressing belt up to the point at which there is a distance of 10 mm between the upper and the lower pressing belt (see Figure 25) and safeguarding access from the sides;
- c) where the pressure belt entrance opening is 120 mm and the 850 mm safety distance cannot be met, limiting the force of the pressure rollers to 200 N and safeguarding access from the sides.

5.9.2.8.2 Safeguarding crushing points

The crushing point between transport belt and package stop (see Figure 23) shall be safeguarded by fixed or interlocking guards if the maximum clamping force when closing is more than 150 N.

5.9.2.8.3 Safeguarding shearing points

Shearing points between the turning belt and the transport belts, ahead of and behind the turning belt, shall be safeguarded (see Figure 23).

**Key**

- 1 upper pressing belt
- 2 lower pressing belt
- 3 pressure rollers
- 4 guide rollers
- a Direction of belt.

Figure 25 — Pressing belt**5.9.2.8.4 Explosion prevention and protection**

Explosion prevention and protection shall be as specified in ISO 12643-1.

5.9.2.9 Rotary tools on laminators

Rotary tools on laminators shall be safeguarded in accordance with the requirements of ISO 12643-1.

5.10 Guillotine cutters**5.10.1 Knife cycles**

All knife drives and controls shall incorporate a single-cycle device. Any programmable sequence of knife and clamp motions shall be operator-initiated and shall be interlocked to safety devices. Actuation of a stop control shall override the programmed sequence and halt the hazardous motion.

At the end of each cutting cycle, the knife shall automatically stop in a fully retracted position, with the knife edge completely covered by the clamp. Failure of the knife to stop at this position shall place the machine in a condition in which it shall be manually reset or restarted.

Motion of the knife in the cutting direction shall stop upon any interruption of the cutting cycle or activation of safety devices, and the knife shall return to a fully retracted position (see also 5.10.2).

Machines without interlocking guards shall monitor stopping performance (both stopping time and position) at any knife stop. Failure of the knife to stop within the designed stopping performance shall place the machine in a condition in which it is necessary for it to be manually reset or restarted.

This requirement is intended for machines that use guarding methods such as light curtains, rather than interlocking guards. See 5.10.6 for requirements for the use of interlocking guards on guillotine cutters.

Machines with a hydraulically-operated knife can be monitored only after an interruption of the cutting cycle.

The method used to monitor stopping performance shall be capable of determining whether the knife stops within the specified stopping criteria, and if not, shall place the machine in a condition in which it is necessary for it to be manually reset or restarted.

Machines incorporating motor/flywheel/clutch knife drives shall be equipped with an anti-repeat device. Examples of mechanical devices to accomplish this include safety bolts, latches, safety clutches, cut out/flat spot in main drive gear, etc.

The cutting edge of the knife shall not extend beyond the clamp during the clamping and the unclamping portions of the cutting cycle. The clamping and unclamping portions of the cutting cycle are those times when the clamp is in motion. Once the clamp has come to rest on the product to be cut, the knife will pass beyond the clamp to complete the cutting portion of the cutting cycle. This is the only time during which the knife is permitted to extend beyond the clamp.

5.10.2 Interruption of cutting cycles

In machines with knife drives utilizing stored energy, the knife shall stop in the event of loss of any power source affecting the knife drive (electrical, hydraulic, pneumatic, etc.).

Machines with a crank-driven knife movement without the possibility of reversing its movement shall be so designed that the clamp is not allowed to retract to its starting position automatically after the cutting cycle has been interrupted.

Machines with a hydraulically operated knife movement shall be so designed that, in the event of the cycle being interrupted, knife and clamp automatically retract to their starting position.

5.10.3 Clamping

5.10.3.1 Clamping pressure

During manual loading, positioning and unloading of material by an operator, high-pressure clamping shall be prohibited through design. Low-pressure or manual clamping is permissible during positioning of the material within the cutting zone. High-pressure clamping shall be possible only while machine operation is under two-hand control or during an automatic cut sequence.

During loading, unloading or positioning by a gripper, high-pressure clamping is allowed.

In machines equipped with power-driven clamps, the interruption of any function that incorporates high-pressure clamping shall cause all clamping motion in the downward direction to stop.

NOTE Power failure is considered as an interruption of function.

5.10.3.2 Low-pressure clamping

The clamping force of a power-driven clamp during low-pressure clamping shall not exceed 300 N on cutting machines of up to and including 1,6 m wide, or 500 N force on cutting machines greater than 1,6 m wide.

5.10.3.3 Low-pressure and manual clamping

Low-pressure clamping may be obtained by the use of either a manual control, or a power-driven clamping device.

