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Textile machinery — Safety requirements —

Part 5: Preparatory machinery to weaving and knitting

Matériel pour l'industrie textile — Exigences de sécurité —

Partie 5: Machines de préparation au tissage et au tricotage

Reference number
ISO 11111-5:2005(E)

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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 11111-5 was prepared by Technical Committee ISO/TC 72, *Textile machinery and machinery for dry-cleaning and industrial laundering*, Subcommittee SC 8, *Safety requirements for textile machinery*.

This first edition of ISO 11111-5, together with ISO 11111-1, ISO 11111-2, ISO 11111-3, ISO 11111-4, ISO 11111-6 and ISO 11111-7, cancels and replaces ISO 11111:1995, which has been technically revised.

ISO 11111 consists of the following parts, under the general title *Textile machinery — Safety requirements*:

— *Part 1: Common requirements*

— *Part 2: Spinning preparatory and spinning machines*

— *Part 3: Nonwoven machinery*

— *Part 4: Yarn processing, cordage and rope manufacturing machinery*

— *Part 5: Preparatory machinery to weaving and knitting*

— *Part 6: Fabric manufacturing machinery*

— *Part 7: Dyeing and finishing machinery*

Introduction

ISO 11111-1 to ISO 11111-7 were prepared simultaneously by ISO/TC 72 and CEN/TC 214 and adopted under the Vienna Agreement in order to obtain identical standards on technical safety requirements for the design and construction of textile machinery.

ISO 11111 as a whole is intended for use by any person concerned with the safety of textile machinery, for example, textile machinery designers, manufacturers and systems integrators. It is also of interest to users of textile machines and safety experts.

This document is a type C standard as stated in ISO 12100-1. The various parts of ISO 11111 deal with significant hazards generated by machines used in the textile industry. The machinery concerned and the extent to which hazards are covered are indicated in the scope of this standard.

When provisions of this type C standard are different from those which are stated in type A or B standards, the provisions of this type C standard take precedence.

For hazards of machines and machine elements not dealt with in the relevant part of ISO 11111, the designer is to perform a risk assessment according to ISO 14121 and evolve means for reducing the risk from significant hazards.

This part of ISO 11111 is intended to be used in conjunction with ISO 11111-1. As far as possible, the requirements of this part of ISO 11111 are treated by way of reference to Clauses 5 and 6 of ISO 11111-1. Clause 5 of ISO 11111-1 contains safety requirements and/or measures for frequently occurring hazards of textile machinery which apply whenever referred to in this part of ISO 11111, while Clause 6 describes significant hazards and corresponding safety requirements and/or measures for certain machine elements and their combinations (e.g. rollers), which also apply whenever referred to in this part of ISO 11111.

Textile machinery — Safety requirements —

Part 5: Preparatory machinery to weaving and knitting

1 Scope

This part of ISO 11111 is intended to be used in conjunction with ISO 11111-1. It specifies significant hazards and corresponding safety requirements and/or measures for preparatory machinery to weaving and knitting. By taking into account the scope of ISO 11111-1 as far as is relevant, this part of ISO 11111 is applicable to all machinery, plant and related equipment intended to be used for warping, beaming, sizing, size preparation and storage of warp beams, as specified in Clause 5.

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 9902-1, *Textile machinery — Noise test code — Part 1: Common requirements*

ISO 9902-5, *Textile machinery — Noise test code — Part 5: Weaving and knitting preparatory machinery*

ISO 11111-1:2005, *Textile machinery — Safety requirements — Part 1: Common requirements*

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

IEC 60204-1:2000, *Safety of machinery — Electrical equipment of machines — Part 1: General requirements*

3 Terms and definitions

For the purposes of this part of ISO 11111, the terms and definitions given in ISO 11111-1 apply.

4 List of significant hazards

Significant hazards found in preparatory machines to weaving and knitting which are common with those frequently occurring with other textile machines or with machine elements of other textile machines shall be considered in accordance with ISO 11111-1:2005, Clauses 5 and 6, whenever referred to under the heading “General safety requirements” in Clause 5 of this part of ISO 11111. Significant hazards which are particular to preparatory machines to weaving and knitting are considered as “Specific hazards” in Clause 5 of this part of ISO 11111.

