BRITISH STANDARD

BS EN ISO 11111-6:2005 +A2:2016

Textile machinery — Safety requirements —

Part 6: Fabric manufacturing machinery (ISO 11111-6:2005)

ICS 59.120.30; 59.120.40; 59.120.99

BSI British Standards

National foreword

This British Standard is the UK implementation of EN ISO 11111-6:2005+A2:2016. It supersedes BS EN ISO 11111-6:2005+A1:2009 which is withdrawn.

The start and finish of text introduced or altered by amendment is indicated in the text by tags. Tags indicating changes to ISO text carry the number of the ISO amendment. For example, text altered by ISO amendment 1 is indicated by 〚A1〉 〈A1〛.

The UK participation in its preparation was entrusted to Technical Committee TCI/33, Textile machinery.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

Compliance with a British Standard cannot confer immunity from legal obligations.

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English version

Textile machinery - Safety requirements - Part 6: Fabric manufacturing machinery (ISO 11111-6:2005)

Matériel pour l'industrie textile - Exigences de sécurité - Partie 6: Machines de production d'étoffes (ISO 11111-6:2005)

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This European Standard was approved by CEN on 21 January 2005.

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Foreword

This document (EN ISO 11111-6:2005) has been prepared by Technical Committee ISO/TC 72 "Textile machinery and machinery for dry-cleaning and industrial laundering" in collaboration with Technical Committee CEN/TC 214 "Textile machinery and machinery for dry-cleaning and industrial laundry", the secretariat of which is held by SNV.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by August 2005, and conflicting national standards shall be withdrawn at the latest by August 2005.

This document supersedes EN ISO 11111:1995.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s).

For relationship with EU Directive(s), see informative Annex ZB, which is an integral part of this document.

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Endorsement notice

The text of ISO 11111-6:2005 has been approved by CEN as EN ISO 11111-6:2005 without any modifications.

NOTE Normative references to International Standards are listed in annex ZA (normative).

Foreword to amendment A1

This document (EN ISO 11111-6:2005/A1:2009) has been prepared by Technical Committee ISO/TC 72 "Textile machinery and accessories" in collaboration with Technical Committee CEN/TC 214 “Textile machinery and accessories” the secretariat of which is held by SNV.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by January 2010, and conflicting national standards shall be withdrawn at the latest by January 2010.

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For relationship with EC Directives, see informative Annex ZA and ZB, which are integral parts of this document.

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Endorsement notice

The text of ISO 11111-6:2005/Amd 1:2009 has been approved by CEN as a EN ISO 11111-6:2005/A1:2009 without any modification.

Foreword to amendment A2

This document (EN ISO 11111-6:2005/A2:2016) has been prepared by Technical Committee ISO/TC 72 “Textile machinery and accessories” in collaboration with Technical Committee CEN/TC 214 “Textile machinery and accessories” the secretariat of which is held by SNV.

This Amendment to the European Standard EN ISO 11111-6:2005 shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by December 2016, and conflicting national standards shall be withdrawn at the latest by December 2016.

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For relationship with EU Directive(s), see informative Annex ZA, which is an integral part of this document.

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Endorsement notice

The text of ISO 11111-6:2016/Amd 2:2016 has been approved by CEN as EN ISO 11111-6:2005/A2:2016 without any modification.

Annex ZA
(informative)

Relationship between this European Standard and the essential requirements of EU Directive 2006/42/EC aimed to be covered

This European Standard has been prepared under a Commission's standardization request M/396 (Machinery) to provide a means of conforming to essential requirements of the New Approach Directive 2006/42/EC on machinery.

Once this standard is cited in the Official Journal of the European Union under that Directive, compliance with the normative clauses of this standard given in Table ZA.1 confers, within the limits of the scope of this standard, a presumption of conformity with the corresponding essential requirements of that Directive and associated EFTA regulations.

Table ZA.1 — Correspondence between this European Standard and Annex I of Directive 2006/42/EC

Essential Requirements of Directive 2006/42/EC	Clause(s)/sub-clause(s) of this EN	Remarks/Notes
All essential requirements of Annex I are covered	All clauses are covered	IMPORTANT — Compliance with the requirements of EN ISO 11111-1 and EN ISO 11111-6 is necessary to achieve presumption of conformity with the relevant essential requirements.