Low-pressure power-driven clamping may be obtained by means of an operator-initiated control, which is separate from the control used for high pressure clamping.

The control for power-driven low-pressure clamping shall not be a latching type. Upon release of the control, the clamp shall immediately return to its retracted position.

For manual clamping controls, release of the clamp actuator shall cause the clamp to remain stationary or return to the retracted position.

During knife servicing, the clamp may be latched by a separate control.

5.10.3.4 Clamps

Cutouts, lips or holes on the side of the clamp facing the knife shall be safeguarded by the use of covers or plugs.

5.10.3.5 Automatic clamp operation

Any programmable system sequence of clamp motion shall be operator-initiated and shall be interlocked to safety devices. Actuation of a stop control shall override the programmed sequence and halt the hazardous motion.

5.10.4 Failure of transmission components

A failure of the components of a knife-carrier holding device or clamp shall not result in hazardous movement of the knife or clamp. This requirement is satisfied, for example, by providing mechanical or other means to prevent the knife or clamp from falling.

5.10.5 Backgauge

Any power-driven backgauge shall be interlocked with the knife and the clamp controls to prevent forward backgauge movement during high-pressure clamping and cutting.

If a programmable sequence is stopped as the result of the activation of a safety device, hazardous movement of the backgauge shall also stop.

Power-up shall not result in backgauge motion.

Actuation of a stop control shall override the programmed sequence and shall halt hazardous motion.

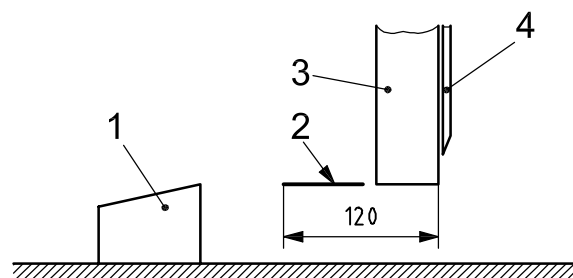
5.10.5.1 Guarding the rear of machines

Guards and/or other safety devices shall prevent access to knife, clamp and backgauge hazard points on guillotines from the rear of the machine.

5.10.5.2 Automatic backgauge travel

Where the backgauge can travel automatically, the hazard point between the back edge of the clamp and the backgauge shall be safeguarded by one or more of the following measures:

- active electro-sensitive protective devices (ESPDs);
- automatic travel limited to up to 25 mm before the clamp, with further travel possible only under hold-to-run control with a maximum speed of 3 m/min;
- protection against reaching below the clamp by providing a guard which makes the hazard point between guard and backgauge at least 120 mm behind the front edge of the clamp (see Figure 26);
- hold-to-run control.

**Key**

- | | |
|-------------|---------|
| 1 backgauge | 3 clamp |
| 2 guard | 4 knife |

Figure 26 — Protection against reaching below the clamp**5.10.5.3 Backgauge spindle**

Access to the any part of the backgauge spindle from the top shall be prevented.

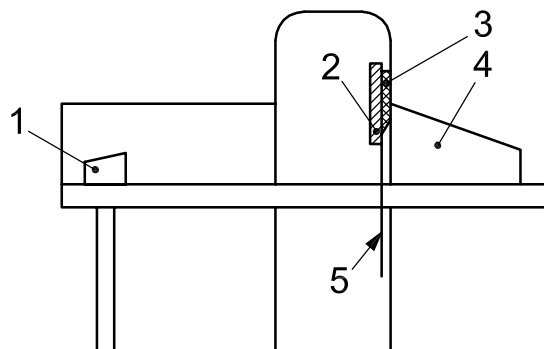
Access to the spindle from the underside of the rear table shall be prevented by fixed guards, unless access is prevented by the position of the spindle. An example of safeguarding this point would be the use of a guard that can be moved back and forth (like a window blind) covering the spindle on the rear table.

5.10.6 Guarding front (operating side) of a guillotine

ESPDs protecting against incidental contact with the knife and the clamp shall be active during that portion of the cutting cycle and/or high-pressure clamping during which hazardous motion is occurring or is possible.

