INTERNATIONAL STANDARD

ISO 11111-1

Second edition
2009-07-01

Textile machinery — Safety requirements —

Part 1: Common requirements

Matériel pour l'industrie textile — Exigences de sécurité —

Partie 1: Exigences communes

Reference number
ISO 11111-1:2009(E)

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Published in Switzerland

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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 11111-1 was prepared by Technical Committee ISO/TC 72, *Textile machinery and accessories*, Subcommittee SC 8, *Safety requirements for textile machinery*.

This second edition cancels and replaces the first edition (ISO 11111-1:2005), 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 machines or machine elements not dealt with in the relevant parts of ISO 11111, the designer is to perform a risk assessment according to ISO 14121-1 and evolve means for reducing the risk from significant hazards.

This part of ISO 11111 contains a summary of safety requirements and/or measures for frequently occurring hazards of textile machinery (see Clause 5) which apply whenever referred to in this, or the other parts, of ISO 11111.

Significant hazards and corresponding safety requirements and/or measures for certain machine elements (e.g. rollers) and their combination of textile machines are also described (see Clause 6).

The various parts of ISO 11111 address significant hazards and corresponding safety requirements and/or measures for specific types of textile machines. As far as possible, these are treated by way of reference to Clauses 5 and 6 of this part of ISO 11111 and other cross-references (see general safety requirements), thus reducing considerably the volume by avoiding many repetitions. The standard for a specific textile machine will normally consist of this part of ISO 11111 and the specific part relevant to that machine. ISO 11111-2 to ISO 11111-7 may also contain exceptions or additions to the requirements given in this part of ISO 11111 (see specific safety requirements).

Textile machinery — Safety requirements —

Part 1: Common requirements

1 Scope

1.1 This part of ISO 11111 specifies safety requirements for frequently occurring hazards common to the types of textile machinery and the hazards of certain machine elements covered by ISO 11111-2 to ISO 11111-7.

1.2 It is applicable to machinery plant and related equipment intended to be used in the textile industry for the following:

— the opening, cleaning, blending, carding, preparation subsequent to carding, spinning and other processing of fibres (staple and filament) and other materials to form yarn or nonwoven material (including felts);

— the winding, doubling, twisting, texturing, etc. of yarns and the processing of yarns preparatory to weaving and knitting;

— the weaving, knitting, lace-making and similar utilization of yarn, etc., to form fabric;

— the formation of braid, cord, strand, rope, twine, net, etc., except take-up reels of stranding and laying machinery;

— processes, including the pretreatment, bleaching, dyeing, printing and finishing of fibre, yarn, fabric, braid, cord, etc. and final assembly for despatch;

— the piece dyeing of made-up goods;

— finishing of warp and weft knitting, including hosiery, other than assembly of the finished product (e.g. sewing);

— carpet manufacture, by weaving, tufting and other processes.

This part of ISO 11111 applies to all machinery, plant and equipment used during the processes listed above, including equipment to enable automated operation of the machines and processes in either free-standing or complex installations, such as pneumatic fibre transportation, but excluding other transportation between the interfaces of the machines.

NOTE 1 The standard for a specific textile machine will normally consist of two parts: this part of ISO 11111 and the specific part of ISO 11111 relevant to that machine. However, in the case of nonwoven lines, which is covered by ISO 11111-3, ISO 11111-2, ISO 11111-6, and ISO 11111-7 are also to be taken into account.

This part of ISO 11111 does not deal with specific requirements for pressure containment.

NOTE 2 In the EU and EFTA specific Directives for pressure vessels and electromagnetic compatibility among others exist.

1.3 ISO 11111 (all parts) addresses hazards arising from the transport, assembly and commissioning of the machinery, its adjustment, use, maintenance, decommissioning, dismantling and disposal. Manual loading/unloading is considered to be part of the normal operation of the machinery.

1.4 This and the other parts of ISO 11111 are not applicable to machinery, plant and related equipment used for

— the manufacture of continuous filaments and man-made fibres up to and including the formation of the first textile package (e.g. continuous filament cheese, staple fibre bale),

— hackling and carding of flax and similar,

— the manufacture of spunbonded and melt blown nonwovens,

— the formation and making up of garments, household and industrial textile goods, and the pressing and die cutting of nonwoven fabric,

— the laundering and drycleaning of made-up textile goods,

— servicing of textile machines (e.g. machines for cardwire mounting, cleaning machines for components of printing machines), and

— certain cutting devices, e.g. log-slitting device, laser cutting, high pressure water jets, ultrasonic device.

