

# Industrial sewing machines — Safety requirements for sewing machines, units and systems

ICS 61.080

# National foreword

This British Standard is the UK implementation of EN ISO 10821:2005+A1:2009. It is identical with ISO 10821:2005, incorporating amendment 1:2009. It supersedes BS EN ISO 10821:2005, which is withdrawn.

The start and finish of text introduced or altered by amendment is indicated in the text by tags. Tags indicating changes to ISO text carry the number of the ISO amendment. For example, text altered by ISO amendment 1 is indicated by **A1** **A1**.

The UK participation in its preparation was entrusted to Technical Committee TCI/33, Textile machinery.

A list of organizations represented on this subcommittee can be obtained on request to its secretary.

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|               |                                                                                |
|               |                                                                                |

English Version

## Industrial sewing machines - Safety requirements for sewing machines, units and systems (ISO 10821:2005)

Machines à coudre industrielles - Exigences de sécurité pour machines à coudre, unités et systèmes de couture (ISO 10821:2005)

Industrienähmaschinen - Sicherheitsanforderungen an Nähmaschinen, Näheinheiten und Nähanlagen (ISO 10821:2005)

This European Standard was approved by CEN on 22 April 2005.

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## **Foreword**

This document (EN ISO 10821:2005) has been prepared by Technical Committee ISO/TC 148 "Sewing machines" in collaboration with CMC.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by January 2006, and conflicting national standards shall be withdrawn at the latest by January 2006.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s).

For relationship with EU Directive(s), see informative Annex ZA, which is an integral part of this document.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

## **Endorsement notice**

The text of ISO 10821:2005 has been approved by CEN as EN ISO 10821:2005 without any modifications.

The CEN correction notice 12 May 2010 provided a revised English language text incorporating the following editorial corrections: □

*Correction to clause 5.2.4.2 following the implementation of amendment A1:2010.*

## **Foreword to amendment A1**

The text of this Amendment EN ISO 10821:2005/Amd 1:2009 to the EN ISO 10821:2005/A1:2009 from Technical Committee ISO/TC 148 “Sewing machines” of the International Organization for Standardization (ISO) has been taken over as an amendment to the European Standard by Technical Committee CEN/SS H10 “Sewing machines” the secretariat of which is held by CMC.

This Amendment to the European Standard EN ISO 10821:2005 shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by September 2009, and conflicting national standards shall be withdrawn at the latest by December 2009.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

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### **Endorsement notice**

The text of ISO 10821:2005/Amd 1:2009 has been approved by CEN as a EN ISO 10821:2005/A1:2009 without any modification.



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## **Introduction**

This International Standard is intended to provide manufacturers, users and official bodies with safety requirements which, in view of the state of the art, are to be met for industrial sewing machines, units and systems.

For machinery and hazards not within the scope of this International Standard, see ISO 12100-1 and ISO 12100-2.

The concept of this International Standard is to deal first in general and then in detail with significant hazards (see Clause 4), as well as safety requirements (see Clause 5); it starts with those requirements applicable to all types of industrial sewing machines in order to arrive at specific requirements for particular types of machines.

A peculiarity of industrial sewing machines is that sewing units and systems are frequently built up by the user from components emanating from various manufacturers. Furthermore, in the course of their period of use, units and systems may be adapted by the user for different tasks (owing to, for example, frequent changes in fashion) by means of the interchange of components or the addition of supplementary equipment. Such measures can also serve the purpose of increasing the degree of automation. As a result, the user who assembles several components into a new sewing unit or system is in the position of a manufacturer and thus, like the manufacturer, is responsible for assuring that any hazards inherent in the operation of the new combination are eliminated, and that it conforms to this International Standard and any other relevant standard or regulation.



# Industrial sewing machines — Safety requirements for sewing machines, units and systems

## 1 Scope

This International Standard identifies hazards and specifies safety requirements applicable to sewing machines, sewing units and sewing systems designed for professional (industrial, commercial or laboratory) use in industries including the clothing and footwear, leather goods, shirts and blousery, hosiery and knitwear, lingerie, glove, upholstery and packaging industries, and in shoe repair.

The information on use and maintenance of such machines in other industries could give rise to hazards not considered in this International Standard.

The requirements of this International Standard are applicable to machinery installed in dry and well-kept, clean locations and processing dry sewing material. Where the sewing machines, sewing units or sewing systems are used in other than dry and well-kept, clean locations, more stringent measures could be necessary: for example, the higher degree of protection provided by enclosures (IP code — see IEC 60529)<sup>[5]</sup>.

The purpose of this International Standard is to assist the manufacturer to design machinery such that the risks arising from its defined, intended use and maintenance are reduced or eliminated. The significant hazards and hazardous situations are given together with a reference to the corresponding safety requirement or measure in 4.2 to 4.8. Significant hazards are those identified and estimated as requiring action to reduce the risk they pose.

This International Standard is not applicable to stepping frame sewing machines, shoe bottom stitching machines, large shuttle embroidery machines in accordance with ISO 11111 <sup>[1]</sup>, integrated sewing systems within in the scope of ISO 11161 <sup>[2]</sup> or household sewing machines in accordance with IEC 60335-2-28 <sup>[4]</sup>.

**NOTE** If household sewing machines are used for professional purposes, it could be necessary to take measures in accordance with this International Standard (e.g. the use of a finger deflecting device).

## 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 286 (all parts), *ISO system of limits and fits*

ISO 639 (all parts), *Codes for the representation of names of languages*

ISO 2768 (all parts), *General tolerances*

ISO 3740:2000, *Acoustics — Determination of sound power levels of noise sources using sound pressure — Comparison method in situ*

ISO 3741:1999, *Acoustics — Determination of sound power levels of noise sources using sound pressure — Precision methods for reverberation rooms*

ISO 3743-1:1994, *Acoustics — Determination of sound power levels of noise sources — Engineering methods for small, movable sources in reverberant fields — Part 1: Comparison method for hard-walled test rooms*

ISO 3744:1994, *Acoustics — Determination of sound power levels of noise sources using sound pressure — Engineering method in an essentially free field over a reflecting plane*

ISO 3745:2003, *Acoustics — Determination of sound power levels of noise sources using sound pressure — Precision methods for anechoic and semi-anechoic rooms*

ISO 3746:1985, *Acoustics — Determination of sound power levels of noise sources using sound pressure — Survey method using an enveloping measurement surface over a reflecting plane*

**A1** ISO 3747:2000, *Acoustics — Determination of sound power levels of noise sources using sound pressure — Comparison method in situ <sup>A1</sup>*

ISO 3864-2:2004, *Graphical symbols — Safety colours and safety signs — Part 2: Design principles for product safety labels*

ISO 4183:1995, *Belt drives — Classical and narrow V-belts — Grooved pulleys (system based on datum width)*

ISO 4871:1996, *Acoustics — Declaration and verification of noise emission values of machinery and equipment*

ISO 4915:1991, *Textiles — Stitch types — Classification and terminology*

ISO 4916:1991, *Textiles — Seam types — Classification and terminology*

ISO 7574 (all parts), *Acoustics — Statistical methods for determining and verifying stated noise emission values of machinery and equipment*

