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Textile machinery — Safety requirements —

Part 7: Dyeing and finishing machinery

Matériel pour l'industrie textile — Exigences de sécurité —

Partie 7: Machines de teinture et de finissage

Reference number
ISO 11111-7:2005(E)

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ISO copyright office
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 11111-7 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 11111-7, together with ISO 11111-1, ISO 11111-2, ISO 11111-3, ISO 11111-4, ISO 11111-5 and ISO 11111-6, 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 frequent and 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 or 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 such 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 7: Dyeing and finishing machinery

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 dyeing and finishing machinery. 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 in preparation, dyeing, printing, fixation, wetting, drying, finishing and making-up/presentation, 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 9902-7, *Textile machinery — Noise test code — Part 7: Dyeing and finishing machinery*

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

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

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

IEC 60519-1:2004, *Safety in electroheat installations — General requirements*

IEC 60519-9:1987, *Safety in electroheat installations — Particular requirements for high-frequency dielectric heating installations*

EN 1539:2000, *Dryers and ovens, in which flammable substances are released — Safety requirements*

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

3 Terms and definitions

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

4 List of significant hazards

Significant hazards found in dyeing and finishing machines 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 dyeing and finishing machines 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 dyeing and finishing machines 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.

The safety requirements of ISO 11111-1:2005, 5.4.6.1, apply to steam pipes and their fittings. For external surfaces of equipment containing hot liquids a warning is considered to be acceptable.

5.2 Preparation machines and equipment

5.2.1 Common requirements for preparation machines and equipment

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

Table 1 — General safety requirements relating to preparation machines and equipment

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
Devices for special operation	5.5
Fitting of parts	5.8

5.2.2 Brushing machines

General safety requirements

The safety requirements and/or measures shall be in accordance with 5.2.1 and Table 2.

Table 2 — Additional safety requirements relating to brushing machines

Application	Reference ISO 11111-1:2005
All machines:	
Noise	5.4.7, 7, 8.2
Emission of dust	5.4.10
Fire	5.4.11
Escape and rescue of trapped persons	5.7
Particular machine elements:	
Drive and transmission enclosures	6.2
Electrical control system	6.3 f)
Rollers	6.5
Observation windows	6.9
Batchers	6.18
Pilers and plaiters	6.20
Complex installations	6.22

Specific hazards

Mechanical, from the rotating brushing rollers, in particular, trapping, drawing-in or entanglement.

Specific risks

Access during normal operation, leading to low probability of severe injury.

Specific safety requirements

Enclosing guards shall be provided for the brushing rollers, which may be a combination of fixed and movable guards (e.g. full-width movable guards) to allow access for cleaning. The movable guards shall be interlocked with guard locking.

5.2.3 Cropping machines, shearing machines

General safety requirements

The safety requirements and/or measures shall be in accordance with 5.2.1 and Table 3.

Table 3 — Additional safety requirements relating to cropping and shearing machines

Application	Reference ISO 11111-1:2005
All machines:	
Noise	5.4.7, 7, 8.2
Emission of dust	5.4.10
Fire	5.4.11
Escape and rescue of trapped persons	5.7
Particular machine elements:	
Drive and transmission enclosures	6.2
Electrical control system	6.3 f)
Rollers	6.5
Observation windows	6.9
Fans	6.11
Batchers	6.18
Pilers and plaiters	6.20
Complex installations	6.22

Specific hazards

Mechanical, from the spiral cutting/cropping blades, in particular, cutting or severing.

Specific risks

Access during normal and special operation, in particular, when cleaning, leading to a low probability of severe injury.

Specific safety requirements

a) Enclosing guards shall be provided to prevent access to the spiral cutting/cropping blades. These shall be movable interlocking guards with guard locking. The interlock shall operate when the cutters are in motion, whether in the cutting or raised position.

b) There shall be no finger or hand access to the cutting/cropping blades from the rear of the machine.

c) Provisions shall be made to enable the blades to be sharpened while mounted in the machines. This may be achieved by designing the machine so that the spiral cutting blade can be run in the reverse direction at a reduced running speed when the guard is open.

5.2.4 Slitting machines

This type of machine can perform its function by way of steel knives (moving or stationary blades) and heated knives. This provision is not applicable to slitting machines specified in ISO 11111-1:2005, 1.4.

General safety requirements

The safety requirements and/or measures shall be in accordance with 5.2.1 and Table 4 .

Table 4 — Additional safety requirements relating to slitting machines

Application	Reference ISO 11111-1:2005
All machines:	
Lasers	5.4.8
Fumes	5.4.10
Particular machine elements:	
Drive and transmission enclosures	6.2
Rollers	6.5
Conveyors	6.10
Cutting devices	6.12
Batchers	6.18
Pilers and plaiters	6.20

Specific hazards

Mechanical, from the rotating cutting device.

Specific risks

Low probability of severe injury from contact with the rotating cutting device, particularly while it is running down.

Specific safety requirements

a) A braking device shall be fitted to the drive motor.

b) Visual indication of blade rotation shall be provided.

c) The blade shall be fully guarded when in the raised position.

5.2.5 Singeing machines

The safety requirements and/or measures shall be in accordance with 5.2.1 and Table 5.

Table 5 — Additional safety requirements relating to singeing machines

Application	Reference ISO 11111-1:2005
All machines:	
Noise	5.4.7, 7, 8.2
Fumes	5.4.10
Fire	5.4.11
Elevated servicing positions	5.6
Particular machine elements:	
Drive and transmission enclosures	6.2
Rollers	6.5
Fans	6.11
Work platforms and walkways	6.13
Burners	6.14
Batchers	6.18
Pilers and plaiters	6.20

5.2.6 Desizing (scouring) machines

The safety requirements and/or measures shall be in accordance with 5.2.1 and Table 6.