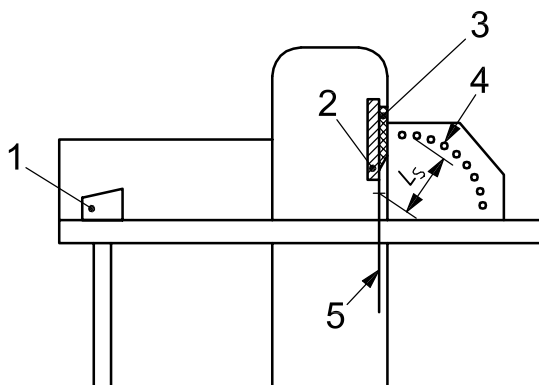
Access to knife and clamp hazard points shall be prevented from the front (operating) side of the machine by one of the following means, which shall be incorporated with the use of two-hand control:

- an interlocking guard in accordance with ISO 14119 and ISO 14120 without side openings; any openings on the front side of the guard shall be designed in accordance with ISO 13852 (see Figure 27);
- active ESPDs extending to the machine table without side openings in the guard; the front table shall extend at least 30 mm beyond the safety distance (outermost beam) of the ESPD; positioning of the ESPD shall be in accordance with Figure 28;
- active ESPDs that do not extend to the machine table. The front table shall extend at least 30 mm beyond the safety distance (outermost beam) of the ESPD; positioning of the ESPD shall be in accordance with Figures 29, 30, 31, 32 and 33.

**Key**

- | | |
|-------------|----------------------|
| 1 backgauge | 4 interlocking guard |
| 2 clamp | 5 cutting plane |
| 3 knife | |

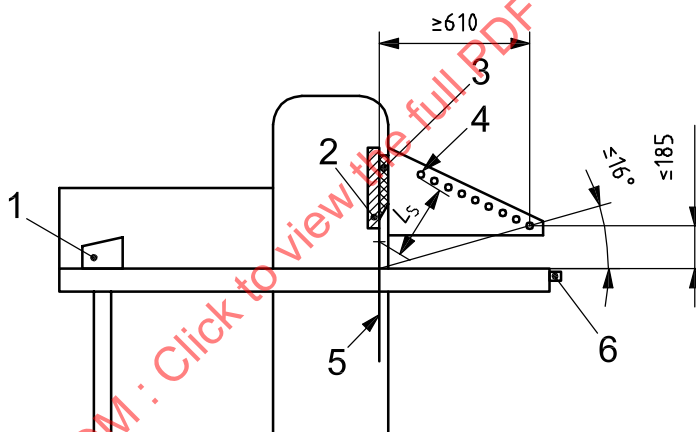
Figure 27 — Guillotine (side view) with interlocking guard on the front side

**Key**

- | | |
|-------------|-----------------------|
| 1 backgauge | 4 ESPD |
| 2 clamp | 5 cutting plane |
| 3 knife | L_S safety distance |

Figure 28 — Guillotine (side view) with ESPDs

Dimensions in millimetres

**Key**

- | | |
|----------------------|-----------------------|
| 1 backgauge | 5 cutting plane |
| 2 clamp | 6 two-hand-control |
| 3 knife | L_S safety distance |
| 4 beam of front ESPD | |

Figure 29 — Guillotine (side view) with ESPDs and two-hand control

The minimum distance of the ESPD is calculated as shown in Equation (1), based on a resolution capability of equal to or less than 40 mm and measured when projected on the centre point between the machine table and the lower edge of the clamp (see Figures 28 and 29).

$$L_S = (2\,000 \times t) + [8 \times (d_R - 14)] \quad (1)$$

where

t is the total response time, in seconds, of the machine;

d_R is the resolution (minimum object detection) capability, in millimetres, of ESPD;

L_S is the safety distance, in millimetres.

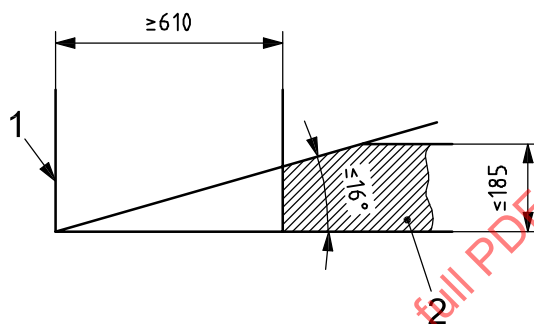
Equation (2) applies to all safety distances, L_S , up to and including 500 mm, with a minimum permissible distance of 250 mm. If L_S , when calculated by this formula, results in a distance of more than 500 mm, the distance may be reduced using the following formula, while maintaining a minimum distance of 500 mm:

$$L_S = (1\,600 \times t) + [8 \times (d_R - 14)] \quad (2)$$

where the symbols are the same as for Equation (1).

The maximum distance of the ESPD beams, measured between the centres of the optical systems, shall not exceed 55 mm for a resolution capability of equal to or less than 40 mm.

The outermost beam of the ESPD shall be arranged on the side of the maximum opening angle of 16° , but the distance to the machine table shall not be more than 185 mm (see Figure 29). The minimum distance to the cutting plane shall be 610 mm (see Figure 30).