NOTE 3 The machines and equipment listed in Annex E are used in the textile industry but are not within the scope of this document.

1.5 This and the other parts of ISO 11111 are not applicable to machinery intended for use in potentially explosive atmospheres.

1.6 This and the other parts of ISO 11111 are not applicable to machines which are manufactured before the dates of publication of the standards.

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 5232, *Graphical symbols for textile machinery*

ISO 9902 (all parts), *Textile machinery — Noise test code*

ISO 9902-1:2001/Amd.1:2009, *Textile machinery — Noise test code — Part 1: Common requirements*

ISO 9902-2:2001/Amd.1:2009, *Textile machinery — Noise test code — Part 2: Spinning preparatory and spinning machinery*

ISO 9902-3:2001/Amd.1:2009, *Textile machinery — Noise test code — Part 3: Nonwoven machinery*

ISO 9902-4:2001/Amd.1:2009, *Textile machinery — Noise test code — Part 4: Yarn processing, cordage and rope manufacturing machinery*

ISO 9902-5:2001/Amd.1:2009, *Textile machinery — Noise test code — Part 5: Weaving and knitting preparatory machinery*

ISO 9902-6:2001/Amd.1:2009, *Textile machinery — Noise test code — Part 6: Fabric manufacturing machinery*

ISO 9902-7:2001/Amd.1:2009, *Textile machinery — Noise test code — Part 7: Dyeing and finishing machinery*

ISO 10218-1:2006, *Robots for industrial environments — Safety requirements — Part 1: Robot*

ISO 11111-2:2005, *Textile machinery — Safety requirements — Part 2: Spinning preparatory and spinning machines*

ISO 11111-2:2005/Amd.1:2009, *Textile machinery — Safety requirements — Part 2: Spinning preparatory and spinning machines*

ISO 11111-3:2005, *Textile machinery — Safety requirements — Part 3: Nonwoven machinery*

ISO 11111-3:2005/Amd.1:2009, *Textile machinery — Safety requirements — Part 3: Nonwoven machinery*

ISO 11111-4:2005, *Textile machinery — Safety requirements — Part 4: Yarn processing, cordage and rope manufacturing machinery*

ISO 11111-4:2005/Amd.1:2009, *Textile machinery — Safety requirements — Part 4: Yarn processing, cordage and rope manufacturing machinery*

ISO 11111-5:2005, *Textile machinery — Safety requirements — Part 5: Preparatory machinery to weaving and knitting*

ISO 11111-5:2005/Amd.1:2009, *Textile machinery — Safety requirements — Part 5: Preparatory machinery to weaving and knitting*

ISO 11111-6:2005, *Textile machinery — Safety requirements — Part 6: Fabric manufacturing machinery*

ISO 11111-6:2005/Amd.1:2009, *Textile machinery — Safety requirements — Part 6: Fabric manufacturing machinery*

ISO 11111-7:2005, *Textile machinery — Safety requirements — Part 7: Dyeing and finishing machinery*

ISO 11111-7:2005/Amd.1:2009, *Textile machinery — Safety requirements — Part 7: Dyeing and finishing machinery*

ISO 11161:2007, *Safety of machinery — Integrated manufacturing systems — Basic requirements*

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

ISO 11691, *Acoustics — Measurement of insertion loss of ducted silencers without flow — Laboratory survey method*

ISO 11821, *Acoustics — Measurements of the in situ sound attenuation of a removable screen*

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 and specification*

ISO 13849-1:2006, *Safety of machinery — Safety-related parts of control systems — Part 1: General principles for design*

ISO 13849-2:2003, *Safety of machinery — Safety-related parts of control systems — Part 2: Validation*

ISO 13850:2006, *Safety of machinery — Emergency stop — Principles for design*

ISO 13851:2002, *Safety of machinery — Two-hand control devices — Functional aspects and design principles*

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

ISO 13857:2008, *Safety of machinery — Safety distances to prevent hazard zones being reached by upper and lower limbs*

ISO 14118:2000, *Safety of machinery — Prevention of unexpected start-up*

ISO 14119:1998, *Safety of machinery — Interlocking devices associated with guards — Principles for design and selection*

ISO 14119:1998/Amd.1:2007, *Safety of machinery — Interlocking devices associated with guards — Principles for design and selection — Amendment 1: Design to minimize defeat possibilities*