ISO 8239:1987, *Sewing machine needles — Fitting dimensions — Tolerances and combinations*

ISO/CIE 8995:2002, *Lighting of indoor work systems*

ISO 9614-1:1993, *Acoustics — Determination of sound power levels of noise sources using sound intensity — Part 1: Measurement at discrete points*

ISO 9614-2:1996, *Acoustics — Determination of sound power levels of noise sources using sound intensity — Part 2: Measurement by scanning*

ISO 11200:1995, *Acoustics — Noise emitted by machinery and equipment — Guidelines for the use of basic standards for the determination of emission sound pressure levels at a work station and at other specified positions*

ISO 11201:1995, *Acoustics — Noise emitted by machinery and equipment — Measurement of emission sound pressure levels at a work station and at other specified positions — Engineering method in an essentially free field over a reflecting plane*

ISO 11202:1995, *Acoustics — Noise emitted by machinery and equipment — Measurement of emission sound pressure levels at a work station and at other specified positions — Survey method in situ*

ISO 11203:1995, *Acoustics — Noise emitted by machinery and equipment — Determination of emission sound pressure levels at a work station and at other specified positions from the sound power level*

ISO 11204:1995, *Acoustics — Noise emitted by machinery and equipment — Measurement of emission sound pressure levels at a work station and at other specified positions — Method requiring environmental corrections*

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

ISO 12100-1:2003, *Safety of machinery — Basic concepts, general principles for design — Part 1: Basic terminology, methodology*

ISO 12100-2:2003, *Safety of machinery — Basic concepts, general principles for design — Part 2: Technical principles*

▣<sup>A1</sup> ISO 13849-1:2006, *Safety of machinery — Safety-related parts of control systems — Part 1: General principles for design* ▣<sup>A1</sup>

ISO 13852:1996, *Safety of machinery — Safety distances to prevent danger zones being reached by the upper limbs*

ISO 13853:1998, *Safety of machinery — Safety distances to prevent danger zones being reached by the lower limbs*

ISO 13854:1996, *Safety of machinery — Minimum gaps to avoid crushing of parts of the human body*

▣<sup>A1</sup> IEC 60204-1:2005, *Safety of machinery — Electrical equipment of machines — Part 1: General requirements* ▣<sup>A1</sup>

IEC 60204-31:2001, *Safety of machinery — Electrical equipment of machines — Part 31: Particular safety and EMC requirements for sewing machines, units and systems*

IEC 60745-1:2003, *Hand-held motor-operated electric tools — Safety — Part 1: General requirements*

▣<sup>A1</sup> IEC 60825-1:2007, *Safety of laser products — Part 1: Equipment classification, requirements and user's guide* ▣<sup>A1</sup>

EN 563, *Safety of machinery — Temperatures of touchable surfaces — Ergonomics data to establish temperature limit values for hot surfaces*

### 3 Terms and definitions

▣<sup>A1</sup> For the purposes of this document, the terms and definitions given in ISO 3744, ISO 4915, ISO 4916, ISO 11204, ISO 12100-1 and ISO/IEC Guide 51 and the following apply. ▣<sup>A1</sup>

#### 3.1

##### **industrial sewing machine**

sewing machine specifically designed for industrial purposes

#### 3.2

##### **sewing machine**

machine designed to produce one or more stitches with one or more sewing threads; in producing a seam the machine can perform one or more sewing functions

NOTE 1 See ISO 4915 and ISO 4916 for stitches and seams, respectively.

NOTE 2 Previously, the term “sewing machine head” was used instead of “sewing machine”.

#### 3.3

##### **sewing machine stand**

item on which a sewing machine is arranged to enable optimum operation

EXAMPLE Sewing machine stand designed as a table.

#### 3.4

##### **sewing machine drive**

equipment that drives a sewing machine, speed-controlled by electrical or mechanical means, or both, either with or without a positioning device and control of machine functions

EXAMPLE Electric motor.

### **3.5**

#### **sewing unit**

equipment consisting of at least a sewing machine, sewing machine stand and sewing machine drive

NOTE One or more devices incorporated in, or attached to, the sewing machine, sewing unit or both (e.g. for sewing, cutting, feeding the sewing material) are, in addition to the sewing machine itself, controlled either by the operator or automatically.

### **3.6**

#### **sewing system**

equipment consisting of at least two sewing units or parts of sewing units, functionally interlinked

### **3.7**

#### **quilting machine**

specially constructed sewing unit or sewing system designed for use in the upholstery industry

EXAMPLES Tape edge machine, multi-needle sewing machine, long-arm quilting machine, tacking machine.

### **3.8**

#### **sewing tool exchange and adjustment**

threading a needle, looper, spreader, or changing a presser foot, bobbin, needle plate, sewing machine needle, or action such as cleaning

### **3.9**

#### **multihead embroidery machine**

sewing system that allows two or more embroidery heads to be modularly linked together

### **3.10**

#### **sewing area**

effective range around sewing machine needle between needle plate and the upper turning point of the needle movement