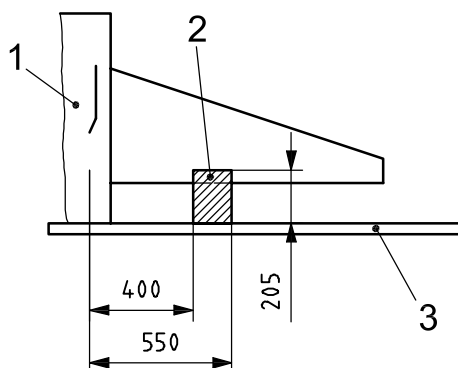
Dimensions in millimetres

Key

- 1 cutting plane
- 2 area admissible for outermost beam of ESPD

Figure 30 — Arrangement of the outermost beam of the ESPD for clamp openings of less than or equal to 185 mm

On guillotines with an automatic cutting sequence, an additional ESPD shall be provided at a distance of between 400 mm and 550 mm from the cutting plane and at a height of between 0 mm and 205 mm from the table surface (see Figure 31). The first cutting cycle shall be started by two-hand control. Following cutting cycles are started automatically. During the automatic cutting sequence, the backgauge shall be allowed to travel only toward the front (direction of the clamp).



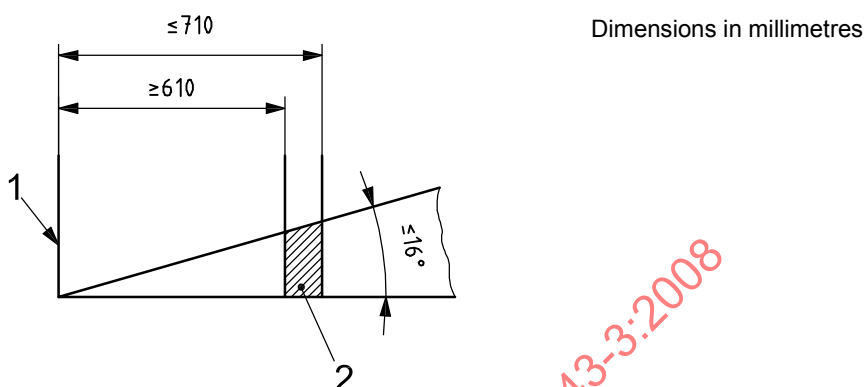
Dimensions in millimetres

Key

- 1 cutting plane
- 2 area admissible for additional ESPD
- 3 front of table

Figure 31 — Position of additional ESPD

As an exception, on machines with a usable pile height of more than 185 mm, the outermost beam of the ESPD may be arranged at a maximum angle of 16° to the lowest point of the cutting plane and at a distance of 610 mm minimum and 710 mm maximum from the lowest point of the cutting plane (see Figure 32).



Key

- 1 cutting plane 2 area admissible for outermost beam of ESPD

Figure 32 — Arrangement of the outermost beam of the ESPD for clamp openings of greater than 185 mm

On guillotines with openings of equal to or less than 165 mm between the outer housing of the ESPD and machine table, the safety distance depicted in Figure 33 shall be 550 mm, as specified by Equation (3), and shall be observed between the lowest point of the cutting plane and the outer edge of the housing, or guards shall be provided. Otherwise, a safety distance of ≥ 850 mm shall be required.

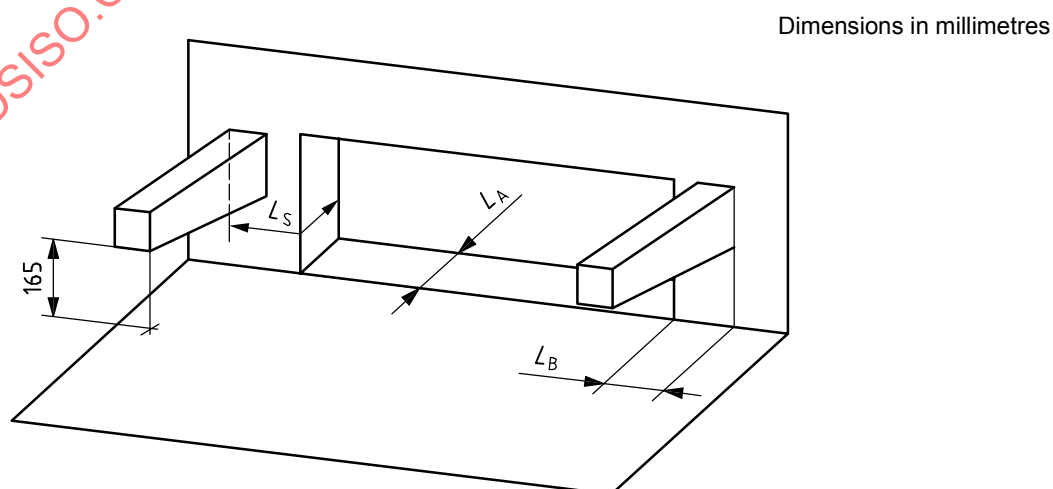
$$L_S = L_A + L_B \quad (3)$$

where

L_S is the safety distance, in millimetres;

L_A is the distance, in millimetres, from the lower edge of cutting plane to the outer plane of the machine frame;

L_B is the distance, in millimetres, from the outer edge of the ESPD to the inner edge of the machine frame.