ISO 14121-1, *Safety of machinery — Risk assessment — Part 1: Principles*

ISO/TR 14121-2, *Safety of machinery — Risk assessment — Part 2: Practical guidance and examples of methods*

ISO 14122-1, *Safety of machinery — Permanent means of access to machinery — Part 1: Choice of fixed means of access between two levels*

ISO 14122-2, *Safety of machinery — Permanent means of access to machinery — Part 2: Working platforms and walkways*

ISO 14122-3, *Safety of machinery — Permanent means of access to machinery — Part 3: Stairs, stepladders and guard-rails*

ISO 14122-4, *Safety of machinery — Permanent means of access to machinery — Part 4: Fixed ladders*

ISO 14123-1:1998, *Safety of machinery — Reduction of risks to health from hazardous substances emitted by machinery — Part 1: Principles and specifications for machinery manufacturers*

ISO 14123-2:1998, *Safety of machinery — Reduction of risks to health from hazardous substances emitted by machinery — Part 2: Methodology leading to verification procedures*

ISO 14163, *Acoustics — Guidelines for noise control by silencers*

ISO 15667, *Acoustics — Guidelines for noise control by enclosures and cabins*

IEC 60204-1:2005, *Safety of machinery — Electrical equipment of machines — Part 1: General requirements*

IEC 60447:2004, *Basic and safety principles for man-machine interface, marking and identification — Actuating principles*

IEC 61310-1:2007, *Safety of machinery — Indication, marking and actuation — Part 1: Requirements for visual, acoustic and tactile signals*

IEC 61496-1:2004, *Safety of machinery — Electro-sensitive protective equipment — Part 1: General requirements and tests*

IEC 61496-1:2004/Amd.1:2007, *Safety of machinery — Electro-sensitive protective equipment — Part 1: General requirements and tests*

IEC 61496-2:2006, *Safety of machinery — Electro-sensitive protective equipment — Part 2: Particular requirements for equipment using active opto-electronic protective devices (AOPDs)*

IEC 61496-3:2006, *Safety of machinery — Electro-sensitive protective equipment — Part 3: Particular requirements for Active Opto-electronic Protective Devices responsive to Diffuse Reflection (AOPDDR)*

IEC 62061:2005, *Safety of machinery — Functional safety of safety-related electrical, electronic and programmable electronic control systems,* corrected by IEC 62061:2005 Corr.1:2005

EN 614-1, *Safety of machinery — Ergonomic design principles — Part 1: Terminology and general principles*

EN 953, *Safety of machinery — Guards — General requirements for the design and construction of fixed and movable guards*

EN 982:1996, *Safety of machinery — Safety requirements for fluid power systems and their components — Hydraulics*

EN 983:1996, *Safety of machinery — Safety requirements for fluid power systems and their components — Pneumatics*

EN 999:1998+A1:2008, *Safety of machinery — The positioning of protective equipment in respect of approach speeds of parts of the human body*

EN 1005-1, *Safety of machinery — Human physical performance — Part 1: Terms and definitions*

EN 1005-2, *Safety of machinery — Human physical performance — Part 2: Manual handling of machinery and component parts of machinery*

EN 1005-3, *Safety of machinery — Human physical performance — Part 3: Recommended force limits for machinery operation*

EN 1005-4, *Safety of machinery — Human physical performance — Part 4: Evaluation of working postures and movements in relation to machinery*

EN 1127-1:1997, *Explosive atmospheres — Explosion prevention and protection — Part 1: Basic concepts and methodology*

EN 1760-1, *Safety of machinery — Pressure sensitive protective devices — Part 1: General principles for the design and testing of pressure sensitive mats and pressure sensitive floors*

EN 1760-2, *Safety of machinery — Pressure sensitive protective devices — Part 2: General principles for the design and testing of pressure sensitive edges and pressure sensitive bars*

EN 1760-3, *Safety of machinery — Pressure sensitive protective devices — Part 3: General principles for the design and testing of pressure sensitive bumpers, plates, wires and similar devices*

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

EN 12198-3, *Safety of machinery — Assessment and reduction of risks arising from radiation emitted by machinery — Part 3: Reduction of radiation by attenuation or screening*

EN 12464-1, *Light and lighting — Lighting of work places — Part 1: Indoor work places*

EN 60825-1:1994/A2:2001, *Safety of laser products — Part 1: Equipment classification, requirements and user's guide; Amendment A2*

3 Terms and definitions

For the purposes of this part of ISO 11111, the terms and definitions given in ISO 12100-1 and EN 953, and the following apply.