Table 6 — Additional safety requirements relating to desizing machines

Application	Reference ISO 11111-1:2005
All machines:	
Hot processing materials: liquor or steam	5.4.6.2
Chemicals	5.4.10
Elevated servicing positions	5.6
Escape and rescue of trapped persons	5.7
Particular machine elements:	
Drive and transmission enclosures	6.2
Rollers	6.5
Work platforms and walkways	6.13
Devices for steam heating of liquors	6.15
Liquor preparatory equipment	6.16
Dancing rollers	6.17
Batchers	6.18
Mangles	6.19
Pilers and plaiters	6.20
Complex installations	6.22
	This part of ISO 11111
Other items:	
Hot surfaces	5.1
Contact with steam	5.2.12 b)
Atmospheric dyeing machines and apparatus	5.3.2

5.2.7 Discontinuous bleaching plants (open kiers)

The safety requirements and/or measures shall be in accordance with 5.2.1 and Table 7.

Table 7 — Additional safety requirements relating to discontinuous bleaching plants (open kiers)

Application	Reference ISO 11111-1:2005
All machines:	
Fluid power systems and components	5.4.5
Chemicals	5.4.10
Elevated servicing positions	5.6
Particular machine elements:	
Doors and lids, opening and closing	6.8.2
Doors and lids, locking and unlocking	6.8.3
Work platforms and walkways	6.13
Devices for steam heating of liquors	6.15
	This part of ISO 11111
Other items:	
Hot surfaces	5.1
Atmospheric dyeing apparatus	5.3.2

5.2.8 Bleaching pits

The safety requirements and/or measures shall be in accordance with 5.2.1 and Table 8.

Table 8 — Additional safety requirements relating to bleaching pits

Application	Reference ISO 11111-1:2005
All machines:	
Chemicals	5.4.10
Particular machine elements:	
Workplaces adjacent to pits	6.13
Pilers and plaiters	6.20
	This part of ISO 11111
Other items:	
Hot surfaces	5.1
Atmospheric dyeing apparatus	5.3.2

5.2.9 Continuous bleaching plants

The safety requirements and/or measures shall be in accordance with 5.2.1 and Table 9.

Table 9 — Additional safety requirements relating to continuous bleaching plants

Application	Reference ISO 11111-1:2005
All machines:	
Fluid power systems and components	5.4.5
Hot processing materials: liquor or steam	5.4.6.2
Chemicals	5.4.10
Elevated servicing positions	5.6
Escape and rescue of trapped persons	5.7
Particular machine elements:	
Drive and transmission enclosures	6.2
Rollers	6.5
Rotating shafts	6.6
Doors and lids, opening and closing	6.8.2
Doors and lids, locking and unlocking	6.8.3
Entry into vessels	6.8.4
Work platforms and walkways	6.13
Devices for steam heating of liquors	6.15
Dancing rollers	6.17
Batchers	6.18
Mangles	6.19
Pilers and plaiters	6.20
Complex installations	6.22
	This part of ISO 11111
Other items:	
Hot surfaces	5.1
Contact with steam	5.2.12 b)
Atmospheric dyeing machines/apparatus	5.3.2

5.2.10 Washers

The safety requirements and/or measures shall be in accordance with 5.2.1 and Table 10.

Table 10 — Additional safety requirements relating to washers

Application	Reference ISO 11111-1:2005
All machines:	
Fluid power systems and components	5.4.5
Hot processing materials: liquor or steam	5.4.6.2
Noise	5.4.7, 7, 8.2
Chemicals	5.4.10
Elevated servicing positions	5.6
Escape and rescue of trapped persons	5.7
Particular machine elements:	
Drive and transmission enclosures	6.2
Rollers	6.5
Rotating shafts	6.6
Doors and lids, opening and closing	6.8.2
Doors and lids, locking and unlocking	6.8.3
Entry into vessels	6.8.4
Work platforms and walkways	6.13
Devices for steam heating of liquors	6.15
Liquor preparatory equipment	6.16
Dancing rollers	6.17
Batchers	6.18
Mangles	6.19
Pilers and plaiters	6.20
Complex installations	6.22
	This part of ISO 11111
Other items:	
Hot surfaces	5.1
Contact with steam	5.2.12 b)
Atmospheric dyeing machines/apparatus	5.3.2

5.2.11 Autoclaves

The safety requirements and/or measures shall be in accordance with 5.2.1 and Table 11.

Table 11 — Additional safety requirements relating to autoclaves

Application	Reference ISO 11111-1:2005
Particular machine elements:	
Rotating shafts	6.6
Wheels	6.7
Doors and lids, opening and closing	6.8.2
Doors and lids, locking and unlocking	6.8.3
Automatic loading and unloading	6.21.2 and 6.21.3
NOTE Specific requirements for pressure containments are not dealt with (see ISO 11111-1:2005, 1.2).	

5.2.12 Continuous steamers for fabric

General safety requirements

The safety requirements and/or measures shall be in accordance with 5.2.1 and Table 12.

Table 12 — Additional safety requirements relating to continuous steamers for fabric

Application	Reference ISO 11111-1:2005
All machines:	
Hot processing materials: liquor or steam	5.4.6.2
Elevated servicing positions	5.6
Particular machine elements:	
Drive and transmission enclosures	6.2
Rollers	6.5
Rotating shafts	6.6
Doors of pressure steamers	6.8
Observation windows	6.9
Work platforms and walkways	6.13
Batchers	6.18
Mangles	6.19
Pilers and plaiters	6.20
Complex installations	6.22
	This part of ISO 11111
Hot surfaces	5.1
NOTE Specific requirements for pressure containments are not dealt with (see ISO 11111-1:2005, 1.2).	

Specific hazards

Thermal, scalding by steam.

Specific risks

For atmospheric steamers:

— during normal operation, failure of the steam exhaust system, causing unexpected discharge of steam through the inlet and outlet openings, leading to low probability of severe injury;

— during special operation (e.g. opening of doors to deal with laps or break-outs) discharge of steam, leading to low probability of moderate to severe injury;

— during normal and special operations on open-bottom steamers, contact with steam, leading to low probability of moderate injury.