Before using this part of ISO 11111, it is important to carry out a check to ascertain that the specific machine has the significant hazards identified.

NOTE The significant hazards of preparatory machinery to weaving and knitting are always considered in conjunction with safety requirements.

5 Significant hazards and corresponding safety requirements and/or measures

5.1 General

Machinery shall conform to the safety requirements of ISO 11111-1:2005, Clauses 5 and 6, whenever referred to under the heading “General safety requirements” of this Clause 5 and shall conform to the additional “Specific safety requirements” of this Clause 5.

5.2 Warping, beaming and assembly beaming machines

Including cone warping machines, sectional warping machines, beam warping machines, beaming machines, assembly beaming machines, sectional beaming machines, sizing machine headstocks and other similar machinery.

General safety requirements

The safety requirements and/or measures shall be in accordance with Table 1.

Table 1 — General safety requirements relating to warping, beaming and assembly beaming machines

Application	Reference ISO 11111-1:2005
All machines:	
Electrical equipment in general	5.4.2.1 and 5.4.2.2
Electrical control systems	5.4.2.3
Starting and stopping	5.4.2.4
Reduction of risks by design	5.3.2
Reduction of risks by safeguarding	5.3.3
— with guards	Table 2
— with safety devices	Table 3
Static electricity	5.4.4
Fluid power systems and components	5.4.5
Noise	5.4.7, 7, 8.2
Emission of dust and fly	5.4.10
Fire	5.4.11
Ergonomics	5.4.13
Devices for special operation	5.5
Fitting of parts	5.8
Particular machine elements:	
Drive and transmission enclosures	6.2
Rollers	6.5
Walk platforms and walkways	6.13
Automatic machines and equipment	6.21
Mobile machines	6.21.3
Mobile machines (which could leave their defined path)	6.21.4
Floor-mounted and overhead rails (tracks)	6.21.5
Complex installations	6.22

Specific hazards

Mechanical, from the headstock rollers, on-running warp threads, drive or pressure rollers and the beam, the flange, the drive pins, in particular, entanglement, drawing-in or trapping, and resulting from the beam being ejected from the machine, in particular, crushing and impact.

Specific risks

Access during normal operation, particularly when starting up, and during special operation, particularly when touching the surface of the beam or removing laps, leading to low probability of moderate to severe or fatal injury.

Pressure drop or loss of vacuum in a hydraulic or pneumatic beam-clamping device, resulting in the beam falling out of the machine, leading to a low probability of severe or fatal injury.

Specific safety requirements

a) Drawing-in points between the headstock rollers shall be provided with a guard (e.g. a movable interlocked guard).

b) Drawing-in points between the beam and the warp threads, the beam and the drive or pressure roller(s), as well as the beam flange and the floor, shall be provided with guards or safety devices, for example, one of the following:

   1) a movable interlocked guard, as in Figure 1a), reaching down to floor level, having a height determined in accordance with ISO 13852:1996, Table 1;

   2) for beam warping machines only, an active opto-electronic protective device (AOPD) [see Figure 1b)] according to ISO 11111-1:2005, Table 3, arranged such that the AOPD is activated in the case of access to the drawing in-point and the beam has come to a standstill before the operator can reach the drawing in-point.