WARNING 1 — Presumption of conformity stays valid only as long as a reference to this European Standard is maintained in the list published in the Official Journal of the European Union. Users of this standard should consult frequently the latest list published in the Official Journal of the European Union.

WARNING 2 — Other Union legislation may be applicable to the product(s) falling within the scope of this standard.

ANNEX ZB

(informative)

Relationship between this European Standard and the Essential Requirements of EU Directive 98/37/EC

This European Standard has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association to provide a means to conforming to Essential Requirements of the New Approach Directive Machinery Directive 98/37/EC amended by Directive 98/79/EC.

Once this standard is cited in the Official Journal of the European Communities under that Directive and has been implemented as a national standard in at least one Member State, compliance with the normative clauses of this standard confers, within the limits of the scope of this standard, a presumption of conformity with the corresponding Essential Requirements of that Directive and associated EFTA regulations.

WARNING: Other requirements and other EU Directives may be applicable to the product(s) falling within the scope of this standard.

Contents

Page

Foreword vii
Introduction viii
1 Scope 1
2 Normative references 1
3 Terms and definitions 2
4 List of significant hazards 2
5 Significant hazards and corresponding safety requirements and/or measures 2
5.1 General 2
5.2 Weaving machines 2
5.2.1 Common requirements of weaving machines 2
5.2.2 Shuttle weaving machines 7
5.2.3 Rapier weaving machines 8
5.2.4 Pile wire weaving machines (Wilton, épinglé, velvet) 8
5.2.5 Gripper weaving machines 9
5.2.6 Face-to-face weaving machines (pile, heavy fabric or carpet) 9
5.2.7 Water-jet weaving machines 10
5.2.8 Needle type narrow fabric weaving machines 10
5.2.9 Jacquard machines 12
5.3 Knitting (circular, flat and warp knitting) machines 13
5.3.1 Common requirements of knitting machines 13
5.3.2 Circular knitting machines 14
5.3.3 Flat bed knitting machines 14
5.3.4 Warp knitting (including stitch bonding) and Raschel machines 15
5.4 Tufting machines 16
5.5 Storage equipment for beams 17
6 Verification of the safety requirements and/or measures 18
7 Information concerning machine use 18
Bibliography 19

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 11111-6 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 11111-6, together with ISO 11111-1, ISO 11111-2, ISO 11111-3, ISO 11111-4, ISO 11111-5 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. 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 12100 and evolve means for reducing the risk from significant hazards.

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

Textile machinery — Safety requirements —

Part 6:
Fabric manufacturing 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 fabric manufacturing 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 for weaving, knitting and tufting, as specified in Clause 5.

〈A2〉 This part of ISO 11111 is complemented by the type C standards ISO 9902-1 and ISO 9902-6 with respect to noise emission measurement and ISO 23771 with respect to measures for the reduction of noise emissions. 〈A2〉

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 9902-6, *Textile machinery — Noise test code — Part 6: Fabric manufacturing machinery*

〈A2〉 ISO 11111-1:2016, *Textile machinery — Safety requirements — Part 1: Common requirements* 〈A2〉

〈A1〉 ISO 13849-1:2006, *Safety of machinery — Safety-related parts of control systems — Part 1: General principles for design*

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

ISO 13857:2008, *Safety of machinery — Safety distances to prevent hazard zones being reached by upper and lower limbs* 〈A1〉

〈A1〉 *Text deleted* 〈A1〉

〈A1〉 ISO 14122-2:2001, *Safety of machinery — Permanent means of access to machinery — Part 2: Working platforms and walkways* 〈A1〉

〈A2〉 ISO 23771, *Textile machinery — Guide to the design of textile machinery for reduction of the noise emissions* 〈A2〉

〈A1〉 *Text deleted* 〈A1〉

〈A1〉 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 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 〈A1〉

〈A1〉 *Text deleted* 〈A1〉

3 Terms and definitions

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

3.1
two-button-control device
device which requires at least simultaneous actuation using two fingers in order to initiate a machine function

4 List of significant hazards

Significant hazards found in fabric manufacturing 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 [A2] ISO 11111-1:2016 [A2],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 fabric manufacturing 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 fabric manufacturing 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 [A2] ISO 11111-1:2016 [A2], Clauses 5 and 6, whenever referred to under the heading “General safety requirements” of this Clause 5 and shall conform to the additional “Specific safety requirements” of this Clause 5.