For pressure steamers:

— during normal operation, failure of the pneumatic seals causing unexpected discharge of steam, leading to very low probability of severe injury.

Specific safety requirements

For atmospheric steamers

a) The discharge of steam in dangerous quantities from the fabric entry and delivery openings shall be prevented. For example, seals, water seals, and exhaust slots may be used for certain types of steamers.

b) Where the design of atmospheric steamers is such that the operator can be injured by escaping steam, the steam exhaust system shall be interlocked with the steam supply to bring about its automatic stop.

   Where large quantities of steam could escape from atmospheric steamers, either the doors shall be designed such that they are opened in two stages, in the first stage deflecting the steam upwards away from the operator; or doors shall be interlocked with the steam supply to prevent them being opened until the steam supply has been cut off.

c) For atmospheric open-bottom steamers, preventing access to the steam zone, the steam zone shall not be below a height of 2 500 mm (see ISO 13852:1996, 4.2.1).

For continuous pressure steamers: the fluid-inflated inlet and outlet seals shall be located on the top of the steamer or in a position remote from that part of the steamer where the operator is normally present, and a steam exhaust system shall be fitted, designed to function in case of loss of fluid pressure to the inlet and outlet seals.

5.2.13 J-boxes

The safety requirements and/or measures shall be in accordance with 5.2.1 and Table 13.

Table 13 — Additional safety requirements relating to J-boxes

Application	Reference ISO 11111-1:2005
All machines:	
Chemicals	5.4.10
Elevated servicing positions	5.6
Particular machine elements:	
Drive and transmission enclosures	6.2
Transport rollers	6.5
Doors and lids, opening and closing	6.8.2
Work platforms and walkways	6.13
Devices for steam heating of liquors	6.15

5.2.14 Mercerizing equipment

The safety requirements and/or measures shall be in accordance with 5.2.1 and Table 14.

Table 14 — Additional safety requirements relating to mercerizing equipment

Application	Reference ISO 11111-1:2005
All machines:	
Hot processing materials: liquor or steam	5.4.6.2
Chemicals	5.4.10
Elevated servicing positions	5.6
Escape and rescue of trapped persons	5.7
Particular machine elements:	
Drive and transmission enclosures	6.2
Rollers	6.5
Rotating shafts	6.6
Doors and lids	6.8
Observation windows	6.9
Work platforms and walkways	6.13
Devices for steam heating of liquors	6.15
Dancing rollers	6.17
Batchers	6.18
Mangles	6.19
Complex installations	6.22
	This part of ISO 11111
Other items:	
Hot surfaces	5.1
Contact with steam	5.2.12 b)
Atmospheric dyeing machines/apparatus	5.3.2

5.2.15 Crabbing machines

The safety requirements and/or measures shall be in accordance with 5.2.1 and Table 15.

Table 15 — Additional safety requirements relating to crabbing machines

Application	Reference ISO 11111-1:2005
All machines:	
Hot processing materials: liquor or steam	5.4.6.2
Particular machine elements:	
Drive and transmission enclosures	6.2
Rollers	6.5
Doors and lids, opening and closing	6.8.2
Devices for steam heating of liquors	6.15
Batchers	6.18
Mangles	6.19
Pilers and plaiters	6.20
	This part of ISO 11111
Other items:	
Hot surfaces	5.1
Contact with steam	5.2.12 b)
Atmospheric dyeing machines/apparatus	5.3.2

5.2.16 Milling machines

The safety requirements and/or measures shall be in accordance with 5.2.1 and Table 16.

Table 16 — Additional safety requirements relating to milling machines

Application Particular machine elements	Reference ISO 11111-1:2005
Drive and transmission enclosures	6.2
Rollers	6.5

5.3 Dyeing machines and apparatus

5.3.1 Common requirements for dyeing machines and apparatus

The safety requirements and/or measures shall be in accordance with Table 17.

Table 17 — General safety requirements relating to dyeing machines and apparatus

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 processing materials: liquor or steam	5.4.6.2
Chemicals	5.4.10
Ergonomics	5.4.13
Devices for special operation	5.5
Elevated servicing positions	5.6
Fitting of parts	5.8
	This part of ISO 11111
Other items:	
Hot surfaces	5.1

5.3.2 Atmospheric dyeing machines and apparatus

This includes machines in which the process material is passed through a bath of dyeing liquor, and apparatus in which the liquor is forced through stationary material packages.

General safety requirements

The safety requirements and/or measures shall be in accordance with 5.3.1 and Table 18.

Table 18 — Additional safety requirements relating to atmospheric dyeing machines and apparatus

Application	Reference ISO 11111-1:2005
All machines:	
Noise	5.4.7, 7, 8.2
Particular machine elements:	
Drive and transmission enclosures	6.2
Doors and lids, opening and closing	6.8.2
Work platforms and walkways, work places adjacent to the machine	6.13
Devices for steam heating of liquors	6.15

Specific hazards

Scalding when adding chemicals or when operating the steam valve.

Specific risks

During normal operation, high probability of severe or fatal injury from overflowing or boiling over.

Specific safety requirements

a) For allowing safe addition of chemicals, means shall be provided to limit temperature and liquor level to preset values (e.g. control devices for temperature and filling level in conjunction with power-operated valves).

   The work cycle shall only be restarted by the operator when the addition of chemicals is complete. Corresponding information shall be given in the instruction handbook.

   Each vessel shall be provided with a catch pan, spillway diverter or similar device to deflect overflowing liquor safely away from the operator.

   Each vessel shall be provided with an individual pipe of appropriate diameter to discharge its content in case of overflow. Information shall be given in the instruction handbook concerning the volume and rate of discharge from the machine.

b) Where steam is used for direct heating of the liquor, the operator shall be protected from scalding when operating the steam control (e.g. by locating the shut-off valves on the steam line at a suitable distance from the vessel). Additionally, the operator of the steam control may be protected by providing a lid or cover for an atmospheric vessel.

5.3.3 High temperature dyeing machines and apparatus

This includes machines in which the process material is passed through a bath of dyeing liquor, and apparatus in which the liquor is forced through stationary material packages.

