INTERNATIONAL STANDARD

ISO 11111-1

First edition
2005-02-15

Textile machinery — Safety requirements —

Part 1: Common requirements

Matériel pour l'industrie textile — Exigences de sécurité —

Partie 1: Exigences communes

Reference number
ISO 11111-1:2005(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 machinery for dry-cleaning and industrial laundering*, Subcommittee SC 8, *Safety requirements for textile machinery*.

This first edition of ISO 11111-1, together with ISO 11111-2, ISO 11111-3, ISO 11111-4, ISO 11111-5, 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 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 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 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 This and the other parts of ISO 11111 address hazards arising from the 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 10218:1992, *Manipulating industrial robots — Safety*

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

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

ISO 11111-4:2005, *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 11111-6:2005, *Textile machinery — Safety requirements — Part 6: Fabric manufacturing machinery*

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

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 13849-1:1999, *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 13850:1996, *Safety of machinery — Emergency stop — Principles for design*

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

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

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

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

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 14121:1999, *Safety of machinery — Principles of risk assessment*

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

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

IEC 60447:1993, *Man-machine interface (MMI) — Actuating principles*

IEC 60947-5-1:2000, *Low voltage switchgear and controlgear — Part 5-1: Control circuit devices and switching elements — Electromechanical control device*

IEC 61310-1:1995, *Safety of machinery — Indication, marking and actuation — Part 1: Requirements for visual, auditory and tactile signals*

IEC 61496-1:1997, *Safety of machinery — Electro-sensitive protective equipment — Part 1: General requirements and tests*

IEC 61496-2:1997, *Safety of machinery — Electrosensitive protective equipment — Part 2: Particular requirements for equipment using active opto-electronic protective devices (AOPDs)*

IEC 61496-3:2001, *Safety of machinery — Electro-sensitive protective equipment — Part 3: Particular requirements for active opto-electronic protective devices responsive to diffuse reflection (AOPDDR)*

EN 563:1994, *Safety of machinery — Temperatures of touchable surfaces — Ergonomics data to establish temperature limit values for hot surfaces;* AC:1994; A1:1999

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

EN 953:1997, *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, *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*

prEN 1005-2:2003, *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*

prEN 1005-4:2002, *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 1760-1:1997, *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 1760-2:2001, *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 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 shall be 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 General

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.

5.3.2 Reduction of risks by design

Hazards arising from the machine shall be reduced by the application of safety requirements selected from ISO 12100-2 in accordance with Table 1.

Table 1 — Risk reduction by design

Application	Reference ISO 12100-2:2003
Making machines safe by virtue of — avoiding sharp edges and corners, protruding parts, etc., — the shape and the relative location of their mechanical component parts (see ISO 13854), — the limitation of the actuating force (see A.4), — the limitation of the mass and/or velocity (see A.1).	4.2

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 of this part of ISO 11111 and in ISO 11111-2 to ISO 11111-7	ISO 12100-2:2003, 5.2 EN 953:1997, Clause 6
Guard design and construction	ISO 12100-2:2003, 5.3 EN 953:1997, Clauses 6 and 7
Guard fastening	EN 953:1997, 6.4.3 and 7.3
Guard arrangement, unless specified in Clause 6 of this part of ISO 11111 and in ISO 11111-2 to ISO 11111-7 [a]	ISO 13852:1996, Tables 1 and 4 ISO 13853:1998, Table 1 and A.1
Guard interlocking, unless specified in Clause 6 of this part of ISO 11111 and in ISO 11111-2 to ISO 11111-7	ISO 14119:1998, 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 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 of this part of ISO 11111 and in ISO 11111-2 to ISO 11111-7	ISO 12100-2:2003, 5.2
Technical characteristics of safety devices	ISO 12100-2:2003, 5.3.3 IEC 61496-1:1997, Clause 4
Positioning of safety devices, unless specified in Clause 6 of this part of ISO 11111 and in ISO 11111-2 to ISO 11111-7 [a]	EN 999:1998, Clauses 5 to 7
Interlocking (with and without guard locking): — selection — design	 ISO 14119:1998, Clause 7 ISO 14119:1998, Clauses 5 and 6 IEC 61496-1:1997, A.5, A.6 and A.8