5.2 Weaving machines

Shuttle weaving machines, rigid and flexible rapier, projectile, air and water-jet and similar weaving machines, also pile weaving and narrow fabric weaving machines.

5.2.1 Common requirements of weaving machines

NOTE For some weaving machines, e.g. air jet weaving machines, projectile weaving machines or shuttle type narrow fabric weaving machines, the requirements of this subclause are the only ones, and for that reason are not mentioned specifically later.

General safety requirements

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

Specific hazards

[A1] Mechanical, from the sley and associated moving parts including the reed, and from the gears of the let-off motion device, as well as from the Jacquard machine, shedding mechanism and heald frames, in particular, crushing and shearing. [A1]

Specific risks

Low probability of moderate-to-severe injury, particularly when a machine is accidentally started up (inadvertent or unintended start) and when mending a broken end (thread).

Table 1 — General safety requirements relating to weaving machines

Application	Reference [A2] ISO 11111-1:2016 [A2]
All machines:	
Electrical equipment in general	5.4.2.1 and 5.4.2.2
Electrical control systems	5.4.2.3
Starting and stopping	5.4.2.4
Reduction of risks by design	5.3.2
Reduction of risks by safeguarding	5.3.3
— with guards	Table 2
— with safety devices	Table 3
Static electricity	5.4.4
Fluid power systems and components	5.4.5
Hot surfaces (heat setting of selvedge)	5.4.6.1
Noise	5.4.7, 7, 8.2
Emission of dust and fly	5.4.10
Fire	5.4.11
Ergonomics	5.4.13
Devices for special operation	5.5
Fitting of parts	5.8
Particular machine elements:	
Drive and transmission enclosures	6.2
Rollers	6.5
Rotating shafts	6.6
Handwheels	6.7.2
Cutting devices	6.12
Batchers	6.18
Automatic machines and equipment	6.21
Automatic guards	6.21.2
Mobile machines, handling devices, operational parts	6.21.3
	This part of ISO 11111
Other items:	
Jacquard machines	5.2.9

Specific safety requirements

a) Start-up by unintended or inadvertent actuation shall be prevented by start controls designed so as to reduce the risk of an operator either inadvertently actuating the control (e.g. by leaning on it) or actuating the wrong control (e.g. starting at normal speed instead of reduced running speed), see [A2] ISO 11111-1:2016 [A2], Table 6. Such controls may be

1) two-button control devices, or

2) control actuators with a movement different from other control actuators (e.g. pull out instead of press).

b) Guards and/or safety devices shall be provided for the crushing and shearing points between the reed and fixed parts such as temple assembling (including temple cover, temple trough and temple support) or “down-holder” or cloth table in order to prevent the machine starting to move (start-up protection) when the operator's fingers are in the danger zone (see Figure 1). This includes start-up for

— single pick insertion,

— normal production speed,

— reduced running speed, and

— restart after automatic broken weft removal.

This safe-guarding may be in the form of the following:

[A2] 1) sensitive protective equipment (SPE), e.g. active opto-electronic protective device(s) (AOPD), in accordance with ISO 11111-1:2016, Table 3.

Reaching the hazard zone shall not be possible without activating the SPE (see Figure 1). The AOPD shall comply with type 4 according to IEC 61496-1 and IEC 61496-2. The SPE may be deactivated immediately after the machine has reached its normal production speed, unless it is used additionally to protect the danger zone between the moving sley and fixed machine parts [see 5.2.1 c)];

2) movable interlocked guards, covering the crushing area between the temple and the reed, designed to prevent finger access. [A2]

c) Guards or safety devices shall be provided for the crushing, shearing and impact points to the left and right of the shed between the ends of the moving sley and fixed parts of the machine, during both start-up and normal running. These may be in the form of one of the following:

1) adjustable fixed guards;

2) movable interlocked guards;