Key

L_S safety distance

L_A distance from the lower edge of cutting plane to outer plane of machine frame

L_B distance from the outer edge of the ESPD to the inner edge of the machine frame

Figure 33 — Safety distance

5.10.7 Pile-support angles (jogging blocks)

For cutting strips, a pile-support angle (jogging block) shall be provided (see Figure 34 for an example of a pile support angle).

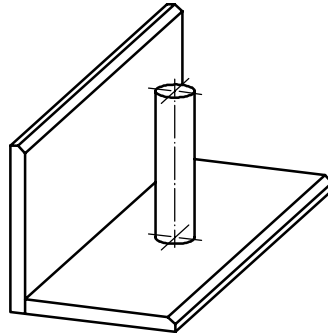


Figure 34 — Pile-support angle

5.10.8 Knife changing and adjustment

Changing and adjusting the knife shall be performed only by an authorized person (defined in ISO 12643-1).

Means shall be provided to install or remove the knife without necessitating that the knife handler contact the cutting edge of the knife. When changing knives, the full cutting edge of the knife shall be protected by a holding device fastened to the knife.

When knives are being changed or adjusted, both the knife blade and hazardous movements shall be safeguarded.

Knife descent shall be possible only by one of the following:

- two-hand controls and safeguarding by ESPDs;
- two-hand controls with the interlocking guard closed;
- mechanical means to engage the clutch.

NOTE In the United States, this method is considered to be a maintenance task, and lockout/tagout procedures as defined by OSHA are applicable (see OSHA 29 CFR 1910.147^[10], or ANSI Z244.1^[5]).

5.10.9 Hazards from integral feeding and delivery equipment on guillotines

5.10.9.1 Crushing point at gripper

The crushing point at the gripper on the feeding table shall be safeguarded.

Examples of safeguarding this area using photoelectric devices include the following measures:

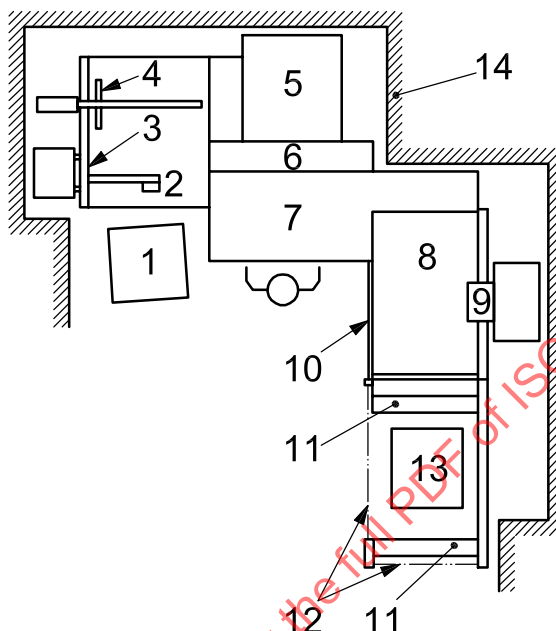
- functional photoelectric device detecting the upper edge of the paper pile;
- functional photoelectric device detecting the front edge of the paper pile;
- functional photoelectric device detecting the presence of paper in the gripper.

If photoelectric devices are used to safeguard this area, the gripper shall be allowed to close only after all photoelectric devices have been operated in the given sequence.

5.10.9.2 Hazard point between feeding table and guillotine

The hazard point between the feeding table and the guillotine caused by the vertical movement shall be safeguarded (see Figure 35).

NOTE Safeguarding can be achieved, for example, by providing a trip device.



Key

1 paper pile	6 guillotine	11 aligning gauges
2 gripper	7 front table	12 ESPD
3 feeding table	8 delivery table	13 pallet
4 pusher	9 hold-down	14 fence guard
5 rear table	10 guard	

Figure 35 — Loading and unloading (feeding and delivery) equipment

5.10.9.3 Hazard point between pusher and table

The hazard point between the pusher on the feeding table and feeding table or rear table of the machine shall be safeguarded.

