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

Machines à coudre industrielles — Exigences de sécurité pour machines à coudre, unités et systèmes de couture

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Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

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Foreword

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

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 10821 was prepared by Technical Committee ISO/TC 148, *Sewing machines*.

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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.

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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)[5].

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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.

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

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 — Guidelines for the use of basic standards*

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

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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*

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

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*

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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*

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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*

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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*

ISO 13849-1:1999, *Safety of machinery — Safety-related parts of control systems — Part 1: General principles for design*

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*

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

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*

IEC 60825-1:2005, *Safety of laser products — Part 1: Equipment classification, requirements and user's guide*

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

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3 Terms and definitions

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

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.

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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

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3.10
sewing area
effective range around sewing machine needle between needle plate and the upper turning point of the needle movement

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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

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4 Significant hazards

4.1 General

This clause contains all the significant hazards, hazardous situations and events, as far as they are dealt with in this International Standard, identified by risk assessment as significant for this type of machine and which require action to eliminate or reduce the risk. Before using this International Standard it is important to carry out a risk assessment of the machine to check that its hazards are those identified in this clause.

Danger zone or hazardous situation	Type of hazard	Corresponding reference (see Clauses 5 and 7)
4.2 Mechanics		
4.2.1 Sewing area (Zone I): movements of the		
a) sewing machine needle,	stabbing or puncture	5.2.1.1, Annex A
b) cutter system,	cutting or severing	5.2.1.2, Annexes B and L
c) feeding system,	crushing, shearing, drawing-in or trapping	5.2.1.3
d) shuttle/hook/looper assembly, or	drawing-in or trapping, impact, stabbing or puncture	5.2.1.4, 5.2.2.3, Annexes B and L
e) movement due to sewing tool exchange and adjustment — unintentional operation of the pedal when the machine is not switched "OFF" or during last runnings.	crushing, trapping, shearing, impact	5.2.1.5, Clause 7, Annexes B and L
4.2.2 Sewing machine (Zone II): movement of the		
a) needle bar, or	impact	5.2.1.6
b) thread take-up lever for needle thread, looper thread, etc.	impact	5.2.1.7
4.2.3 Drive (Zone III):		
a) handwheel,	drawing-in or trapping	5.2.1.8
b) pulley/belt drive at sewing machine,	drawing-in or trapping, severing	5.2.1.9, Annexes E and F
c) pulley/belt drive at sewing machine drive (motor).	drawing-in or trapping, severing	5.2.1.10, Annex E, F and H
4.2.4 Tilting area: falling down/out of the uptilted machine by gravity.	crushing, shearing	5.2.1.11, Clause 7
4.2.5 Auxiliary equipment: for example, additional feeding, folding, transfer, separating, stacking system at automated sewing systems.	crushing, shearing, entanglement, drawing-in or trapping, impact	5.2.1.12

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

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Danger zone or hazardous situation	Type of hazard	Corresponding reference (see Clauses 5 and 7)
4.7 Ergonomics		
This covers		
a) unhealthy posture (e.g. chair, height of chair and sewing table),	risk of occupational disease, accelerated fatigue, posture diseases	5.2.6, Annex L
b) inadequacy with human hand, arm or foot, leg anatomy (e.g. arm position while sewing, knee actuator for presser foot lifting),	accelerated fatigue	
c) inadequate local lighting (e.g. bad visibility in sewing area),	eye strain	
and		
d) unhealthy exposure to the jet of air from pneumatic equipment or cooling air from a motor	cold, muscle strain	5.2.6.3
4.8 Special hazards		
4.8.1 Button sewing machine, buttonhole sewing machine, bartacking machine, programmable pattern sewing machine:		
— ejection of parts (e.g. splinted or broken sewing machine needle)	facial injuries (especially eyes), caused by stabbing or puncture	5.3.1, Annex D
4.8.2 Quilting machine	drawing-in	5.3.2
4.8.3 Bag closing sewing machine	drawing-in	5.3.3
4.8.4 Embroidery machine	drawing-in	5.3.4
4.8.5 Glove sewing machine	stabbing or puncture	5.3.5
4.8.6 Sewing machine for shoe repair	stabbing or puncture	5.3.6
4.8.7 Blind stitch sewing machine	stabbing or puncture	5.3.7
4.8.8 Linking machines	stabbing or puncture	5.3.8