### **3.11**

#### **finger deflecting device**

means of preventing access of fingers into the danger zone of the sewing area

### **3.12**

#### **cutter system**

devices for cutting sewing threads, tape or sewing material

### **3.13**

#### **auxiliary equipment**

additional device that assists in handling procedures

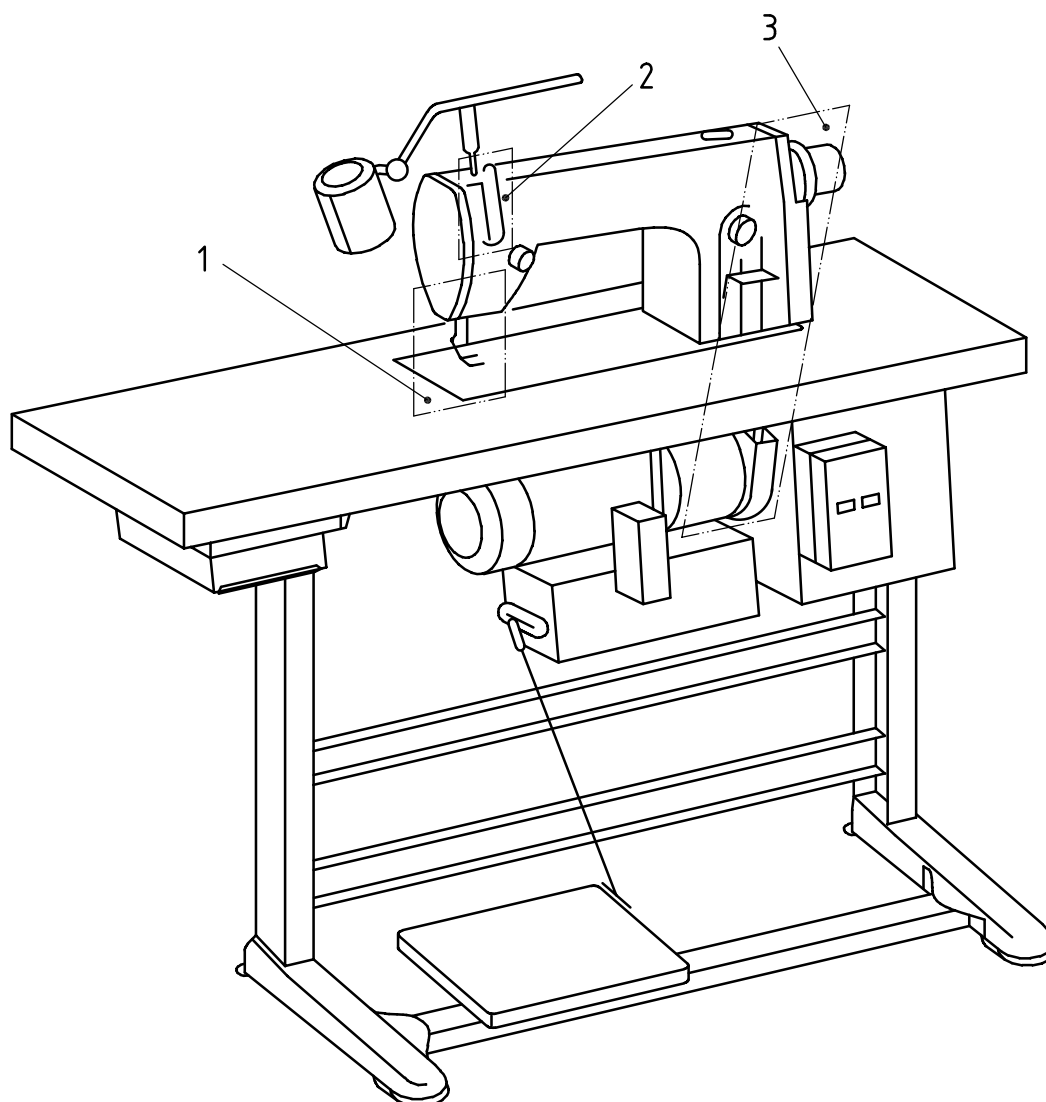


| Danger zone or hazardous situation                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Type of hazard                                                                                                                                                                                                                                 | Corresponding reference<br>(see Clauses 5 and 7)                                                     |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------|
| <b>4.3 Electricity/Control</b><br><br><b>4.3.1</b> Electrical contact (direct or indirect), caused by<br><br>a) component failure,<br>b) insulation failure, or<br>c) incorrect design, installation or component specification of the electrical equipment.<br><br><b>4.3.2</b> Functional disorders:<br><br>a) failure of control system (e.g. malfunction of safety devices, unexpected start),<br>b) irregularity of energy supply (e.g. loss, recurrence, fluctuation).<br><br><b>4.3.3</b> Electrostatic phenomena<br><br><b>4.3.4</b> External influences (e.g. EMC) | <p>electric shock or burns</p> <p>electric shock or burns</p> <p>burns</p> <p>all possible hazards generated by unexpected dangerous movements</p> <p>sudden fright caused by electrostatic discharge</p> <p>unexpected dangerous movement</p> | <p>5.2.2.1</p> <p>5.2.2.1, 5.2.2.2, 5.2.2.4 to 5.2.2.13, Annex G</p> <p>5.2.2.14</p> <p>5.2.2.15</p> |
| <b>4.4 Thermal hazards</b><br><br>Accidental contact with hot surfaces:<br><br>a) sewing lamp head (needle light);<br>b) drives (e.g. motors);<br>c) machine surface.                                                                                                                                                                                                                                                                                                                                                                                                       | <p>burns</p>                                                                                                                                                                                                                                   | <p>5.2.3</p>                                                                                         |
| <b>4.5 Noise</b><br><br>Drive or transmission.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | <p>temporary or permanent loss of hearing; other physiological disorders (e.g. loss of balance, loss of awareness); interference with oral message and other acoustical signals</p>                                                            | <p>5.2.4, 7.4.1 i), Annexes C, I and J</p>                                                           |
| <b>4.6 Radiation</b><br><br>Eye contact with laser marker.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | <p>temporary or general loss of eyesight</p>                                                                                                                                                                                                   | <p>5.2.5, Clause 7</p>                                                                               |

| Danger zone or hazardous situation                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Type of hazard                                                                                                                                                                                                                                 | Corresponding reference<br>(see Clauses 5 and 7)                                                                 |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------|
| <p><b>4.7 Ergonomics</b></p> <p>This covers</p> <ul style="list-style-type: none"> <li>a) unhealthy posture (e.g. chair, height of chair and sewing table),</li> <li>b) inadequacy with human hand, arm or foot, leg anatomy (e.g. arm position while sewing, knee actuator for presser foot lifting),</li> <li>c) inadequate local lighting (e.g. bad visibility in sewing area), and</li> <li>d) unhealthy exposure to the jet of air from pneumatic equipment or cooling air from a motor</li> </ul>                                                 | <p>risk of occupational disease, accelerated fatigue, posture diseases</p> <p>accelerated fatigue</p> <p>eye strain</p> <p>cold, muscle strain</p>                                                                                             | <p>5.2.6, Annex L</p> <p>5.2.6.3</p>                                                                             |
| <p><b>4.8 Special hazards</b></p> <p><b>4.8.1</b> Button sewing machine, buttonhole sewing machine, bartacking machine, programmable pattern sewing machine:</p> <p>— ejection of parts (e.g. splinted or broken sewing machine needle)</p> <p><b>4.8.2</b> Quilting machine</p> <p><b>4.8.3</b> Bag closing sewing machine</p> <p><b>4.8.4</b> Embroidery machine</p> <p><b>4.8.5</b> Glove sewing machine</p> <p><b>4.8.6</b> Sewing machine for shoe repair</p> <p><b>4.8.7</b> Blind stitch sewing machine</p> <p><b>4.8.8</b> Linking machines</p> | <p>facial injuries (especially eyes), caused by stabbing or puncture</p> <p>drawing-in</p> <p>drawing-in</p> <p>drawing-in</p> <p>stabbing or puncture</p> <p>stabbing or puncture</p> <p>stabbing or puncture</p> <p>stabbing or puncture</p> | <p>5.3.1, Annex D</p> <p>5.3.2</p> <p>5.3.3</p> <p>5.3.4</p> <p>5.3.5</p> <p>5.3.6</p> <p>5.3.7</p> <p>5.3.8</p> |