      NOTE The AOPD can be completed with an additional barrier [e.g. trip bar, see Figure 1b)] that can also be helpful for preventing accidental activation of the AOPD;

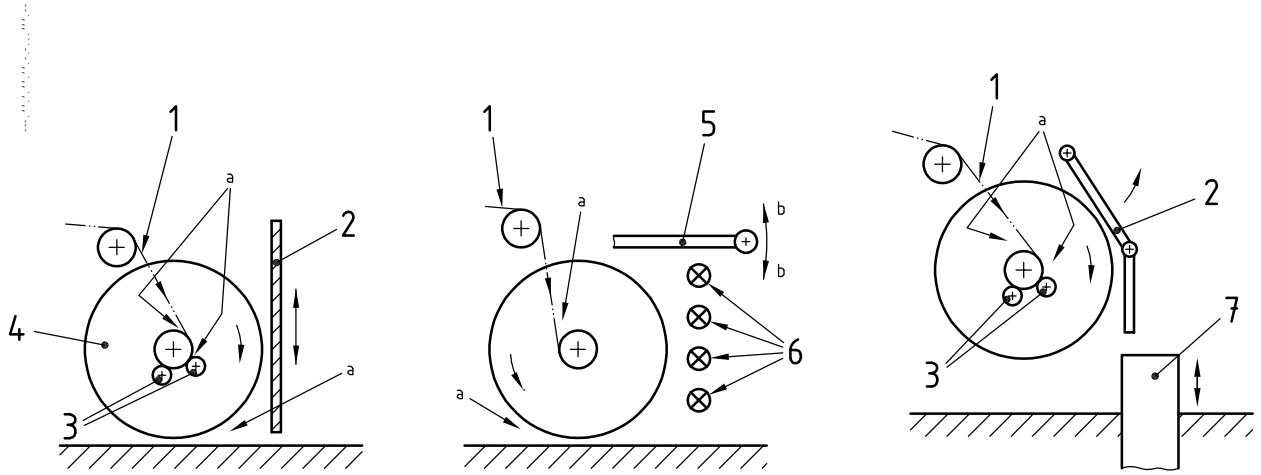
   3) an interlocked elevating platform in conjunction with other guards so designed that together they shall prevent access to any drawing-in point, as in Figure 1c).

c) Beam warping, beaming and sizing machines shall be designed so that when guards and safety devices referred to in a) and b) are made inactive, the machine shall only be capable of movement by one of the following means:

   1) operation at crawl speed in accordance with ISO 11111-1:2005, Table A.1, by means of a hold-to-run control;

   2) rotating the beam by hand.

   These modes facilitate special operations (e.g. the insertion of paper strips).



a) b) c)

Key

1 warp threads
2 movable interlocked guard
3 pressure rollers
4 beam flange
5 trip bar
6 AOPD
7 interlocked elevating platform

a Danger zone.

b Stop.

Figure 1 — Safeguarding of drawing-in points

d) On cone sectional warping machines, the adjustable cone blades shall be designed so that the risk of entanglement and impact is removed. This may be accomplished by means of a cover closing the open ends of the bars.

e) Hydraulically or pneumatically powered beam-clamping devices shall be designed such that the beam remains clamped during the functioning of the machine even in the event of a pressure drop or loss of vacuum.

f) A warning shall be given in the instruction handbook that the beams used shall be precisely balanced and over-rapid rotation of the beam shall be prevented.

5.3 Sizing equipment

5.3.1 Common requirements of sizing machines

General safety requirements

The safety requirements and/or measures shall be in accordance with Table 2.

5.3.2 Cylinder dryers for sizing lines

General safety requirements

The safety requirements and/or measures shall be in accordance with 5.3.1 and Table 3.

Table 2 — General safety requirements relating to sizing machines

Application	Reference ISO 11111-1:2005
All machines:	
Electrical equipment in general	5.4.2.1 and 5.4.2.2
Electrical control systems	5.4.2.3
Starting and stopping	5.4.2.4
Reduction of risks by design	5.3.2
Reduction of risks by safeguarding	5.3.3
— with guards	Table 2
— with safety devices	Table 3
Fluid power systems and components	5.4.5
Noise	5.4.7, 7, 8.2
Emission of dust and fly	5.4.10
Ergonomics	5.4.13
Devices for special operation	5.5
Elevated servicing positions	5.6
Escape and rescue of trapped persons	5.7
Fitting of parts	5.8
Particular machine elements:	
Drive and transmission enclosures	6.2
Rollers	6.5
Doors and lids, opening and closing	6.8.2
Doors and lids, locking and unlocking	6.8.3
Entry into machines, vessels or items of plant	6.8.4
Observation windows	6.9
Conveyors	6.10
Fans	6.11
Work platforms and walkways, work adjacent to tanks and pits	6.13
Devices for steam heating of liquors	6.15
Automatic machines and equipment	6.21
Complex installations	6.22