NOTE Where values are applicable to terms defined in this clause, these values are indicated in Annex A.

3.1
stopping time
time taken by a machine or machine part to reach a stand-still after the signal to stop has been given

3.2
access time
time required to reach a dangerous part from first exposure to that part

3.3
crawl speed
linear or tangential speed of machine elements which is substantially below its normal speed and has a maximum speed and a maximum stopping distance

3.4
reduced running speed
linear or tangential speed of machine elements which is substantially below its normal speed and has a maximum stopping distance

3.5
fence guard
fixed guard to provide a barrier at a distance which prevents access to a danger zone

NOTE It can be either fixed directly to the machine or free-standing and fixed to the floor or constructional elements of the building. Access to the space between the fence guard and the machine is controlled by interlocked doors (see Annex A).

3.6
lap
wrap
undesired wrapping of the process material around a rotating part of the machine

3.7
normal operation
entire sequence of the production process, including start-up and incidental cleaning and elimination of routine process faults

EXAMPLE Feeding and removal of process material, threading up, process surveillance, quality tests, removal of fibre fly, mending of broken ends.

3.8
special operation
procedure and action not included in normal operation

EXAMPLE Setting, tuning, major cleaning, elimination of substantial process faults, maintenance such as the removal of blockages, laps except on spinning, twisting and texturizing machines, re-sewing broken cloth, elimination of rope loops.

3.9
complex installation
combination of textile machines and service equipment, arranged to work as one integrated production unit, subject to overall control either from a central system or from distributed, communicating systems

3.10
automatic machinery [equipment]
machinery [equipment] for which systems are employed to govern its operation without further intervention from the operator once the start control has been activated

NOTE Such machines may be either free-standing or included in a complex installation. Automatic control can apply to the operational sequence of a machine and its integrated equipment located in a permanent place, and equipment which is mobile, including handling devices (e.g. piecing devices, knotters).

4 List of significant hazards

Significant hazards frequently occurring on textile machinery are considered in Clause 5. Additional significant hazards common to certain machine elements are given in Clause 6. Specific significant hazards for individual textile machines shall be considered in ISO 11111-2 to ISO 11111-7.

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 textile machinery are always considered in conjunction with safety requirements.

5 Safety requirements and/or measures for frequently occurring hazards

5.1 General

This clause contains safety requirements and/or measures to be taken in relation to frequently occurring significant hazards related to textile machinery.

Machinery shall comply with the safety requirements and/or protective measures of this clause, Clause 6 and ISO 11111-2 to ISO 11111-7. In addition, the machine shall be designed according to the principles of ISO 12100 for hazards relevant but not significant, which are not dealt with by this part of ISO 11111.

Where the means of reducing the risk is by the arrangement of the installed machine or a safe system of working the machine, the manufacturer shall give a detailed description of this in the instruction handbook.

Where type B standards that are referred to offer a choice of safety requirements and/or measures having different levels of safety and the selection is not specified in this part of ISO 11111 or in ISO 11111-2 to ISO 11111-7, the manufacturer shall carry out a risk assessment to identify the appropriate level.

5.2 Safety requirements for the different phases of “life” of a machine

The safety requirements given in this Clause 5 and in Clause 6, together with the requirements set out in ISO 11111-2 to ISO 11111-7, apply to the use and maintenance of the machine. For the other phases in the life of a machine, mainly see Clause 8.

5.3 Risk reduction by design and safeguarding

5.3.1 Inherently safe design measures

A design concept for the machine and/or its mechanisms which does not inherently create a hazard shall, as far as possible, be adopted

EXAMPLE Use of pneumatic trunking instead of open lattice conveyors, use of pneumatic uncurling devices instead of mechanical uncurling rollers.

For textile machinery, the technical guidelines on inherently safe design in accordance with ISO 12100-2:2003, Clause 4, shall apply.

5.3.2 Consideration of geometrical factors and physical aspects

For risk reduction of textile machinery, the geometrical factors and physical aspects given in Table 1 and in accordance with ISO 12100-2:2003, 4.2 shall apply.