#### 4.9 Danger zones

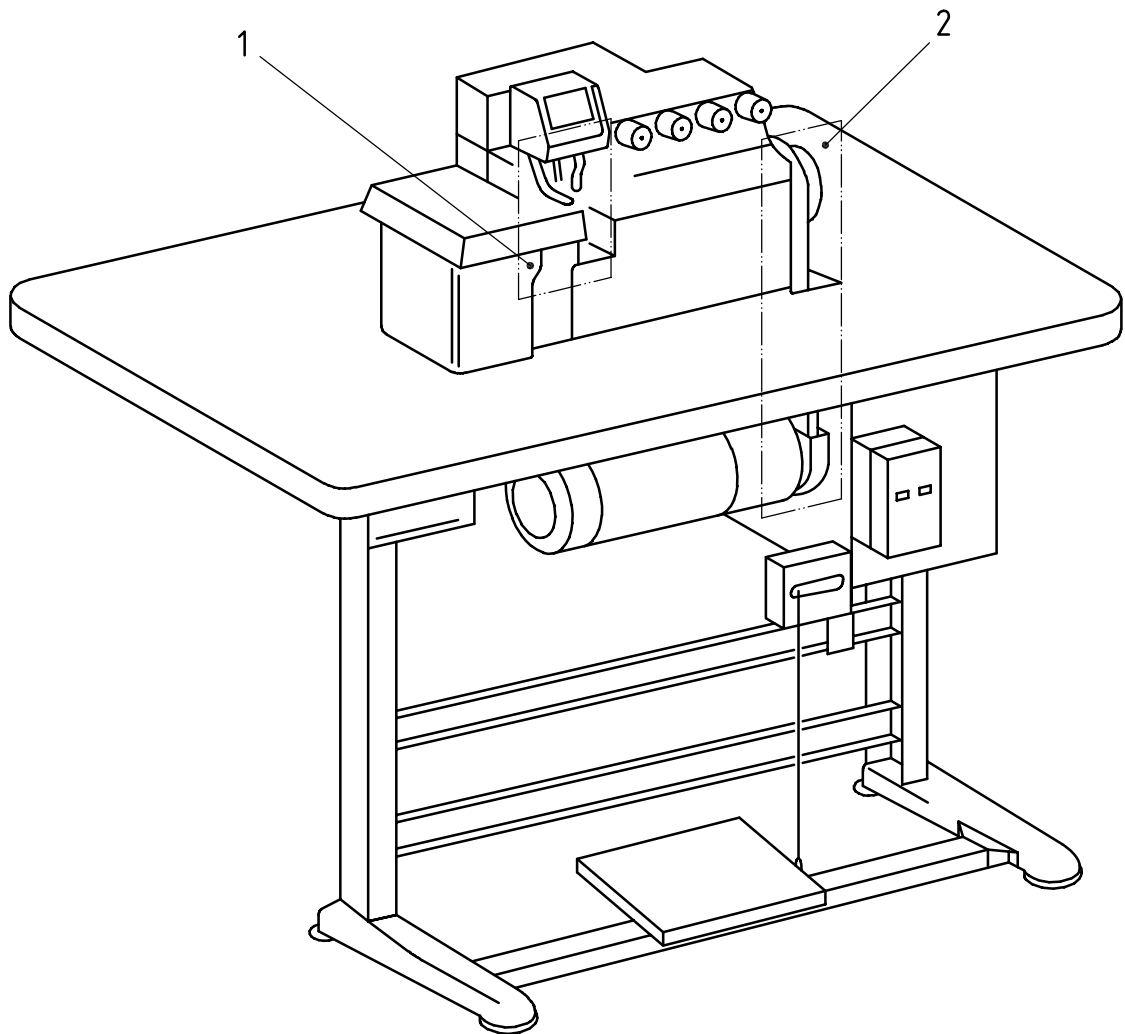
Figures 1 to 7 show different types of industrial sewing machines, indicating the danger zones and some details of construction. These figures are shown for information only.



**Key**

- 1 zone I
- 2 zone II
- 3 zone III

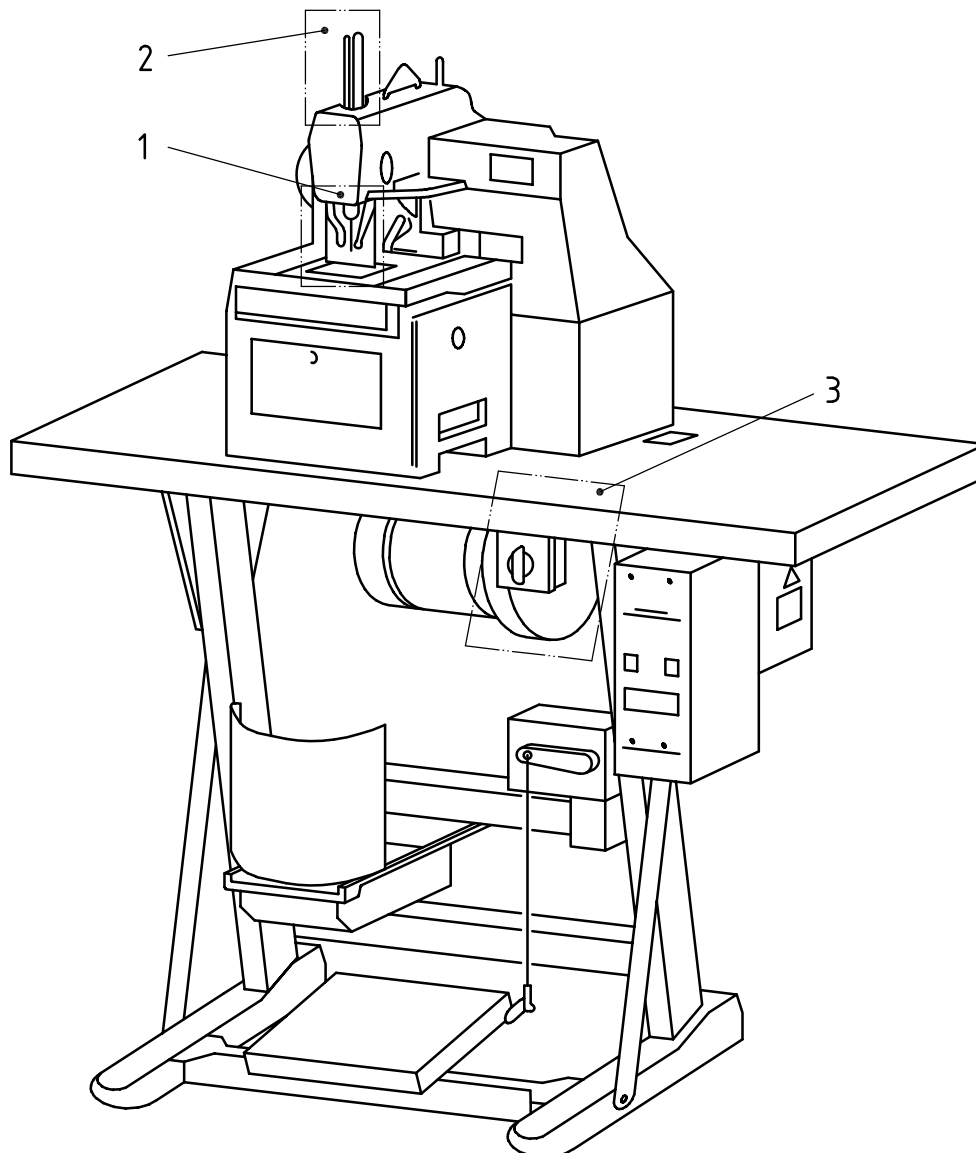
**Figure 1 — Danger zones — Mechanics (see 4.2)**