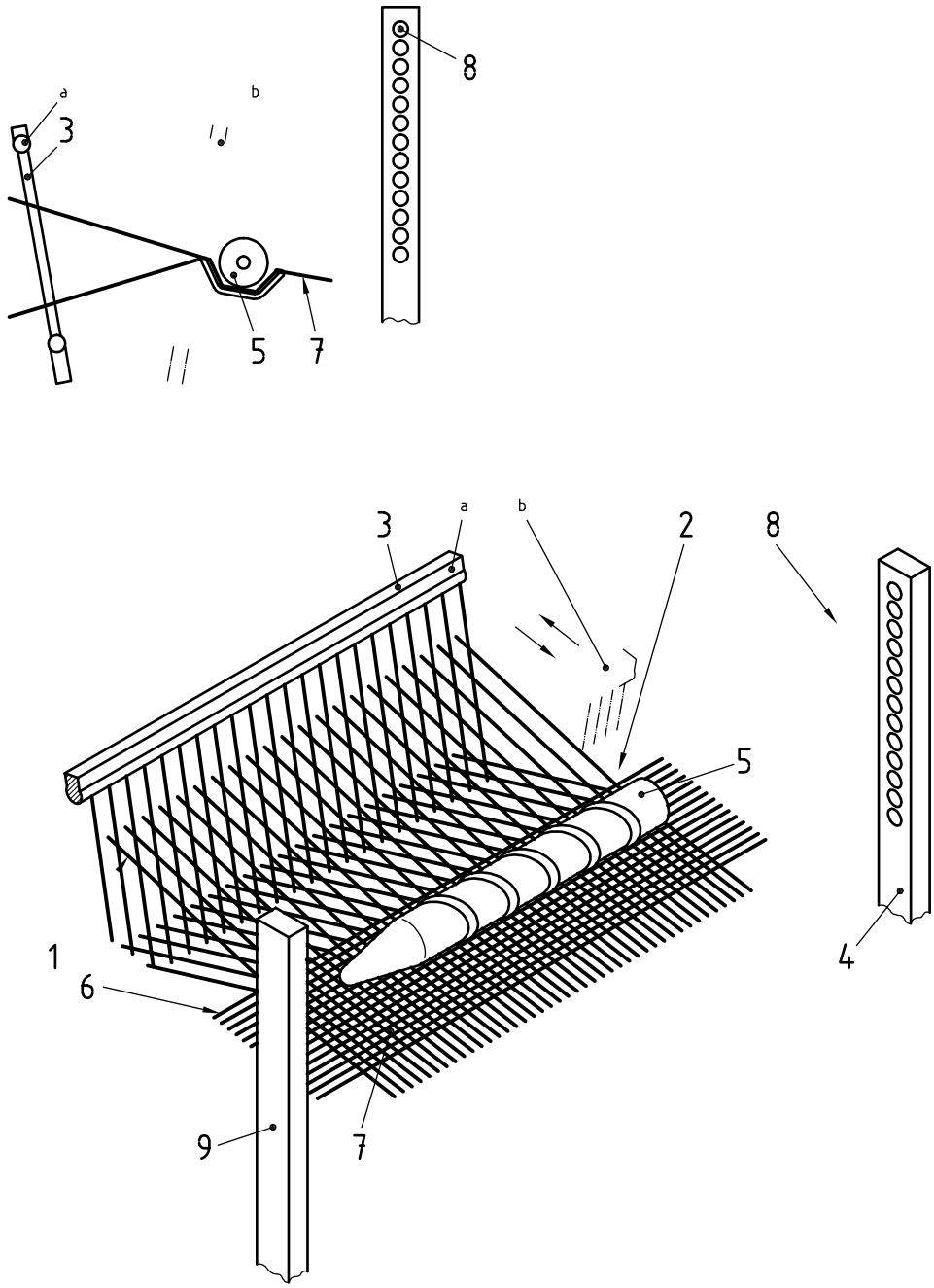
3) [A1] sensitive protective equipment [A1] so positioned that the danger zones cannot be reached before the machine has stopped and so designed that the machine cannot be restarted as long as parts of the body are inside the danger zone, and which type of safety device may, for example, be fitted to slow-running, wide-width heavy-duty weaving machines, such as paper felt weaving machines.

[A1] d) The manual start of the machine by the operator is permitted only if

— all guards and safety devices provided for normal operation are in position and/or active, and

— an optical signal is activated from the operation of the start button until the end of the starting process and the normal production speed is reached. The signal device shall be positioned so as to be visible and attract attention at the normal operating positions on the weaving machine and to provide an unmistakable warning for the imminent startup of the machine. [A1]

Dimensions in millimetres



Key

1	warp threads	6	fell
2	crushing zone: reed/temple	7	fabric
3	reed	8	light beam
4	AOPD transmitters	9	AOPD receivers
5	temple		

[a] Reed position during weft insert.