Table 1 — Risk reduction by design

Application	Reference
Making machines safe by virtue of	ISO 13854, ISO 13857
— the shape and the relative location of their mechanical component parts,	
— the limitation of the actuating force,	A.4
— the limitation of the mass and/or velocity.	A.1

5.3.3 Reduction of risks by safeguarding

Guards and safety devices used to reduce risks from textile machines shall conform to the requirements of the standards given in Tables 2 and 3.

Table 2 — Safety requirements and/or measures for guards

Application	Reference
Guard selection, unless specified in Clause 6 and in ISO 11111-2, ISO 11111-3, ISO 11111-4, ISO 11111-5, ISO 11111-6 and ISO 11111-7	ISO 12100-2:2003, 5.2 EN 953
Guard design and construction	ISO 12100-2:2003, 5.3 EN 953
Guard fastening	EN 953
Guard arrangement, unless specified in Clause 6 and in ISO 11111-2, ISO 11111-3, ISO 11111-4, ISO 11111-5, ISO 11111-6 and ISO 11111-7 [a]	ISO 13857:2008, Tables 1, 4 and 7 and B.1
Guard interlocking, unless specified in Clause 6 and in ISO 11111-2, ISO 11111-3, ISO 11111-4, ISO 11111-5, ISO 11111-6 and ISO 11111-7	ISO 14119:1998 (as amended by ISO 14119:1998/Amd.1:2007), Clauses 5, 6 and 7
Fence guard	A.3

[a] The safety distances for guards shall apply to all positions for normal operation as well as for setting, adjustment, maintenance work and elimination of process faults.

Table 3 — Safety requirements and/or measures for safety devices

Application	Reference
Selection of safety devices, unless specified in Clause 6 and in ISO 11111-2, ISO 11111-3, ISO 11111-4, ISO 11111-5, ISO 11111-6 and ISO 11111-7	ISO 12100-2:2003, 5.2
Technical characteristics of safety devices	ISO 12100-2:2003, 5.3.3 IEC 61496-1
Positioning of safety devices, unless specified in Clause 6 and in ISO 11111-2, ISO 11111-3, ISO 11111-4, ISO 11111-5, ISO 11111-6 and ISO 11111-7 [a]	EN 999:1998+A1:2008, Clauses 5, 6 and 7
Interlocking (with and without guard locking): — selection — design	 ISO 14119:1998 (as amended by ISO 14119:1998/Amd.1:2007), Clause 7 ISO 14119:1998 (as amended by ISO 14119:1998/Amd.1:2007), Clauses 5 and 6 IEC 61496-1
Electro-sensitive protective equipment: [b, d] — arrangement	IEC 61496-1 EN 999:1998+A1:2008, Clause 6
Active opto-electronic protective devices (AOPDs): [b, d] — arrangement — safety distance (upper and lower limbs)	IEC 61496-2 EN 999:1998+A1:2008, Clause 6 ISO 13857
Active opto-electronic protective devices responsive to diffuse reflection (AOPDDR): [b, d] — arrangement — safety distance (upper and lower limbs)	IEC 61496-3 EN 999:1998+A1:2008, Clause 6 ISO 13857
Pressure sensitive mats and floors [d]	EN 1760-1
Pressure sensitive edges and bars [d]	EN 1760-2
Pressure sensitive bumpers, plates, wires [d]	EN 1760-3
Two-hand controls: — selection [c] — arrangement	ISO 12100-1:2003, 3.26.4 IEC 60204-1:2005, 9.2.6.2 ISO 13851:2002, Clause 4 and Annex B EN 999:1998+A1:2008, Clause 8
Hold-to-run control devices (touch control, biased-off switch)	ISO 12100-1:2003, 3.26.3 IEC 60204-1:2005, 9.2.6.1
Limited movement control device	ISO 12100-1:2003, 3.26.9

[a] The safety distances for safety devices shall apply to all positions for normal operation as well as for setting, adjustment, maintenance work and elimination of process faults.

[b] The type selected in accordance with IEC 61496-1 shall be consistent with the required performance level (PL) or safety integrity level (SIL) of the safety-related part of the control system, as defined in ISO 13849-1:2006, 4.2.2 (or IEC 62061:2005, 5.2.4.).

[c] The type selected in accordance with ISO 13851 shall be consistent with the required performance level (PL) or safety integrity level (SIL) of the safety-related part of the control system, as defined in ISO 13849-1:2006, 4.2.2 (or IEC 62061:2005, 5.2.4).

[d] Sensitive protective equipment (SPE) in accordance with ISO 12100-1:2003, 3.26.5.