General safety requirements

The safety requirements and/or measures shall be in accordance with 5.3.1 and Table 19.

Table 19 — Additional safety requirements relating to high temperature dyeing machines/apparatus

Application	Reference ISO 11111-1:2005
All machines:	
Noise	5.4.7, 7, 8.2
Particular machine elements:	
Drive and transmission enclosures	6.2
Doors and lids, opening and closing	6.8.2
Doors and lids, locking and unlocking	6.8.3
Devices for steam heating in liquor preparation plants	6.15
	This part of ISO 11111
Liquor preparation plants for dyeing processes	5.3.4
NOTE Specific requirements for pressure containments are not dealt with (see ISO 11111-1:2005, 1.2).	

Specific hazards

Mechanical combined with thermal, by explosive opening of the door or lid or by explosive ejection of machine/apparatus fragments. In particular, the use of hydrogen peroxide for bleaching can cause explosion where over-rapid decomposition occurs.

Thermal, scalding due to ejected hot liquor or steam

— owing to explosive vaporization of pockets of superheated fluid after the door or lid has been opened;

— owing to a residual pressure when opening the door or lid,

— when opening sample pots without closing the connection pipes and venting, or

— owing to pockets of high temperature liquor retained in rope-form fabrics.

Specific risks

Low probability of severe injury from the door opening explosively on release as a result of residual pressure.

High probability of severe injury due to the escape of steam or hot liquor when opening the machine/apparatus at the beginning or end of the cycle or for clearing a fault during the cycle.

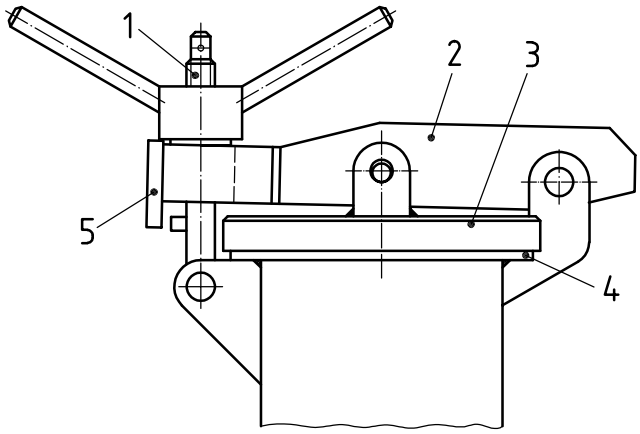
Low probability of severe or fatal injury as a result of the over-rapid decomposition of hydrogen peroxide.

Specific safety requirements

a) Where vertical vessels are used to dye either packages or loose fibre stock, and are fitted with doors or lids which can be opened before the vessel is drained, a thermal interlock with guard locking shall be installed to prevent the door or lid being raised until the liquor temperature has been reduced to 80 °C. The lids of sample pots are excluded from compliance with this provision.

b) Vessels, including sample pots, having a bridge or multibolted locking device (i.e. without quick-release catches) shall be fitted with one of the following to divert steam or hot liquor away from the operator: diversion collars, hoods, deflector plates, deflector rings or similar devices.

c) Lids and doors of sample pots shall be designed so that they cannot be opened unless the inlet and outlet connection pipes are closed and the vent pipe is open. This arrangement may be in the form of a single shaft, coupled with the lid or door, which operates the shut-off valves on both the inlet and outlet connection pipes together with the valve to the vent pipe. Alternatively, sample pots can be safeguarded by a bridge locking device (see Figure 1) in which the bridge is hinged on one side and retained by a hinge bolt with a butterfly nut fitted on the opposite side. The nut shall be retained in the bridge by a lug or collar until it has unscrewed at least 3 mm, to allow any pressure to be released. A deflecting ring shall be fitted to the lid to prevent injury to the operator from any escaping steam. The instruction handbook shall contain a warning that if steam is escaping, the connecting lines between the sample pot and main vessel is to be checked to ensure that they are closed, and the vent is open.



Key

1 locking element (e.g. hinge bolt with butterfly nut)
2 bridge
3 lid
4 deflecting ring
5 lug

Figure 1 — Bridge locking device

d) Where high-temperature machines are used to dye fabric in rope form, there is a danger of pockets of super-heated fluid being trapped in the vessel if the fabric rope becomes tangled or knotted. It is impossible to detect these ”hot-spots” and therefore information shall be given in the instruction handbook that operators are to be instructed to wear protective clothing when opening a machine to release an entanglement.

e) Where hydrogen peroxide is used for bleaching, the vessel and its control systems shall be designed with control measures such that the permissible operating pressure cannot be exceeded by more than 10 %. This may be achieved by controlling the rate of the chemical reaction and by incorporating means of venting the pressure.

NOTE The control measures and means of venting are not described in ISO 11111-1 to -7.

5.3.4 Liquor preparation plants for dyeing processes

The safety requirements and/or measures shall be in accordance with 5.3.1 and Table 20.

Table 20 — Additional safety requirements relating to liquor preparation plants for dyeing processes

Application	Reference ISO 11111-1:2005
Particular machine elements:	
Work place adjacent to the plant	6.13
Devices for steam heating of liquors	6.15
Stirrers	6.16
	This part of ISO 11111
Other items:	
Adding chemicals and operating the steam valve	5.3.2

5.3.5 Jigs

General safety requirements

The safety requirements and/or measures shall be in accordance with 5.3.1 and Table 21.

Category 3 or 4 according to ISO 13849-1:1999, Clause 6, of the safety-related part of the control system shall be selected.

Table 21 — Additional safety requirements relating to jigs

Application	Reference ISO 11111-1:2005
All machines:	
Noise	5.4.7, 7, 8.2
Particular machine elements:	
Drive and transmission enclosures	6.2
Doors and lids, opening and closing	6.8.2
Observation windows	6.9
Work place adjacent to the machine	6.13
Devices for steam heating of liquors	6.15
Batchers for rewinding the cloth	6.18
Stability of A-frames	**ISO 12100-2:2003, 5.2.6**

Specific hazards

Mechanical, in particular, drawing-in from the rollers and the on-running cloth, and crushing from overbalancing of the A-frame.