[b] Reed position during beat-up.

Figure 1 — Safeguard between temples and reed

e) Automatic restart after the machine has carried out process sequences such as

— broken pick removal,

— weft threading-in on feeder, or

— broken end (thread) repair,

shall only be permitted when

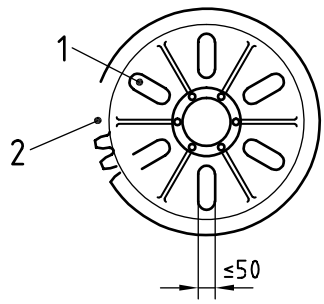
1) all guards and safety devices provided for normal operation are in position and/or active, and

[A1] 2) an optical signal is activated during the automatic sequence until the end of the starting process and the normal production speed is reached. The signal device shall be positioned so as to be visible and attract attention at the normal operating positions on the weaving machine and to provide an unmistakable warning for the imminent automatic restart of the machine.[A1]

Information shall be given in the instruction handbook concerning the need to give suitable training to operators changing over to running automated machines.

f) Gear-wheels of warp let-off motions need not be safeguarded, provided that apertures therein are not wider than 50 mm (see Figure 2) and an [A2] emergency stop device [A2] is provided within reach of the gear-wheel.

Dimensions in millimetres



Key

1 aperture
2 gear-wheel

Figure 2 — Gear-wheel of warp let-off motion

g) Information relating to safe methods for insertion and let-off of beams shall be given in the instruction handbook.

h) The instruction handbook shall contain a warning and a code of practice for operations on drive, transmission and braking systems when an imbalanced load is present on Jacquard machines or dobbies.

[A1] i) For heavy-duty weaving machines of 8 m or more in width, the safety-related part of the control system shall comply with a performance level PL = d in accordance with ISO 13849-1:2006, or a safety integrity level SIL = 2 in accordance with IEC 62061:2005.

The adoption of a performance level lower than PL = d or a safety integrity level lower than SIL = 2 shall be based on a risk assessment in accordance with ISO 13849-1:2006, Annex A or IEC 62061:2005, Annex A. [A1]

j) Drawing-in points between rollers, rollers and on-running fabrics, and rough-surfaced rollers of weaving machines, wherever the circumferential speed is less than 10 mm/s, need not be guarded if an [A2] emergency stop device [A2] is within easy reach over the whole working width.

[A1] k) Due to the low probability of minor to moderate injuries from crushing and shearing by the healdframes, safeguarding is not necessary. Information about the risk shall be given in the instruction handbook. [A1]

5.2.2 Shuttle weaving machines

General safety requirements

The safety requirements and/or measures shall be according to 5.2.1.

Specific hazards

Impact from flying shuttle.

Specific risks

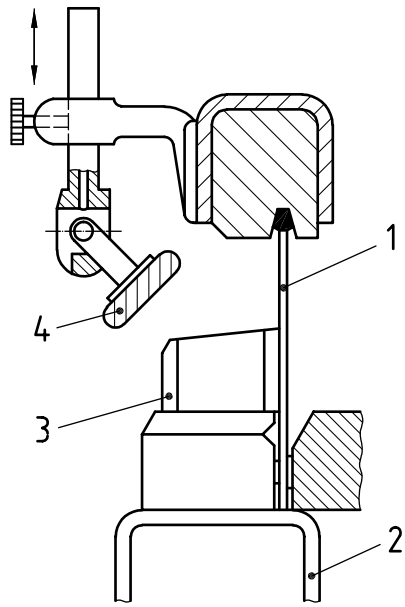
During normal and special operation, low probability of the shuttle flying beyond the machine and leading to severe injury.

Specific safety requirements

a) A guard shall be provided to prevent the shuttle from leaving the race. This may be an adjustable shuttle guard attached to the sley, covering the full width, which may be raised and which shall automatically return to its working position (see Figure 3).

b) Where weaving conditions prevent the fitting of shuttle guards to the sley, wing guards shall be provided at each side of the machine to stop a flying shuttle from travelling beyond the extremities of the machine.

c) Weaving machines of widths greater than 8 m shall be provided with additional guards, at intervals not greater than 4 m, on the path of the shuttle to stop a flying shuttle.