**Key**

- 1 zone I
- 2 zone III

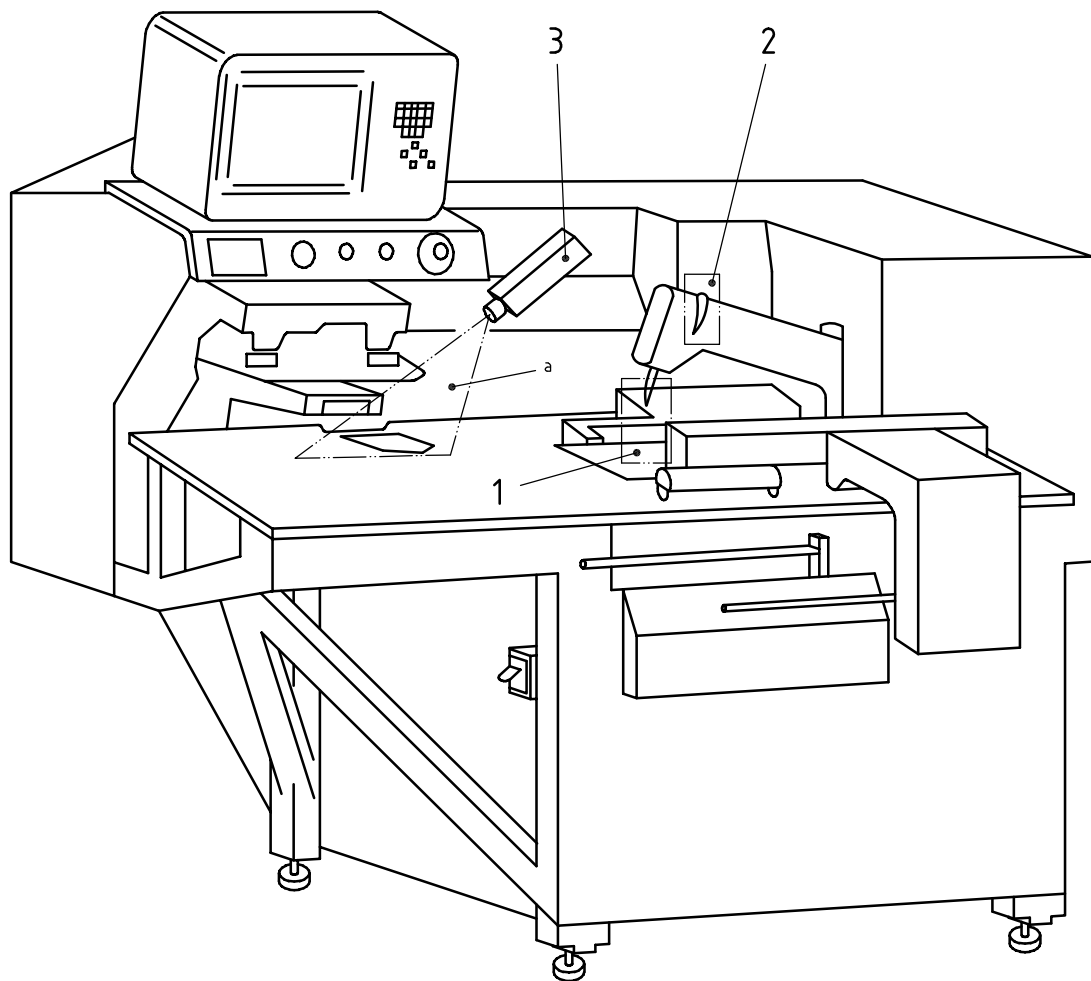
**Figure 2 — Danger zones — Mechanics (see 4.2)**



**Key**

- 1 zone I
- 2 zone II
- 3 zone III

**Figure 3 — Danger zones — Mechanics (see 4.2)**



**Key**

- 1 zone I
- 2 zone II
- 3 laser <sup>a</sup>
- <sup>a</sup> See 4.6.