Table 3 — Additional safety requirements relating to cylinder dryers for sizing lines

Application	Reference ISO 11111-1:2005
All machines:	
Hot surfaces	5.4.6.1
Other items:	
Fence guards	A.3

Specific hazards

Mechanical, from the cylinders and on-running warp threads, in particular, drawing-in between cylinders or cylinders and warp threads;

Specific risks

When removing laps from drying cylinders, leading to low probability of severe injury.

Specific safety requirements

a) Where the drying cylinders are enclosed with fence guards or a thermal cabinet, any side access doors shall be interlocked with the drive to the cylinders. However, the cylinders may be operated at crawl speed in accordance with ISO 11111-1:2005, Table A.1, while the access doors are open, provided that the control button is a hold-to-run type. This control button shall be mounted either on the door in such a position that the danger zones can be observed by the operator or on a portable control station (hand-held unit) for use when removing laps from the drying cylinders. In the latter case, the appliance and allied cabling shall be fail-safe (i.e. it shall prevent the machine running in the case of interruption or short circuit) in accordance with ISO 11111-1:2005, Table 6. A cableless portable control station shall comply with IEC 60204-1:2000, 9.2.7.

b) Where operation with the door open using a hold-to-run device is not possible, the drying cylinders shall be operated at reduced running speed in accordance with ISO 11111-1:2005, Table A.2, in combination with an emergency stop device, provided the operator has easy access to it over the whole roller width.

c) Information shall be given in the instruction handbook concerning the safe removal of laps and threading-up.

5.3.3 Size baths

General safety requirements

The safety requirements and/or measures shall be in accordance with 5.3.1 and Table 4.

Table 4 — Additional safety requirements relating to size baths

Application	Reference ISO 11111-1:2005
All machines:	
Hot liquor (size)	5.4.6.2
Particular machine elements:	
Work platforms and walkways, ladders	6.13

Specific hazards

Mechanical, from the rollers, in particular, drawing-in.

Specific risks

When removing laps from squeeze rollers, leading to low probability of severe injury.

Specific safety requirements

The size baths shall be designed to prevent access to the drawing-in points of rollers, and to facilitate safe removal of laps from squeeze rollers, by means of one or the other of the following measures.

a) An interlocking enclosing guard shall be provided which prevents access to the drawing-in points between each pair of squeeze rollers during normal operation. The machine may be run at crawl speed in accordance with ISO 11111-1:2005, Table A.1, with the guard open, provided that the crawl speed control button is the hold-to-run type and is located in a position from which the squeeze rollers can be seen clearly. If this is not possible, the machine shall be run at reduced running speed in accordance with ISO 11111-1:2005, Table A.2, combined with an emergency stop device that can be reached by the operator over the whole roller width.