Table 3 (*continued*)

Application	Reference
Electro-sensitive protective equipment: [d]	
— requirements [b]	IEC 61496-1:1997, Clause 4
— testing	IEC 61496-1:1997, Clause 5
— marking for identification and for safe use	IEC 61496-1:1997, Clause 6
— accompanying documentation	IEC 61496-1:1997, Clause 7
— arrangement	EN 999:1998, Clause 6
Active opto-electronic protective devices (AOPD): [d]	
— requirements [b]	IEC 61496-2:1997, Clause 4
— testing	IEC 61496-2:1997, Clause 5
— marking for identification and for safe use	IEC 61496-2:1997, Clause 6
— accompanying documentation	IEC 61496-2:1997, Clause 7
— arrangement	EN 999:1998, Clause 6
— safety distance (upper and lower limbs)	ISO 13852 and ISO 13853
Active opto-electronic protective devices responsive to diffuse reflection(AOPDDR): [d]	
— requirements	IEC 61496-3:2001, Clause 4
— testing	IEC 61496-3:2001, Clause 5
— marking for identification and for safe use	IEC 61496-3:2001, Clause 6
— accompanying documentation	IEC 61496-3:2001, Clause 7
— arrangement	EN 999:1998, Clause 6
— safety distance (upper and lower limbs)	ISO 13852 and ISO 13853
Pressure-sensitive mats and floors: [d]	
— selection	EN 1760-1:1997, Clause 4
— installation	EN 1760-1:1997, Annex D
— design	EN 1760-1:1997, Annex C
Pressure-sensitive edges and bars: [d]	
— selection	EN 1760-2:2001, Clause 4
— installation	EN 1760-2:2001, Annex E
— design	EN 1760-2:2001, Annex C
Two-hand controls:	
— selection [c]	ISO 13851:2002, Clause 4 and Annex B ISO 13849-1:1999, Clause 6 and Annex B IEC 60204-1:2000, 9.2.5.7
Hold-to-run control devices	ISO 12100-1:2003, 3.26.3 IEC 60204-1:2000, 9.2.5.6
Limited movement control devices	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 setting, adjustment, maintenance work and elimination of process faults.

[b] The type selected shall be consistent with the category of the safety-related part of the control system as defined in ISO 13849-1:1999, 6.2. for category 2 of ISO 13849-1:1999, type 2 of IEC 61496-1:1997 shall be used.

[c] The type selected shall be consistent with the category of the safety-related part of the control system as defined in ISO 13849-1:1999, 6.2. For category 2 of ISO 13849-1:1999, type II of ISO 13851 : 2002 shall be used.

[d] Trip devices.

5.4 Safety requirements for various hazards

5.4.1 General

The principles of risk elimination, reduction by design and safeguarding in accordance with 5.3 shall apply.

5.4.2 Electrical hazards

5.4.2.1 General

Hazards

— Electrical, generated by contact of persons with live parts and parts which have become live under fault conditions (e.g. insulation fault or failure), or by approach of persons to live parts, especially in the high voltage range.

— Mechanical, due to failure of electrical equipment e.g. failure of the control system, unexpected restart.

5.4.2.2 General safety requirements for electrical equipment

Hazards arising from electrical equipment shall be reduced by the application of safety requirements selected from the clauses of IEC 60204-1 in accordance with in Table 4.

Table 4 — Safety requirements for electrical equipment of machines

Electrical hazards	Reference IEC 60204-1:2000
Electric shock	Clauses 6 and 8
Overcurrent, overspeed and overload	Clauses 7 and 8
Environmental influences	Clause 4
Restart after voltage drop or supply interruption	7.5
Accessibility, layout and identification of control equipment	Clauses 10, 12 and 17
Ergonomics for manual operation	Clauses 10 and 12
Cabling and wiring	Clauses 13 and 14
Accessories and lighting	Clause 16
Documentation and instruction handbook	Clause 18
Testing	Clause 19

5.4.2.3 Specific safety requirements for control systems and devices

Hazards arising from the control system shall be reduced by the application of safety requirements selected from the Clauses of IEC 60204-1 or from other relevant standards in accordance with Table 5.