**Figure 4 — Danger zones — Mechanics and radiation (see 4.2 and 4.6)**

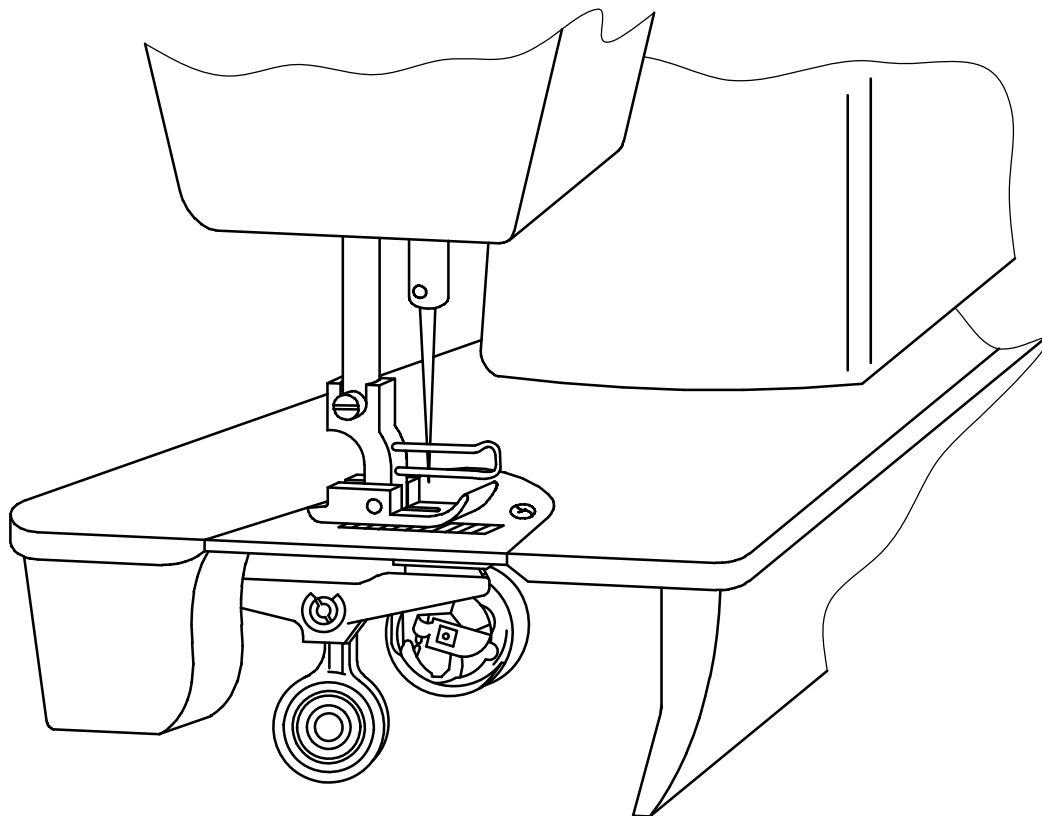


Figure 5 — Danger zones — Zone I (see 4.2.1): hook with horizontal axis

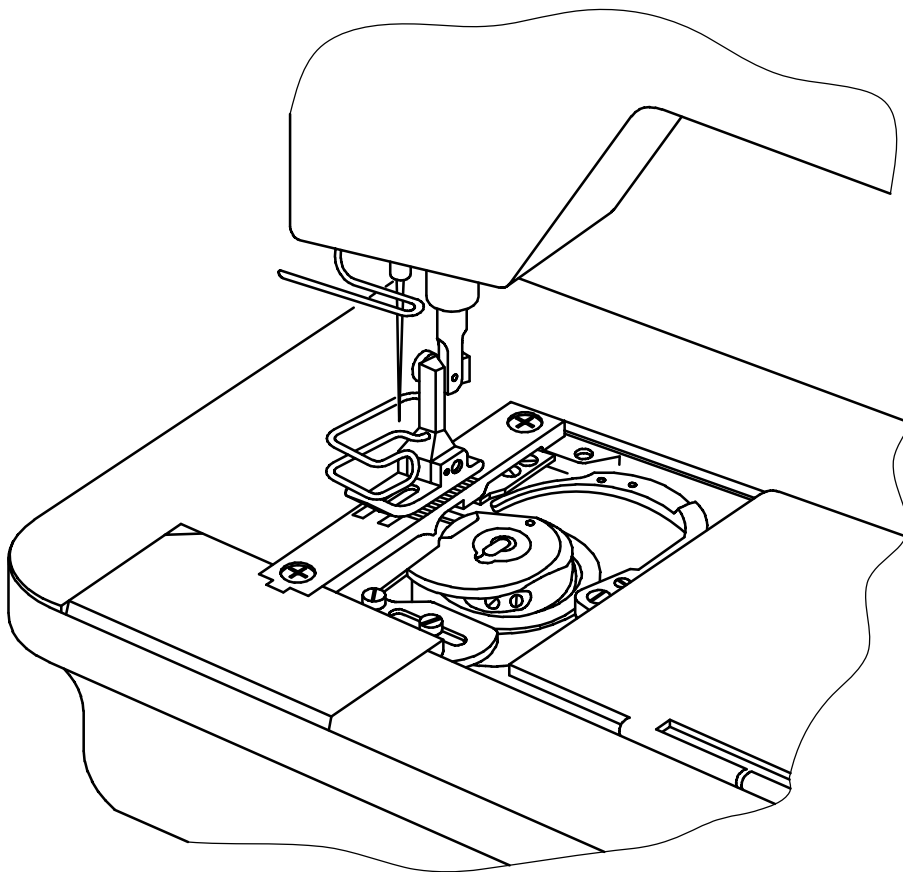
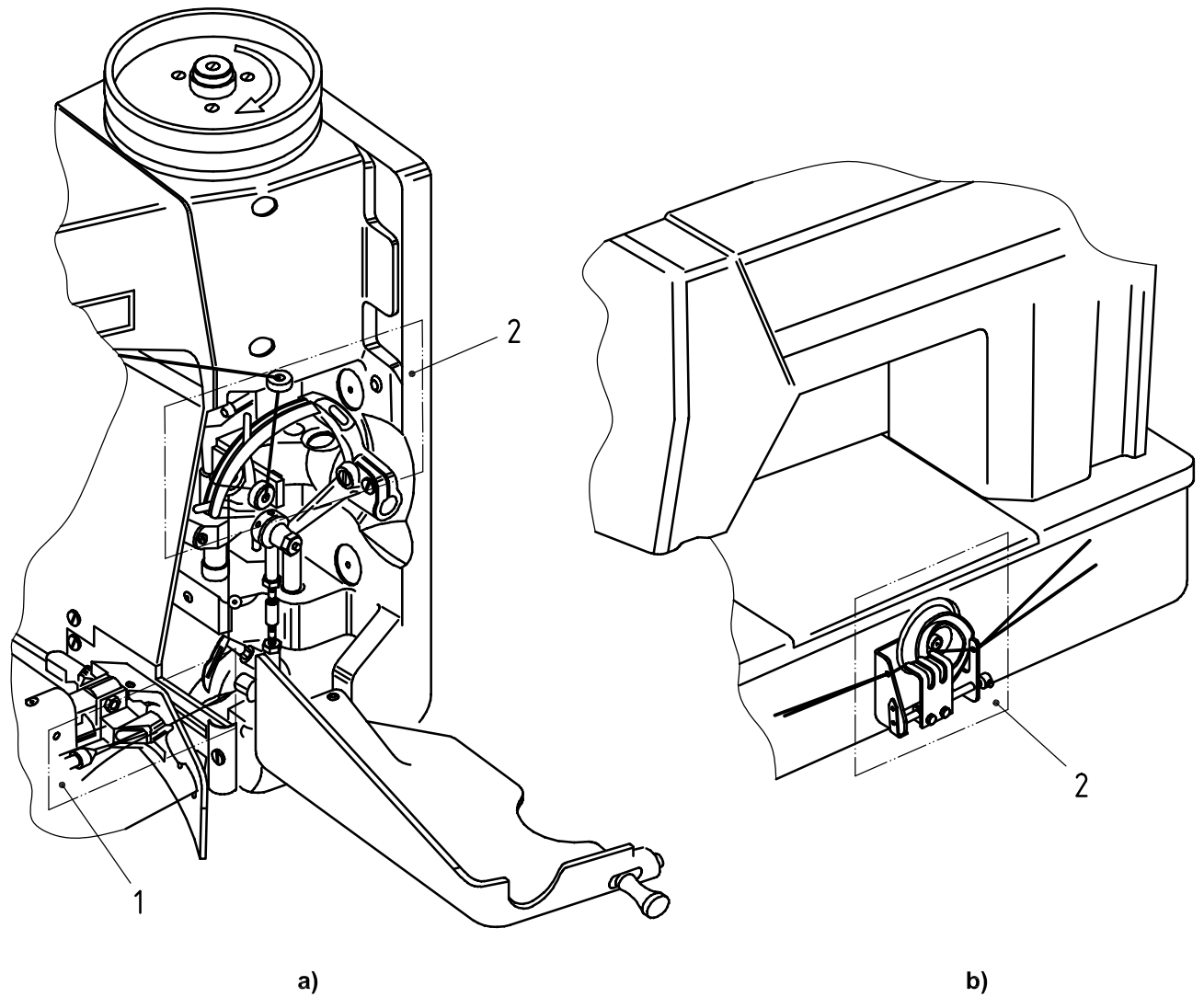