Key

1 reed
2 sley
3 shuttle
4 adjustable shuttle guard

Figure 3 — Shuttle guard

5.2.3 Rapier weaving machines

General safety requirements

The safety requirements and/or measures shall be according to 5.2.1.

Specific hazards

Mechanical, from the rapier head, in particular, stabbing or puncture, and from the rapier drives, in particular, shearing and impact.

Specific risks

During normal operation, in particular, on start-up, and during special operation, in particular, when setting, adjusting or carrying out repairs, leading to a low probability of moderate-to-severe injury.

Specific safety requirements

a) On machines where it is possible to reach between the rapier head and the shed, guards or safety devices shall be provided which prevent the machine being started up while the operator's fingers, hand or arm are within the danger zone. This includes start-up for single pick insertion, normal production speed, reduced running speed and restart after automatic broken pick removal. This safeguarding may be in the form of one or the other of the following:

[A1] 1) sensitive protective equipment, e.g. active opto-electronic protective device(s) (AOPD), in accordance with [A2] ISO 11111-1:2016 <A2>, Table 3, located such that the full width of the rapier path is covered; <A1]

2) interlocking guards on both sides of the machine covering the rapier path to the left and right of the shed;

These guards and safety devices may also be used to guard other danger zones (e.g. those between the reed and temple support or those of the colour selector needle).

b) The rapier drive (including gears, crank mechanism, linkages, driving arm and, where necessary, rapier bar, etc.), shall be guarded, preferably by close-fitting fixed enclosing guards.

5.2.4 Pile wire weaving machines (Wilton, épinglé, velvet)

General safety requirements

The safety requirements and/or measures shall be according to 5.2.1.

Specific hazards

Mechanical, from the pile wire when ejected, in particular, impact, stabbing or puncture.

Specific risks

During normal operation, possibility of the pile wire being ejected from the track, leading to low probability of moderate-to-severe injury.

Specific safety requirements

The pile wires shall be held down in the tracks. This may be by means of a bridge which lifts automatically to allow the wires to be repositioned. The instruction handbook shall contain a warning concerning the risk of pile wire breakage.

5.2.5 Gripper weaving machines

General safety requirements

The safety requirements and/or measures shall be according to 5.2.1 and 5.2.3.

Specific hazards

Mechanical, between the grippers and heald wires or between the grippers and the warp bed, in particular, crushing and shearing.

Specific risks

During normal operation, when removing fly or attending to broken or pulled ends, leading to low probability of moderate injury to fingers or hands.

Specific safety requirements

[A1] Sensitive protective equipment shall be fitted to protect the danger zones at the healds and at the bed of the carpet. The equipment may be muted as the grippers are moving away from the danger zone. [A1]

5.2.6 Face-to-face weaving machines (pile, heavy fabric or carpet)

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 face-to-face weaving machines

Application	Reference [A2] ISO 11111-1:2016 [A2]
Particular machine elements:	
Work platforms and walkways	6.13

Specific hazards

Mechanical, from the sley after switching off the machine, in particular, crushing, and from warp beams fitted in a raised position, in particular, falling.

Specific risks

During normal operation, in particular, mending of broken ends (threads) and inspection, leading to low probability of moderate-to-severe injury.

Specific safety requirements

a) At every stoppage, including that due to failure of the power supply, the machine shall be brought to a standstill in such a way that subsequent uncontrolled movement caused by residual energy, e. g. by warp thread tension of the open shed is prevented.

b) Information relating to safe methods for insertion of full and removal of empty warp beams shall be given in the instruction handbook.

5.2.7 Water-jet weaving machines

General safety requirements

The safety requirements and/or measures shall be according to 5.2.1.

Specific hazards

Slipping on wet ground.

Specific risks

Very low probability of moderate injury.

Specific safety requirements

Covers or shields shall be provided over the weft insertion area to contain spray and splashes. Where these splash guards are also used to protect a danger zone, they shall be interlocked.

5.2.8 Needle type narrow fabric weaving machines

This applies for machines weaving fabrics $\leqslant$ 600 mm wide having one or more curved weft insertion needles.

General safety requirements

The safety requirements and/or measures shall be according to 5.2.1.