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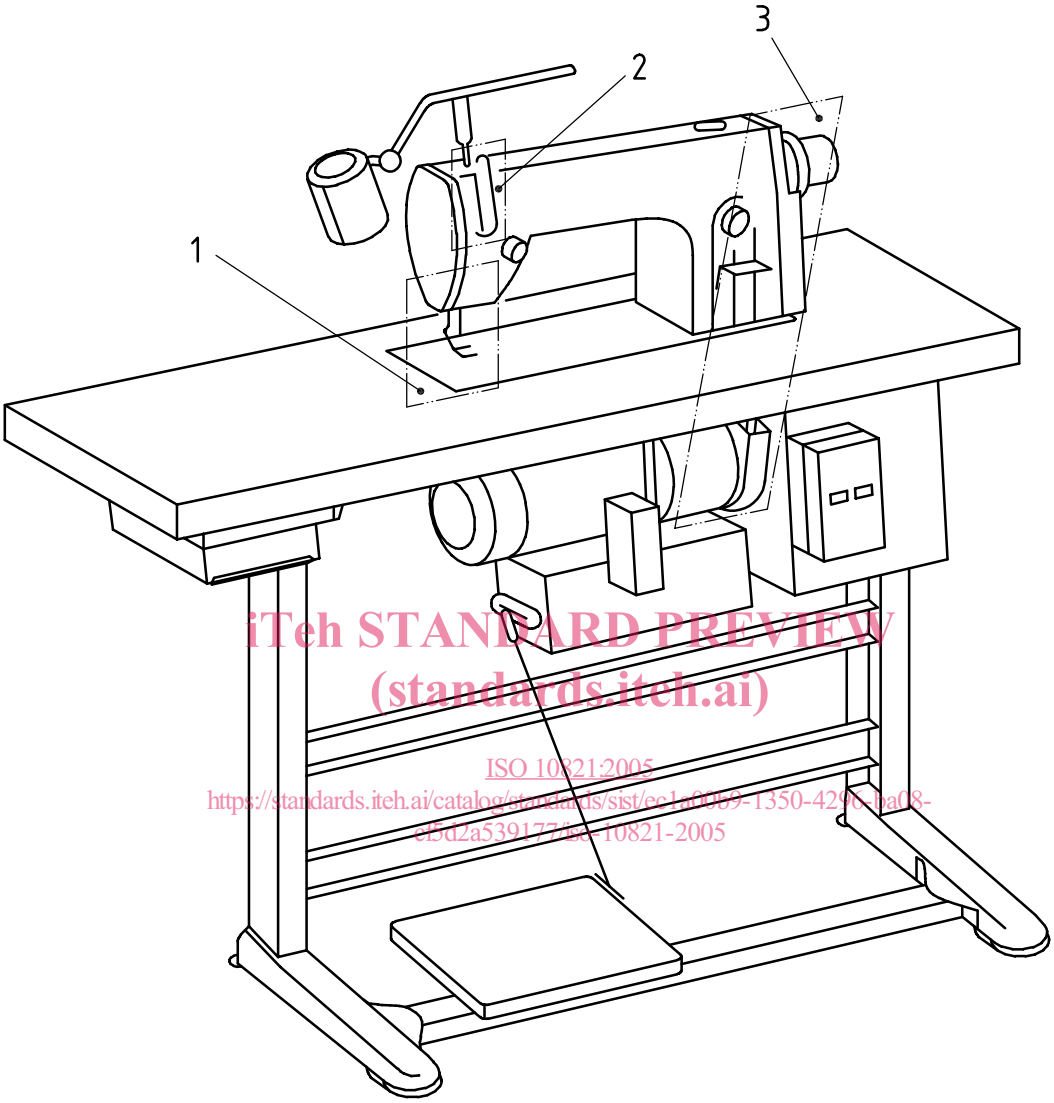
4.9 Danger zones

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.