Figure 6 — Danger zones — Zone I (see 4.2.1): hook with vertical axis



**Key**

- 1 zone I
- 2 zone II

**Figure 7 — Danger zones — Zone I (see 4.2.1): looper; Zone II (see 4.2.2): thread take-up**

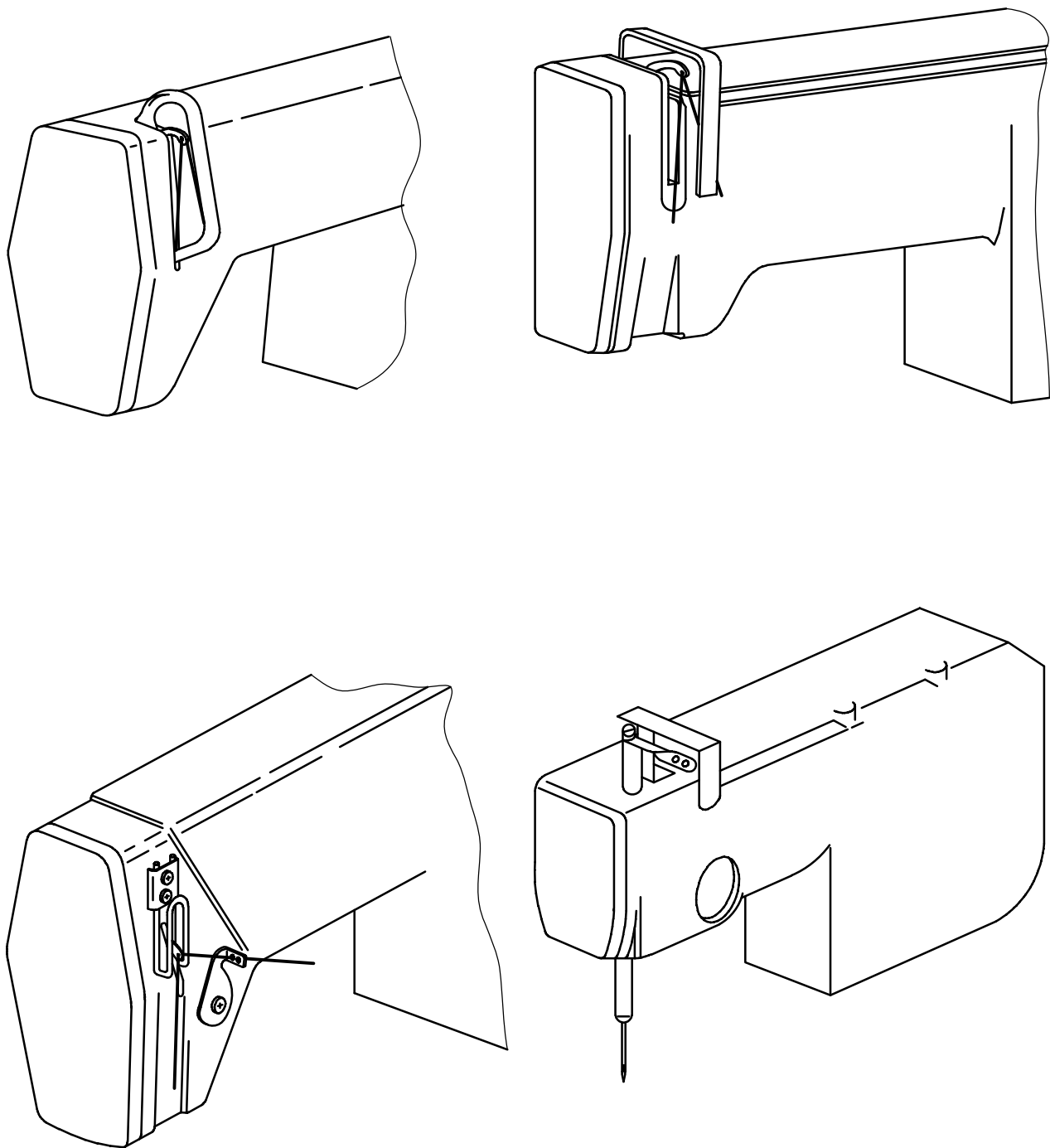


Figure 8 — Danger zones — Zone II (see 4.2.2): thread take-up

## 5 Safety measures and requirements

### 5.1 General principles

**5.1.1** Sewing machines, units and systems shall comply with the safety requirements and/or protective measures of this clause (and of Clause 7). In addition, they shall be designed according to the principles of ISO 12100 for hazards relevant but not significant, which are not dealt with by this document (e.g. sharp edges).

**5.1.2** Gaps between moving surfaces shall not exceed 8 mm where there exists a risk of trapping, severing, crushing or shearing. One possible solution for ensuring the safety of the machines is the provision of safety distances that prevent danger zones from being reached which are in accordance with ISO 13852, ISO 13853 and ISO 13854.

**5.1.3** Safeguarding techniques are not required if the maximum force of a moving part is limited to 50 N and the contact pressure to 50 N/cm<sup>2</sup>.

### 5.2 Requirements for all types of industrial sewing machines

#### 5.2.1 Mechanical equipment

##### 5.2.1.1 Sewing machine needle

Unless otherwise required for particular machine types in other clauses of this document, hazards caused by needle movement shall be eliminated by means of a safeguard device. This requirement is considered to have been met when a finger-deflecting device is used, or when the position of the needle in relation to other devices mounted on the sewing machine (roller foot, spreader, looper, needle cooling tube, feed-in devices, angular tape guide, binder etc.) prevents access of fingers to the sewing machine needle (see Annex A).

Needle breakage protection is only required for specific machines as specified in 5.3.1.

##### 5.2.1.2 Cutter system

The cutter systems such as sewing thread, tape or sewing material cutting device should be designed so that the opening width of the cutter is limited to less than 8 mm. When, due to the sewing operation (e.g. sewing of quilted material), the opening width exceeds 8 mm, this shall be indicated in the instructions (see Clause 7), and, in addition, Form A of the warning sign in accordance with Figure B.1 or ISO 3864:1984, Figure B.3.1, shall be affixed in or near the danger zone. This applies, for example, to lining stitch-in machines in the shoe industry, to sewing units for thick material in the upholstery industry and to bag closing sewing machines in the packaging industry (see 5.3.3), and to other cases where the specific sewing operation does not allow the use of a protective device.

##### 5.2.1.3 Feeding area

The instructions (see Clause 7) shall contain information on the correct use of hazardous feeding elements which cannot be safeguarded completely.

**NOTE** Feeding elements such as a feed dog, feeding chain, presser foot, roller foot and puller feed generally involve low risk.

#### **5.2.1.4 Shuttle/hook/looper assembly**

Hazards caused by movements of stitch forming and thread guiding means shall be eliminated by guards such as casings or covers as far as the sewing process allows (see examples in Figures 7 and 8). The casings/covers need not be interlocked with the sewing machine drive and at the same time will be able to be opened without any tools (see also 5.2.2.3).

To prevent injury during threading, changing bobbins or needles, cleaning, etc., Form B or C of the warning sign according to Annex B (see Clauses B.3 and B.4), shall be affixed in or near the danger zone.

#### **5.2.1.5 Sewing tool exchange and adjustment**

To enable safe threading, changing of bobbin, looper or needle, cleaning, etc., a main switch in accordance with IEC 60204-31:2001, 5.3, shall be installed.

Warning sign, Form B or C (see Clause B.3 or B.4), shall be affixed according to Annex B.

#### **5.2.1.6 Top of needle bar**

The operator shall be protected against impact by the top of the needle bar. Guards such as a bow or stake are suitable (see examples in Figure 8).

#### **5.2.1.7 Thread take-up lever for needle thread, looper thread, etc.**

A guard against an impact hazard, such as a cover, bow or stake, shall be provided (see examples in Figure 8). Movable guards need not be interlocked with the sewing machine drive and will be able to be opened without tools (see also 5.2.2.3).