Specific hazards

Mechanical, from the weft needle carrier shank and fixed parts of the framework, in particular, crushing or shearing; from the side edges of the heald rail ends, in particular, shearing; from the reed, in particular, crushing.

Specific risks

During normal operation, in particular, on start-up or when drawing in a broken end, and during special operation, in particular, when setting, leading to low probability of moderate injury.

Specific safety requirements

a) The area through which the pivoted weft needle carrier shank travels shall be guarded. This may be in the form of a fixed cover plate between the fixed parts of the framework or the fabric guide and the pivoting angle of the needle carrier shank, as shown in Figure 4.

   An additional fixed guard shall be provided where the travel of the weft needle carrier shank outside the frame creates a shear point with the frame.

b) The front edge of the upper fabric guide plate shall be chamfered at an angle of 45° or greater in order to minimize the risk of crushing the finger ends during beat-up. The height of the unchamfered face of the guide shall be the minimum possible, as shown in Figure 4.

c) The side edges of the heald frame ends shall be protected by either a fixed side guard or heald frame guides to prevent access from the side during operation of the machine.

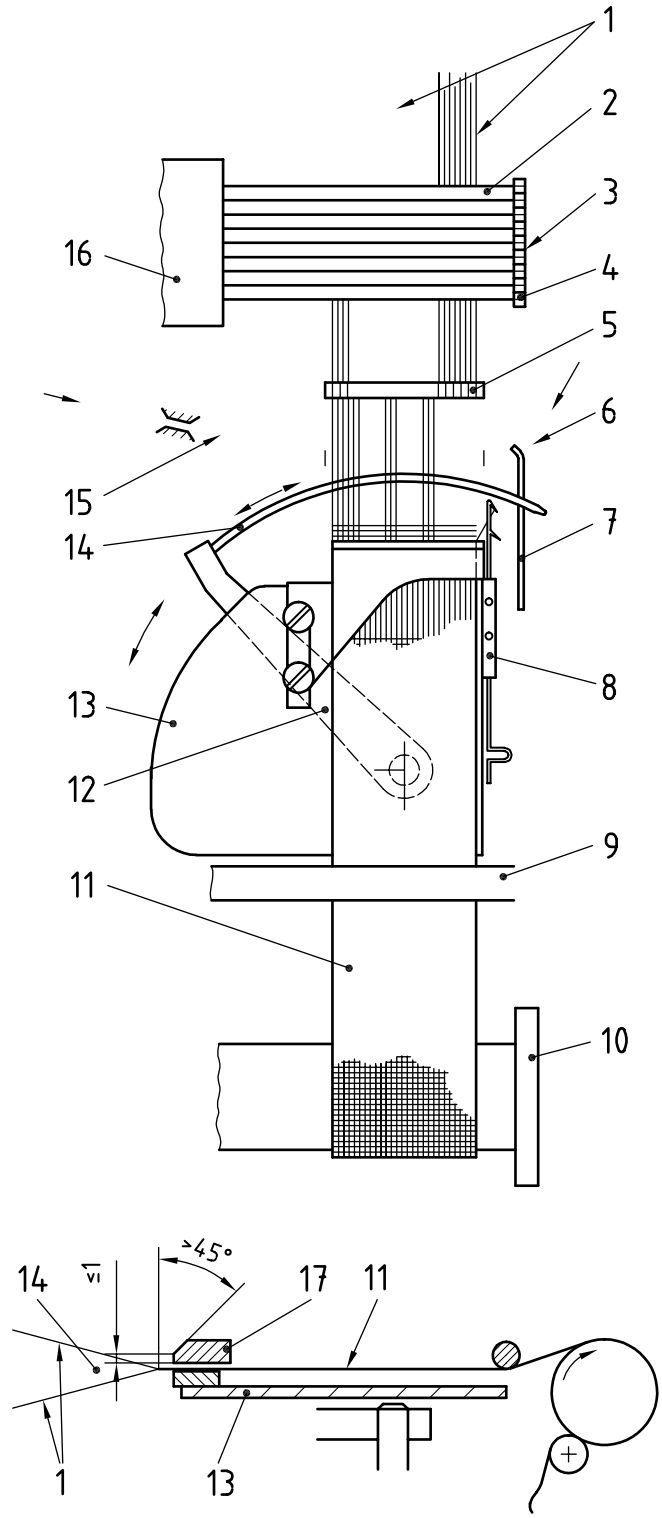
d) Where possible, handwheels shall be provided for setting.