NOTE Safeguarding can be achieved, for example, by limiting the distance between the lower edge of the pusher and the table to no more than 6 mm.

The safety distance between back of the pusher and fixed machine parts shall be at least 100 mm.

5.10.9.4 Hazard point between delivery table and front table

The hazard point between delivery table and front table of the guillotine caused by the horizontal movement shall be safeguarded.

NOTE Safeguarding can be achieved, for example, by providing guards or trip bars.

5.10.9.5 Hazard point between delivery table and fixed parts

The hazard point between delivery table and fixed machine parts caused by vertical movement of the table shall be safeguarded.

NOTE Safeguarding can be achieved, for example, by providing trip devices.

5.10.9.6 Hazard points between delivery table and floor or pallet

The hazard points between the delivery table and the floor or pallet shall be safeguarded.

NOTE This can be achieved, for example, if all of the following requirements are met:

- access from the back of the equipment is prevented by guards in accordance with ISO 13852 (see Figure 35);
- guards are provided on the front (see Figure 35);
- there are two ESPDs safeguarding the delivery area (see Figure 35), or there are other guards such as an ESPD in front of the delivery table and trip nip guards under the delivery table to safeguard the delivery area while the delivery table is in its forward or downward movement;
- an emergency stop device is provided in the delivery area.

5.10.9.7 Hazard points between delivery table and aligning gauge

The hazard points between the delivery table and the aligning gauge shall be safeguarded.

NOTE This can be achieved, for example, if the aligning gauge lowers under its own mass or the force to lower the gauge is as shown in 5.2.

5.10.9.8 Hazard point between hold-down and delivery table

The hazard point between the hold-down and the delivery table shall be safeguarded.

NOTE This can be achieved, for example, by one of the following:

- hold-down devices are fitted at a minimum distance of 850 mm from the edge of the delivery table;
- the maximum force of the hold-down is limited to 500 N.

5.11 Trimmers

The hazard zone at the knives shall be guarded on the feeding and delivery sides in accordance with Clause 5. Fixed guards, movable guards, or other means of guarding may be used, depending upon the design. Emergency stop buttons shall be provided at each operating position as specified in ISO 12643-1.

For manually fed machines using a conveyor that puts the product into the cutting zone, feeding and delivery openings shall be designed in accordance with ISO 13852.

On the feeding and delivery side, a safety distance of 550 mm to the nearest hazard point is acceptable if the trimmer is mounted in-line and manual take-off is excluded (see Figure 36).

Dimensions in millimetres

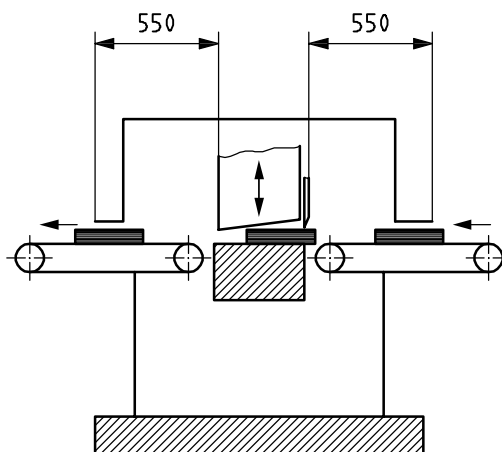


Figure 36 — Trimmer with automatic feed

Where material is fed manually into the hazard zone by the operator, the hazard points on the operator side of the trimmer shall be safeguarded by a two-hand control located on the front edge of the feed table. The requirements for two-hand controls as specified in ISO 12643-1 shall be met. Feeding apertures on the operator side of the trimmer shall be as small as possible, consistent with the size of the format cut.

When the interlocking guard is opened, it shall be possible to start the trimmer only by means of two-hand controls. Operation of the control with the guard open shall allow only a single stroke of the knives, regardless of how long the control is held. The means to control a single stroke of the knife shall comply with category 1 of ISO 13849-1:1999.

Knife covers to be applied for knife changing and transport of knives shall be supplied with the machine.

Openings and safety distances on waste discharge chutes shall satisfy ISO 13852.

For trimmers with an automatic vacuum system to remove paper cuttings or an automatic exhaust system, the system shall comply with the requirements for explosion prevention and protection as specified in ISO 12643-1.

5.12 Onserters/attaching machines

The exception specified in 5.3.2 may be applied to feeder guards for onserters/attaching machines, if necessary.

5.13 Overcover/protective wrapper gluers

The exception specified in 5.3.2 may be applied to feeder guards for overcover/protective wrapper gluers, if necessary.