Specific risks

When winding on the cloth or when batching off, low probability of severe or fatal injury, in particular, if the A-frame overturns.

Specific safety requirements

a) Movable, interlocked enclosing guards (e.g. hinged doors or lids) shall be provided on both sides of the jig. When the guards are open the machine shall only run by one of the following:

   1) at crawl speed according to ISO 11111-1:2005, Table A.1, using a hold-to-run control (which may be foot-operated);

   2) by hand.

   Winding-on and batching-off shall be permitted at full speed with the inlet/outlet door open, provided that access to the area between the A-frame and jig is prevented at all times. For example, this may be achieved using active opto-electronic protective devices or fence guards with interlocked doors.

b) Jigs shall be designed to accelerate very slowly. The manufacturer shall provide appropriate means for fastening the A-frame to the floor. Reference shall be made in the instruction handbook to the risk that A-frames may fall over if not properly fastened to the floor.

5.3.6 Winches

The safety requirements and/or measures shall be in accordance with 5.3.1 and Table 22.

Table 22 — Additional safety requirements relating to winches

Application	Reference ISO 11111-1:2005
Particular machine elements:	
Drive and transmission enclosures	6.2
Doors and lids, opening and closing	6.8.2
Devices for steam heating of liquors	6.15
	This part of ISO 11111
Other items:	
Atmospheric dyeing machines and apparatus	5.3.2
High temperature dyeing machines and apparatus	5.3.3

5.3.7 Jet dyeing machines

The safety requirements and/or measures shall be in accordance with 5.3.3 and ISO 11111-1:2005, 6.8.4 (for access to the nozzle).

5.3.8 Padding mangles

General safety requirements

The safety requirements and/or measures shall be in accordance with 5.3.1 and Table 23.

Specific hazards

Mechanical, from the mangle, immersion and idle rollers, in particular, drawing-in or trapping; from the trough when lowering or lifting, in particular, crushing and shearing between the trough and stationary machine parts.

Specific risks

Occasional access during normal and special operations, particularly threading-up and cleaning, leading to high probability of severe injury.

Table 23 — Additional safety requirements relating to padding mangles

Application	Reference ISO 11111-1:2005
Particular machine elements:	
Drive and transmission enclosures	6.2
Rollers	6.5
Dancing rollers	6.17
Mangles	6.19
Complex installations	6.22
	This part of ISO 11111
Other items:	
Atmospheric dyeing machines and apparatus	5.3.2

Specific safety requirements

a) Access to mangle, immersion and idle rollers shall be prevented. Movable interlocking guards (e.g. pivoted flaps), in conjunction with the trough may be used. With the movable guard open, the rollers shall be operable only by means of a limited movement control or at crawl speed according to ISO 11111-1:2005, A.1 by means of a hold-to-run control installed so that all drawing-in points are clearly visible but not within reach. If the trough can be lowered, it shall be interlocked with the drive in the same manner as for guards.

   For certain operations (e.g. for automatic cleaning), if it is required that the rollers be run at normal speed when the trough is in its lowered position, means (e.g. fixed guards) shall be provided to prevent access to the rollers.

   The guards for the rollers may be designed to allow safe access to the rollers with a cleaning device (e.g. brush). Access by hand shall not be possible.

b) Means shall be provided to protect against crushing and shearing between the moving trough and stationary machine parts. These means may also be used to prevent access to the running rollers when the trough is in lower position.

   As an alternative, a hold-to-run control may be used to raise and lower the trough only if the entire trough is visible from the control position.

5.3.9 Continuous dyeing machines

The safety requirements and/or measures shall be in accordance with 5.3.1 and Table 24.

Table 24 — Additional safety requirements relating to continuous dyeing machines

Application	Reference ISO 11111-1:2005
All machines:	
Escape and rescue of trapped persons	5.7
Particular machine elements:	
Drive and transmission enclosures	6.2
Rollers	6.5
Doors and lids, opening and closing	6.8.2
Devices for steam heating of liquors	6.15
Dancing rollers	6.17
Batchers	6.18
Mangles	6.19
Pilers and plaiters	6.20
Complex installations	6.22
	This part of ISO 11111
Other items:	
Atmospheric dyeing machines	5.3.2

5.3.10 Package dyeing apparatus

The safety requirements and/or measures shall be in accordance with 5.3.1 and 5.3.2 (for atmospheric package dyeing apparatus) and 5.3.3 (for high temperature package dyeing apparatus).

5.3.11 Beam dyeing apparatus

The safety requirements and/or measures shall be in accordance with 5.3.1 and Table 25.

Table 25 — Additional safety requirements relating to beam dyeing apparatus

Application	Reference ISO 11111-1:2005
Particular machine elements:	
Wheels	6.7
	This part of ISO 11111
Other items:	
Atmospheric dyeing apparatus	5.3.2
High temperature dyeing apparatus	5.3.3

5.3.12 Hank dyeing machines

The safety requirements and/or measures shall be in accordance with 5.3.1 and 5.3.2 (for atmospheric hank dyeing machines) and 5.3.3 (for high temperature hank dyeing machines).

5.4 Printing machines

5.4.1 Common requirements for printing machines

The safety requirements and/or measures shall be in accordance with Table 26.

Table 26 — General safety requirements relating to printing 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
Use of flammable solvents (fire and explosion)	5.4.11 and 5.4.12
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
Conveyors	6.10
Work platform and walkways	6.13
Batchers	6.18
Pilers and plaiters	6.20

5.4.2 Flat screen printing machines

General safety requirements

The safety requirements and/or measures shall be in accordance with 5.4.1 and ISO 11111-1:2005, 5.4.4 (for static electricity).

Specific hazards

Mechanical, from the automatic lifting and lowering of bars or scrapers, in particular, crushing; from the ram linkages and drives, in particular, drawing-in or trapping, shearing.