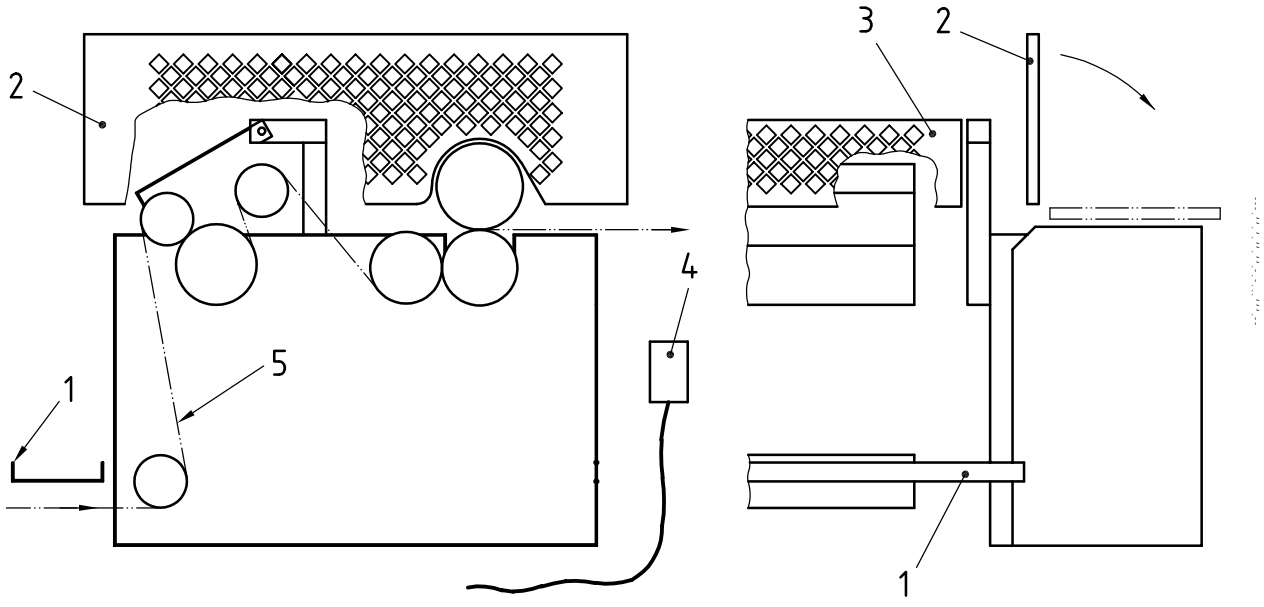
b) The size bath shall be fitted with movable interlocked guards on both sides (lateral) and over the width (see Figure 2).

   Precautions shall be taken to reduce the risk when threading-up the warp threads, mending broken ends, removing laps or cleaning the trough, e.g. by one of the following:

   1) The machine shall be stopped, when one of the movable guards is opened, however with the guard open the machine shall be run at crawl speed only by means of a hold to run control;

   2) A walkway or work platform with a pressure-sensitive surface (e.g. pressure-sensitive mat or floor) with handrail or handle shall be provided, as shown in Figure 3. It shall be so designed that when an operator is present on the sensitive surface, the machine will only operate at crawl speed, and by means of a hold-to-run control. If this is not possible, the machine shall be operated at reduced running speed provided the operator on the sensitive surface has easy access to an emergency stop device over the whole roller width.

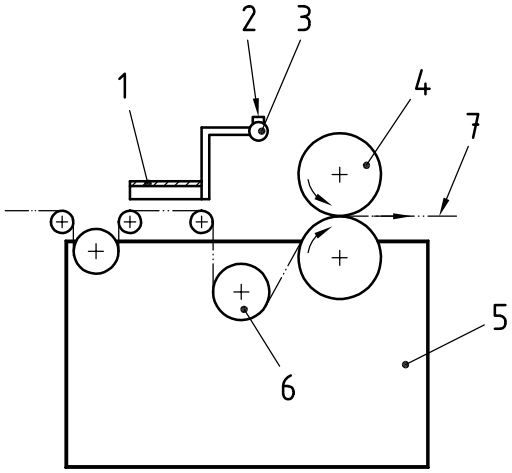
c) The instruction handbook shall contain information about safe methods for threading-up and removing laps.



Key

1 work platform (access passage way)
2 movable distance guard (lateral)
3 movable distance guard (width)
4 hold to run-control device (mobile or fixed)
5 warp threads

Figure 2 — Size bath with movable interlocked distance guards



Key

1 pressure-sensitive work platform
2 hold-to-run control
3 handle
4 Squeeze rollers
5 size bath
6 ducking roller (immersion)
7 warp threads

Figure 3 — Interlocked work platform on size bath

5.4 Size kettles

General safety requirements

The safety requirements and/or measures shall be in accordance with Table 5.

Specific hazards

Thermal, from hot sizing fluid.

Specific risks

Low probability of moderate-to-severe injury from hot sizing fluid spilling over and splashing.