5.14 Corner rounding machines

On corner rounding machines (see Figure 37), the hazard point at the trimming knife or saw shall be safeguarded.

NOTE This requirement is met, for example, by providing an adjustable transparent guard in front of the knife and ensuring the cutting operation can only be started after a pile has been fed, by using a sensor (e.g. a photoelectric device). See Figure 37.

Operation of the knife or saw shall only be possible by means of a hold-to-run control (hand- or foot-operated).

Fixed or interlocking guards shall be provided at the back and on both sides of the knife or saw.

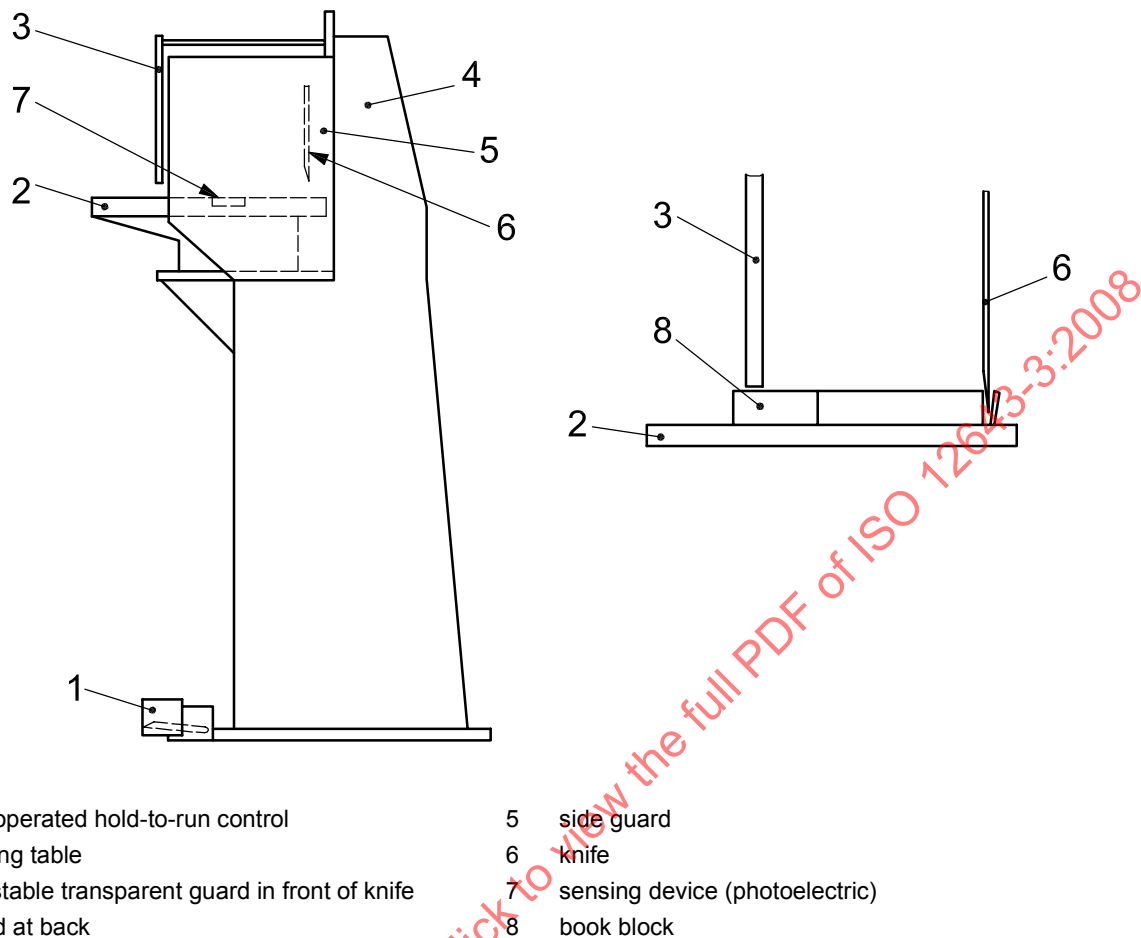


Figure 37. — Corner rounding machine

6 Information for use

6.1 Minimum requirements for machine markings

The requirements of ISO 12643-1 shall be met.

6.2 Contents of instruction handbook

6.2.1 Information for gang stitchers

Where production circumstances require the gang stitcher to be started by two-hand control at speeds greater than 10 m/min with the interlocking guards open, the instruction handbook shall contain the following warning:

WARNING — The person operating the two-hand control shall make sure that, before operating the control, there is no other person in the hazard area.