Specific risks

During normal operation, when screens move, leading to low probability of moderate-to-severe injury, in particular, between lifting bars and table.

During special operation from the ram linkages and drives, leading to low probability of severe injury.

Specific safety requirements

a) There shall be no crushing points between the screen-lifting bars and the machine table.

b) The ram linkages and drives beneath the table shall be inaccessible or guarded (e.g. by fixed guards).

5.4.3 Rotary screen printing machines

General safety requirements

The safety requirements and/or measures shall be in accordance with 5.4.1.

Specific hazards

Mechanical, from the screen and screen support, in particular, drawing-in and trapping; from the squeegees, in particular, cutting.

Specific risks

During normal operation, low probability of moderate injury at each screen support. When handling squeegees with sharp blades, while setting up the machine, leading to high probability of cuts to fingers or hands.

Specific safety requirements

a) By design the screen support drive shall not be accessible. Emergency stop controls (e.g. trip-wires), accessible from the danger zone, shall be fitted on both sides of the machine.

b) Where possible, squeegees with plastic edges shall be provided. Instruction shall be given in the instruction handbook on how to handle the squeegees.

5.4.4 Transfer printing machines

The safety requirements and/or measures shall be in accordance with 5.4.1.

5.4.5 Roller printing machines

General safety requirements

The safety requirements and/or measures shall be in accordance with 5.4.1 and Table 27.

Specific hazards

Mechanical, from the crown and box wheels, in particular, drawing-in.

Specific risks

During special operation, when setting up the machine, and when adjusting the crown and box wheels, leading to high probability of severe injury.

Table 27 — Additional safety requirements relating to roller printing machines

Application	Reference ISO 11111-1:2005
Particular machine elements:	
Drive and transmission enclosures	6.2
	This part of ISO 11111
Other items:	
Rotary screen printing machines	5.4.3

Specific safety requirements

a) The rollers shall be capable of being adjusted remotely by means of pitching devices.

b) Fixed or interlocked enclosing guards shall be provided for the crown and box wheels, the choice depending on the frequency of access required according to ISO 11111-1:2005, 5.3.3.

5.4.6 Colour paste preparation plant

The safety requirements and/or measures shall be in accordance with 5.4.1 and Table 28.

Table 28 — Additional safety requirements relating to colour paste preparation plant

Application	Reference ISO 11111-1:2005
All plant:	
Chemicals	5.4.10
Explosions due to flammable solvents	5.4.12
Particular elements:	
Workplaces adjacent to the plant	6.13
Stirrers	6.16

5.5 Fixation, wetting and drying machines

5.5.1 Common requirements for fixation, wetting and drying machines

The safety requirements and/or measures shall be in accordance with Table 29.

Table 29 — General safety requirements relating to all fixation, wetting and drying 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
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
Work platforms and walkways	6.13
Batchers	6.18
Pilers and plaiters	6.20
Complex installations	6.22

5.5.2 Steam chambers

The safety requirements and/or measures shall be in accordance with 5.5.1 and 5.2.12 (for steam chambers).

5.5.3 Wringing machines

The safety requirements and/or measures shall be in accordance with 5.5.1 and ISO 11111-1:2005, 6.19 (for mangles).

5.5.4 Stenters, tenters

General safety requirements

The safety requirements and/or measures shall be in accordance with 5.5.1 and Table 30.

Table 30 — Additional safety requirements relating to stenters, tenters

Application	Reference ISO 11111-1:2005
All machines:	
Noise	5.4.7, 7, 8.2
Evaporating chemicals	5.4.10
Evaporating flammable liquids (fire and explosion) [a]	5.4.11 and 5.4.12
Particular machine elements:	
Conveyors	6.10
Fans	6.11
Cutting devices	6.12
Burners	6.14
Dancing rollers	6.17
	This part of ISO 11111
Other items:	
Hot surfaces	5.1

[a] Means to avoid or counter the risks of an explosive atmosphere from flammable liquids in dryers are given in EN 1539:2000, 5.7.2.

Specific hazards

Mechanical, from the chains carrying clips or pins, in particular, drawing-in or trapping between chains and sprockets.

Specific risks

During special operation, low probability of moderate-to-severe injury.

Specific safety requirements

The intakes between the chains carrying clips or pins and the sprockets shall be provided with fixed guards.

Fixed or movable interlocking distance guards shall be fitted to safeguard the clips or pins on return sections of the chains outside the tender chamber.

5.5.5 Dryers, bakers

The safety requirements and/or measures shall be in accordance with 5.5.1 and Table 31.

Table 31 — Additional safety requirements relating to dryers, bakers

Application	Reference ISO 11111-1:2005
All machines:	
Evaporating chemicals	5.4.10
Evaporating flammable liquids (fire and explosion) [a]	5.4.11 and 5.4.12
Particular machine elements:	
Conveyors	6.10
Fans	6.11
Radiators, burners for heat treatment	6.14
Dancing rollers	6.17
	This part of ISO 11111
Other items:	
Hot surfaces	5.1

[a] Means to avoid or counter the risks of an explosive atmosphere from flammable liquids in dryers are given in EN 1539:2000, 5.7.2.

5.5.6 Cylinder dryers

General safety requirements

The safety requirements and/or measures shall be in accordance with 5.5.1 and 5.5.5.

Specific hazards

Mechanical, from the drying cylinders, or from on-running fabric, in particular, drawing-in or trapping between the cylinders.

Thermal, from the hot cylinders.

Specific risks

During normal and special operation, in particular, mending of torn process material, leading to low probability of severe injury.

Specific safety requirements

Where there is a drawing-in point within the reach of the operator from either the front or rear of the stack, the cylinders shall be guarded in accordance with ISO 11111-1:2005, 6.5. Fixed guards or, where necessary, movable interlocking guards shall be fitted at the sides of the cylinders to prevent access to any danger point or contact with hot surfaces.