Table 5 — General safety requirements relating to size kettles

Application	Reference ISO 11111-1:2005
All machines:	
Electrical equipment in general	5.4.2.1 and 5.4.2.2
Electrical control systems	5.4.2.3
Starting and stopping	5.4.2.4
Reduction of risks by design	5.3.2
Reduction of risks by safeguarding	5.3.3
— with guards	Table 2
— with safety devices	Table 3
Hot surfaces	5.4.6.1
Hot liquor (size) or steam	5.4.6.2
Emission of dust and fly	5.4.10
Fire	5.4.11
Ergonomics	5.4.13
Devices for special operation	5.5
Fitting of parts	5.8
Particular machine elements:	
Drive and transmission enclosures	6.2
Rotating shafts	6.6
Doors and lids, opening and closing	6.8.2
Doors and lids, locking and unlocking	6.8.3
Walk platforms and walkways, work adjacent to tanks and pits	6.13
Devices for steam heating of liquors	6.15
Liquor preparatory equipment, incorporating stirrer	6.16

Specific safety requirements

a) For size kettles within which the size cannot be boiled, in addition to temperature regulation, a safety thermostat shall be provided for limiting the temperature below the boiling point, e.g. 96 °C, and/or a splash cover shall be provided. The safety thermostat shall be located where it will normally register the highest temperature in the system.

b) For size kettles within which the size *can* be boiled, the size kettle shall be equipped with a lid and vented. The lid shall be interlocked with guard locking (with feed back), and shall not be able to be opened unless

   1) the energy supply (e.g. steam) has been interrupted, and

   2) the size has been cooled to 80 °C, and

   3) the stirrer has stopped, and

   4) at least 30 s have elapsed.

   Provided that the temperature is below 50 °C, the stirrer shall only be able to run with the lid open at a speed low enough to prevent spilling and splashing.

5.5 Storage equipment for warp beams

Stands for holding beams of warp yarn for sizing, weaving and knitting machines.

General safety requirements

The safety requirements and/or measures shall be in accordance with Table 6.

Table 6 — General safety requirements relating to storage equipment for warp beams

Application	Reference ISO 11111-1:2005
All machines:	
Electrical equipment in general	5.4.2.1 and 5.4.2.2
Electrical control systems	5.4.2.3
Starting and stopping	5.4.2.4
Reduction of risks by design	5.3.2
Reduction of risks by safeguarding	5.3.3
— with guards	Table 2
— with safety devices	Table 3
Ergonomics	5.4.13
Elevated servicing positions	5.6
Fitting of parts	5.8
Particular machine elements:	
Drive and transmission enclosures	6.2
Handwheels	6.7.2
Conveyors	6.10

Specific hazards

Mechanical, from the beam falling, in particular, crushing and impact and from the drive, in particular, drawing-in.

Specific risks

During normal operation and also after loading, leading to low probability of severe or fatal injury if a beam falls out of the stand.

Specific safety requirements

a) The beam support brackets on the stands shall be sufficient in size and strength to carry the maximum beam load and so designed as to retain the beams in position.

b) The beam stands shall be designed so as to prevent beams falling out (e.g. by means of a series of vertical bars along the beam stand).

c) Any drawing-in points between drive chain and sprockets shall be guarded (e.g. by fixed covers).

6 Verification of the safety requirements and/or measures

Final verification shall be carried out when the machine is in a fully commissioned condition in accordance with ISO 11111-1:2005, Clause 7 and Annex C.

Noise emission values shall be determined for all machines covered by this part of ISO 11111 in accordance with ISO 9902-1 and ISO 9902-5, whether or not noise is a significant hazard.

7 Information concerning machine use

Information for use of the machine shall be provided in accordance with ISO 11111-1:2005, Clause 8. It shall include all elements in Clause 5.

Noise emission values shall be declared for all machines covered by this part in accordance with ISO 9902-1 and ISO 9902-5, whether or not noise is a significant hazard.

Bibliography

[1] ISO 14121, *Safety machinery — Principles of risk assessment*

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

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