6.2.2 Information for gathering machines

Where production circumstances require the gathering machine to be started by two-hand control at speeds greater than 10 m/min with the interlocking guards open, the instruction handbook shall contain the following warning:

WARNING — The person operating the two-hand control shall make sure that, before operating the control, there is no other person in the hazard area.

6.2.3 Information for perfect binders

Where production circumstances do not allow the milling cutter to be stopped when opening the interlocking guard covering the book carriage, the instruction handbook shall indicate the residual risk and the stopping time.

Where production circumstances require the perfect binder to be started with interlocking guards open, either by hold-to-run control at a speed greater than 5 m/min or by two-hand control at a speed greater than 10 m/min, the instruction handbook shall contain the following warning:

WARNING — The person operating the hold-to-run/two-hand control shall make sure that, before operating the control, there is no other person in the hazardous area.

Where polyurethane hotmelt glues are used, the instruction handbook shall give the following instructions:

- indication of the need to provide adequate exhaust equipment in the area of the glue duct and the preheater and specifying the minimum exhaust volume;
- instructions for removing hot glue ducts from the perfect binder and for cleaning the glue ducts, for example:
 - move the duct immediately under exhaust hood,
 - clean duct with low-risk non-aromatic solvents,
 - close glue-duct cover during removal;
- indication of the need for adequate ventilation in the working area;
- indication of the need to follow the instructions on the material-safety data sheet;
- warning not to leave glue reservoirs and glue ducts open;
- indication that an appropriate protective mask shall be provided for the operating personnel where the release of isocyanates cannot be excluded when the glue reservoir is changed or the glue ducts are cleaned or removed from the perfect binder; instructions for use of the mask shall also be given;
- indication that appropriate protective glasses and gloves shall be used when there is a hazard of spilling of the hot glue (e.g. during pressure clearing); eye-washing and cleaning equipment should be readily available in case glue gets into the eyes; for spills on skin, washing facilities should be available in the working area;
- indication to thoroughly clean hands when finishing work or taking breaks. Operating personnel dealing with this type of glue should use a barrier hand cream or protective hand lotion;
- indication that soiled clothes shall be changed immediately;
- indication that eating, drinking and smoking is forbidden throughout the working area;
- warning of residual risks in case of non-observance.

6.2.4 Information for sheet folding machines

Where production circumstances require the sheet folding machine to be started by two-hand control at a speed greater than 10 m/min with guards open, the instruction handbook shall contain the following warning:

WARNING — The person operating the two-hand control is responsible for safe working practices. Before starting the machine, the operator shall make sure that there is/are no other person(s) in the hazard area.

6.2.5 Information for inserting machines

Where production circumstances require the inserting machine to be started by two-hand control at a speed greater than 10 m/min with guards open, the instruction handbook shall contain the following warning:

WARNING — The person operating the two-hand control is responsible for safe working practices. Before starting the machine, the operator shall make sure that there is/are no other person(s) in the hazard area.

6.2.6 Information for machines for the production of envelopes

The instruction handbook for machines for the production of envelopes shall contain a warning of the residual risk existing between the staggering wheel and the paper guides, if operator intervention is required at this point during production runs.

Where production circumstances require the machine to be started at a speed of more than 5 m/min with guards open, either when using a stroboscope and hold-to-run control or at a speed greater than 10 m/min by two-hand control, the instruction handbook shall contain the following warning:

WARNING — The person operating the hold-to-run/two-hand control shall make sure that, before operating the control, there is/are no other person(s) in the hazard area.

6.2.7 Information for guillotines

The instruction handbook for guillotines shall contain the following additional information:

- total response time of the system, in milliseconds;
- resolution capability of ESPDs, in millimetres;
- minimum distance of ESPDs, in millimetres.

The handbook for guillotines shall also contain the instruction that safety devices shall be checked for effectiveness before each work shift and each time a knife has been changed and that test results shall be recorded.

Measures to be taken in case of failure of transmission elements shall be described in order to enable safe repair. It shall be indicated, for example, that the paper pile shall not be withdrawn by force.

The instruction handbook shall indicate that there is a residual risk caused by the spindle under the rear table of the guillotine.

The instruction handbook shall describe safe working practices for changing the knives, including the means of safeguarding knife blades and of adjusting the knives in order to prevent hazards from exposed knife edges. It shall give detailed instructions on the removal of the knives using the tools and the knife covers supplied and on the subsequent storage in knife boxes.

The instruction handbook shall indicate the need for regular checks of the guillotine against manufacturer specifications. Tests shall include the functioning of the control systems, monitoring of the stopping performance, clamping force, functioning of the ESPD, functioning of the two-hand control, and overrun protection in accordance with 5.10.1. The instruction handbook shall indicate that test results shall be recorded.