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Key

1 zone I
2 zone II
3 zone III

Figure 1 — Danger zones — Mechanics (see 4.2)

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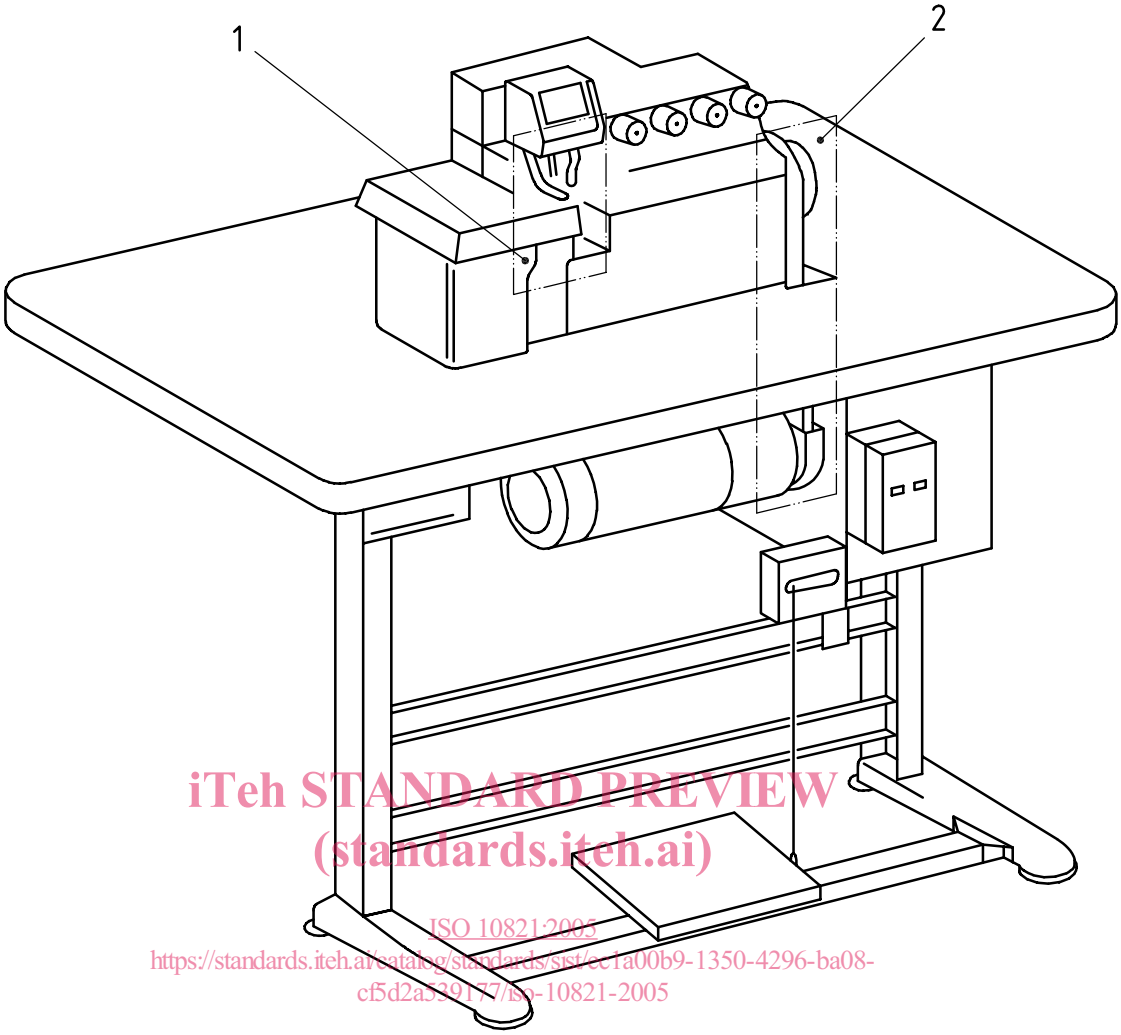

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Key

1 zone I

2 zone III

Figure 2 — Danger zones — Mechanics (see 4.2)

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