This requirement does not apply to machines with slow operating speeds (< 500 stitches per minute, e.g. shoe-repairing machines).

#### **5.2.1.8 Handwheel**

Any accessible area on rotating handwheels not fully covered while sewing shall be smooth and shall not have spokes, hazardous openings exceeding 8 mm, protrusions or webs.

The main direction of rotation shall be clearly and visibly marked on the sewing machine (e.g. within the hand wheel area, see Figure 9).

#### **5.2.1.9 Pulley/belt drive at sewing machine**

If the power transmission from motor to handwheel is obtained by an externally running belt, the belt intake point shall be guarded to avoid injury to the operator's fingers [see Figure 9 and Figure E.1a)].

If the distance between the belt and the border of the table top opening exceeds 8 mm, a belt guard shall be provided to reduce the distance to 8 mm or less (see Figure 9 as an example of complete guarding).

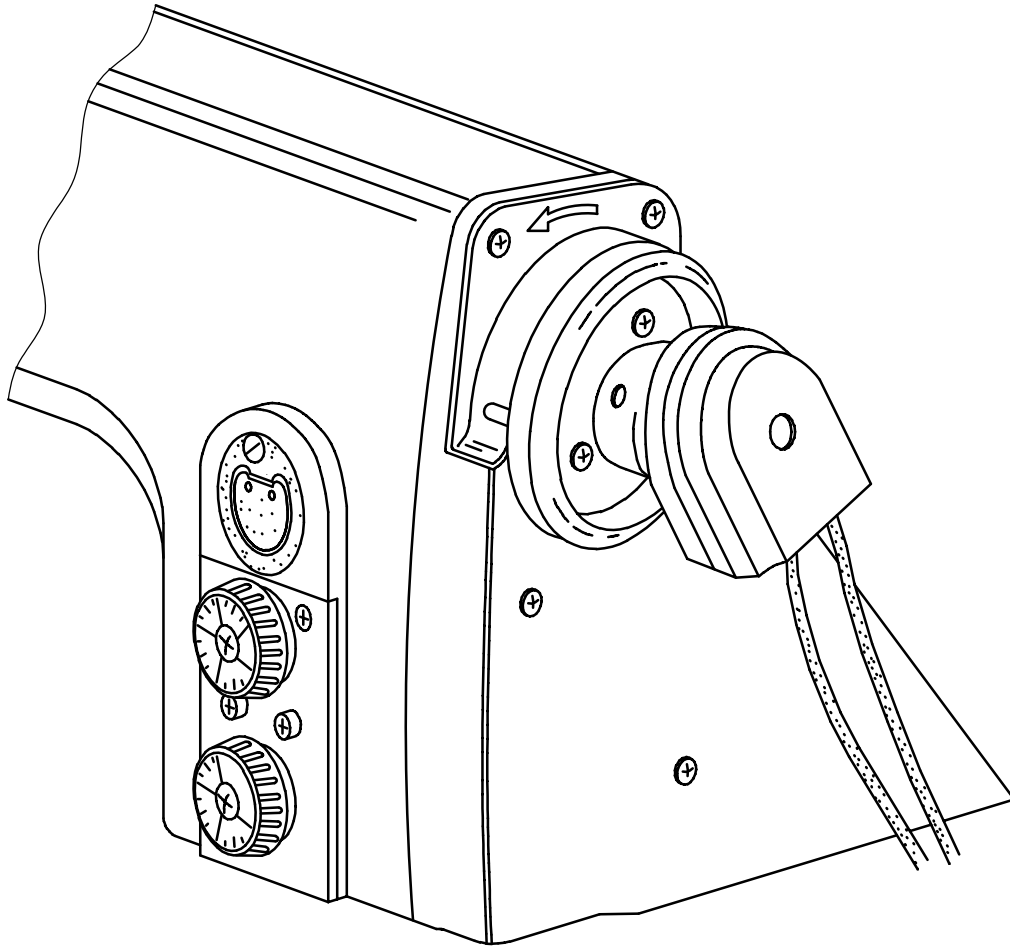


Figure 9 — Example of belt guard

#### 5.2.1.10 Pulley/belt drive at sewing machine drive (motor)

The belt intake point at the pulley of the sewing machine drive shall be guarded so that fingers cannot reach the danger area. This requirement is met when the guard satisfies the requirements of Annex E.

In order to prevent the belts falling off the belt pulley when the sewing machine is being tilted or lowered, a device according to Annex E shall be provided.

NOTE 1 Due to the frequent motor actuation required and, consequently, the high load of the belt pulleys, belt pulleys and drive shafts with taper fit should be used (see Annex F).

NOTE 2 For safe mounting of sewing machine drives, the requirements of Annex H should be followed.

#### 5.2.1.11 Tiltable sewing machines

The sewing machine shall be secured in the frame or table so that, when tilted, it cannot fall out or accidentally drop back.

This requirement is considered to have been met if, for example, the tilted position of the sewing machine is stable or if a locking device is available.

Further information shall be given in the instructions (see Clause 7).

#### **5.2.1.12 Auxiliary equipment**

Considering the diversity of possible auxiliary equipment, the manufacturer shall carry out a risk assessment for defining the required safety measures, taking account of the following.

On auxiliary equipment such as additional feeding, folding, binding, transfer, separating and stacking systems, access to crushing and shearing points shall be prevented by guards, e.g. fencing, covers.

Swivel, flip-over and roll type stackers used on sewing units or sewing systems shall be secured by deterring or impeding devices such as bows or stakes.

#### **5.2.1.13 Stability of the sewing unit**

The sewing unit shall be stable in a tilting range of 15° based on a horizontal floor.

### **5.2.2 Electrical equipment/control/control gear**

#### **5.2.2.1 General**

Electrical systems and equipment for industrial sewing machines shall be in accordance with IEC 60204-31.

All operator-related controls requiring adjustment for changing the working process shall be located outside the electric cabinet.

Machines with several operating modes shall be equipped with a mode-selection device that indicates the mode (e.g. automatic operation, hand-controlled operation, adjustment).

NOTE In general, for sewing machines the different operating modes do not present different safety levels.

In general, on sewing units and systems on which the hazardous movement of parts is limited to parts of the sewing machine itself (e.g. stitch forming elements, feed) protective interlocking is not required.

#### **5.2.2.2 Redundancy/diversity**

On sewing units and systems on which the hazardous movement of parts is limited to parts of the sewing machine itself (e.g. stitch-forming elements, feed), provision of redundancy or use of diversity is not required (see 5.2.2.13).

#### **5.2.2.3 Movable protection device**

Movable protection devices (e.g. needle plate, bed slide, cover for stitch forming and thread-guiding elements) need not be linked to any safety control system (see 5.2.1.4).

#### **5.2.2.4 Starting conditions for automatic start-up by closing a movable or sensitive protection device**

The automatic start-up of automatically or semi-automatically operated sewing units or systems shall be achieved by one of the following:

- for machines requiring an intervention within the danger zones during each sewing cycle, by closing of the protective guard or clearing the danger zone at the least;
- for machines requiring occasional intervention into danger zones, by the additional actuation of a push button.