5.5.7 High frequency dryers

General safety requirements

The safety requirements and/or measures shall be in accordance with 5.5.1.

Risks caused by high frequency shall be in accordance with IEC 60519-1, IEC 60519-9:1987, Clause 4, and EN 12198-1:2000, Clauses 6 to 8.

Specific hazards

Electrical, direct contact with live electricity.

Radiation, from the electrode.

Thermal, from burning process material.

Specific risks

During special operation, low probability of severe or fatal injury from contact with live electricity.

During special operation, low probability of internal damage to the body tissues.

Low probability of burning.

Specific safety requirements

a) The input and output apertures shall be adjustable to the height of the process material (e.g. by a fixed adjustable guard, positioned to restrict access to the electrodes with long pusher rods). Where there is a risk that process material may fall off the conveyor, suitable lateral guides shall be fitted inside the heater.

b) A warning shall be given in the instruction handbook regarding the settings on the machine to reduce the risk of fire (information shall be given regarding power density, frequency and ratio of kilowatts to unit of product).

5.5.8 Straightening machines

General safety requirements

The safety requirements and/or measures shall be in accordance with 5.5.1.

Specific hazards

Mechanical, from the drawing-in points between rollers and between rollers and on-running fabric.

Specific risks

Low probability of severe injury for fingers and hands.

Specific safety requirements

The drawing-in points shall be guarded by means according to ISO 11111-1:2005, 6.5 c) and 6.5 g), e.g. by fitting interlocked sliding doors consisting of mesh or transparent material on the infeed and delivery side.

5.6 Finishing machines

5.6.1 Common requirements for finishing machines

The safety requirements and/or measures shall be in accordance with Table 32.

Table 32 — General safety requirements relating to finishing 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
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

5.6.2 Calenders

General safety requirements

The safety requirements and/or measures shall be in accordance with 5.6.1 and Table 33.

Table 33 — Additional safety requirements relating to calenders

Application	Reference ISO 11111-1:2005
All machines:	
Fluid power systems and components	5.4.5
Elevated servicing positions	5.6
Escape and rescue of trapped persons	5.7
Particular machine elements:	
Rotating shaft	6.6
Work platforms and walkways	6.13
Batchers	6.18
Pilers and plaiters	6.20
Complex installations	6.22
	This part of ISO 11111
Other items:	
Hot surfaces	5.1

Specific hazards

Mechanical, from the calender rollers, in particular, drawing-in and trapping; from the calender rollers moving together, in particular, crushing.

Specific risks

During normal and special operation, in particular, threading-up, leading to high probability of severe injury.

Specific safety requirements

a) The guard for each drawing-in point shall be a fixed guard in accordance with ISO 11111-1:2005, 6.5 c). Where the rollers can be run in the reverse direction, the drawing-in points thus created shall be guarded in accordance with ISO 11111-1:2005, 6.5 d). Where rollers can run both when in contact and when separated, guarding shall be in accordance with of ISO 11111-1:2005, 6.5 f).

b) Where the rollers can be separated and access is possible, the rollers shall only be brought together by means of a hold-to-run control from a position where both sides can be overseen and the drawing-in point cannot be reached.

c) Category 3 or 4 according to ISO 13849-1:1999, Clause 6, shall be used for the safety-related part of the control system.

5.6.3 Calenders for tubular knitted fabric

General safety requirements

The safety requirements and/or measures shall be in accordance with 5.6.1.

Specific hazards

Mechanical, from the calender rollers, in particular, drawing-in and trapping.

Thermal, from the steamer.

Specific risks

During normal operation, in particular, threading-up, leading to high probability of severe injury.

High probability of scalds through contact with steam.

Specific safety requirements

a) The calender rollers shall be protected with movable interlocked guards.

   The machine shall be designed such that, with the guards open, the rollers may be moved apart only while the machine is at rest; and with one or the other of the following provisions:

   1) the rollers can be turned by hand;

   2) the rollers can run at crawl speed according to ISO 11111-1:2005, A.1 only if a hold-to-run control is used.

b) When a steamer is fitted to be used with the calender, movable guards fitted at the steam box shall be interlocked with the rollers.

5.6.4 Coating and laminating machines

The safety requirements and/or measures shall be in accordance with 5.6.1 and Table 34.

Table 34 — Additional safety requirements relating to coating and laminating machines

Application	Reference ISO 11111-1:2005
All machines:	
Fluid power systems and components	5.4.5
Noise	5.4.7, 7, 8.2
Emission of fumes	5.4.10
Evaporating flammable solvent (fire and explosion)	5.4.11 and 5.4.12
Elevated servicing positions	5.6
Escape and rescue of trapped persons	5.7
Particular machine elements:	
Doors and lids, opening and closing	6.8.2
Entry into machines	6.8.4
Fans	6.11
Radiators and burners	6.14
Dancing rollers	6.17
Batchers	6.18
Mangles	6.19
Pilers and plaiters	6.20
Complex installations	6.22

5.6.5 Raising machines

General safety requirements

The safety requirements and/or measures shall be in accordance with 5.6.1 and Table 35.

Table 35 — Additional safety requirements relating to raising machines

Application	Reference ISO 11111-1:2005
All machines:	
Fluid power systems and components	5.4.5
Noise	5.4.7, 7, 8.2
Emission of dust	5.4.10
Fire	5.4.11
Escape and rescue of trapped persons	5.7
Particular machine elements:	
Electrical control system	6.3 f)
Batchers	6.18
Pilers and plaiters	6.20

Specific hazards

Mechanical, from the worker rollers, in particular, entanglement; from the feed and draw rollers, in particular, drawing-in and trapping.

Specific risks

During normal operation (e.g. threading-up), and during special operation (e.g. stripping and grinding), leading to low probability of severe injury.

Specific safety requirements

a) Movable interlocked guards with guard locking shall be provided at both front and rear of the machine, to prevent access to the worker rollers. These may be in the form of vertical, full-height, interlocked screens with guard locking extending to floor level.

   Stripping and grinding may be carried out with the front guard open provided that

   1) the raising roller can only be started by a limited movement control while the pile and counter-pile rollers are at a standstill,

   2) alternate pile rollers or counter-pile rollers can run while the cylinder is at a standstill,

   3) the grinding speed of the pile or counter-pile rollers is less than 1/4 of the operational speed,

   4) the grinding device creates no trapping hazard, and

   5) walkways are provided in a position commensurate with ergonomic requirements.

b) The feed and draw rollers shall be guarded as in a), or else precautions in accordance with ISO 11111-1:2005, 6.5, shall be taken.

   Where there are drawing-in points between pairs of feed and draw rollers, the machine shall be designed so that the rollers can be moved to 120 mm apart to allow threading-up at crawl speed according to ISO 11111-1:2005, A.1.

5.6.6 Cropping machines and shearing machines

The safety requirements and/or measures shall be in accordance with 5.6.1 and 5.2.3.

5.6.7 Shrinking machines

General safety requirements

The safety requirements and/or measures shall be in accordance with 5.6.1 and ISO 11111-1:2005, 5.4.6.1 (for hot surfaces).

Specific hazards

Mechanical, in particular, drawing-in and trapping, from the blanket and the drying cylinder; from the rubber sleeve (shrinkage belt) and the heated roller; from the rubber sleeve and the grinding attachment.

Specific risks

During normal and special operation, low probability of moderate to severe injury.

Specific safety requirements

a) The drawing-in point between the blanket and the drying cylinder and between the rubber sleeve and the heated roller shall be protected in accordance with ISO 11111-1:2005, 6.5 g).

b) When using a grinding attachment to dress the rubber sleeve (shrinking belt), the intake between the belt and the grinding attachment shall be protected by purpose-designed guards.

5.6.8 Flocking plant

General safety requirements

The safety requirements and/or measures shall be in accordance with 5.6.1 and ISO 11111-1:2005, 5.4.11 (for fire) and ISO 11111-1:2005, 5.4.12 (for explosion).

Specific hazards

Electrical, from high voltage; electrostatic, from the field, leading to explosion.

Specific risks

During special operation, high probability of severe or fatal injury.

Specific safety requirements

a) The flocking area shall be totally enclosed with a fence guard in accordance with ISO 11111-1:2005, A.3. Fence guard doors into the enclosure shall be interlocked with the power supply.

b) The interlocking shall be power interlocking as defined in ISO 14119 or dual-control system interlocking with cross-monitoring in accordance with ISO 13849-1:1999, Clause 6, Category 4, unless the risk assessment shows a low risk of injury.

c) High-voltage conductors shall be provided with automatic earthing, because a high voltage can remain on the electrically charged plates. Either opening of the guard or disconnection of the power supply shall cause the conductors to be earthed.

5.6.9 Decatizing machines

The safety requirements and/or measures shall be in accordance with 5.6.1 and 5.3.2.

5.6.10 Rotary presses

General safety requirements

The safety requirements and/or measures shall be in accordance with 5.6.1 and Table 36.

Table 36 — Additional safety requirements relating to rotary presses

Application	Reference ISO 11111-1:2005
All machines:	
Fluid power systems and components	5.4.5
Escape and rescue of trapped persons	5.7
	This part of ISO 11111
Other items:	
Hot surfaces	5.1

Specific hazards

Mechanical, from heated roller and bed, in particular, drawing-in or trapping.

Specific risks

Occasional access during normal operation, in particular, start-up, and during special operation, in particular, cleaning, leading to low probability of severe injury.

Specific safety requirements

A guard or safety device in accordance with ISO 11111-1:2005, 5.3.3 (e.g. an interlocked hinged flap), shall be provided for the trap between the heated roller and the curved metal bed. If, after activating the guards and safety devices, it is possible to reach the nip point between the roller and bed, means shall be provided to bring the roller to a standstill within the access time.

5.6.11 Polishing machines

General safety requirements

The safety requirements and/or measures shall be in accordance with 5.6.1 and Table 37.

Table 37 — Additional safety requirements relating to polishing machines

Application Particular machine elements	Reference ISO 11111-1:2005
Batchers	6.18
Pilers and plaiters	6.20

Specific hazards

Mechanical, from the polishing rollers, in particular, drawing-in and trapping, entanglement.

Specific risks

During normal operation, low probability of moderate-to-severe injury.

Specific safety requirements

Interlocking guards with guard locking shall be provided for the polishing rollers.

5.6.12 Liquor preparation plants for finishing processes

The safety requirements and/or measures shall be in accordance with 5.6.1and Table 38.

Table 38 — Additional safety requirements relating to liquor preparation plants for finishing processes

Application	Reference ISO 11111-1:2005
All plant:	
Hot processing material: liquor or steam	5.4.6.2
Chemicals	5.4.10
Explosions due to flammable solvents	5.4.12
Particular machine elements:	
Workplaces adjacent to the plant	6.13
Devices for steam heating of liquors	6.15
Stirrers	6.16
	This part of ISO 11111
Other items:	
Adding chemicals and operating the steam valve	5.3.2
Hot surfaces	5.1

5.7 Making-up/presentation machines

5.7.1 Common requirements for making-up/presentation machines

The safety requirements and/or measures shall be in accordance with Table 39.

Table 39 — General safety requirements relating to making-up/presentation 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
Devices for special operation	5.5
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
Rotating shafts	6.6
Fans	6.11
Batchers	6.18
Pilers and plaiters	6.20

5.7.2 Inspection machines

The safety requirements and/or measures shall be in accordance with 5.7.1 and Table 40.

Table 40 — Additional safety requirements relating to inspection machines

Application All machines	Reference ISO 11111-1:2005
Substances including solvents	5.4.10
Explosions due to flammable solvents	5.4.12

5.7.3 Folding machines

The safety requirements and/or measures shall be in accordance with 5.7.1.

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 ISO 11111-1:2005, 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 9902-7, 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 of ISO 11111 in accordance with ISO 9902-1 and ISO 9902-7, 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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