e) Where a limited movement control is fitted, this shall be of the two- button-control, or shall be selected by means of an additional switch which isolates the normal machine start switches (e.g. mode selector in accordance with [A2] ISO 11111-1:2016 [A2], Table 8).

f) Where the machine can be operated at a reduced speed, in deviation from A2 ISO 11111-1:2016 A2, 5.5, a hold-to-run control shall be used for this operation.

g) A warning shall be given in the instruction handbook, that the reed width shall not exceed the fabric width at the fell by more than 10 mm on each side, in order to avoid the risk of crushing between the reed assembly and fixed parts of the machine.

Dimensions in millimetres



Key

1 warp threads
2 healds
3 heald frame
4 heald frame guide
5 reed
6 catch thread
7 catch thread guide
8 catch thread needle carrier
9 guide bar
10 fabric delivery
11 fabric or tape
12 weft needle carrier shank
13 cover over weft needle carrier shank
14 weft needle
15 weft thread
16 heald frame guide cover
17 upper fabric guide plate

Figure 4 — Safeguarding of needle type narrow fabric weaving machines

5.2.9 Jacquard machines

General safety requirements

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

Table 3 — General safety requirements relating to Jacquard machines

Application	Reference [A2] ISO 11111-1:2016 [A2]
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
Noise	5.4.7, 7, 8.2
Ergonomics	5.4.13
Devices for special operation	5.5
Elevated servicing positions	5.6
Fitting of parts	5.8
Particular machine elements:	
Drive and transmission enclosures	6.2
Rotating shafts	6.6
Walk platforms and walkways	6.13
Complex installations	6.22

Specific hazards

Mechanical, due to unexpected start-up, in particular, crushing, shearing and entanglement.

Specific risks

During special operation, when work is being carried out on the Jacquard device (e.g. card changing), unexpected start-up can occur, leading to low probability of moderate-to-severe injury.

Specific safety requirements

a) A start prevention switch shall be provided to stop each Jacquard machine and to prevent it being started by the weaving machine controls at ground level. In deviation from ISO 13850, the [A2] emergency stop [A2] may also perform the function of start prevention.

   A start prevention switch is not required for narrow-fabric weaving machines with Jacquard machines that have no working platform.

b) In order to prevent unexpected motion of the machine caused by residual energy, it shall be possible to maintain the machine stationary by means of an appropriate device, e.g. by mechanical brakes.

   The instruction handbook shall include recommended work procedures for avoiding work on the drive system of the Jacquard machine when an imbalanced load caused by the warp threads is present.

c) The drives between the Jacquard machine and the weaving machine shall be guarded.

d) When several operators are involved in the start-up of a weaving machine and associated Jacquard machine as a result of the type of control, reference shall be made in the instruction handbook regarding the method of communication required between operators and a warning signal shall be given before the start of the machine in accordance with [A2] ISO 11111-1:2016 [A2], 5.4.2.3.

e) Work platforms for Jacquard machines shall be in accordance with [A2] ISO 11111-1:2016 [A2], 6.13. Necessary openings in the work platforms shall be constructed in a manner which prevents operators from falling off the platform.

f) The instruction handbook of the Jacquard machine shall contain references concerning the safe mounting and dismounting of the harness or parts thereof.

5.3 Knitting (circular, flat and warp knitting) machines

5.3.1 Common requirements of knitting machines

General safety requirements

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

Table 4 — General safety requirements relating to knitting machines

Application	Reference [A2] ISO 11111-1:2016 [A2]
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
Noise	5.4.7, 7, 8.2
Static electricity	5.4.4
Materials and substances (waxing)	5.4.10
Ergonomics	5.4.13
Devices for special operation	5.5
Elevated servicing positions	5.6 [a]
Fitting of parts	5.8
Particular machine elements:	
Drive and transmission enclosures	6.2
Machine elements which normally do not require safeguarding	6.4
Rollers	6.5
Rotating shafts	6.6
Handwheels	6.7.2
Walk platforms	6.13 a) [a]
[A1] *Text deleted* [A1]	

[a] The requirements of [A2] ISO 11111-1:2016 [A2], 5.6 and 6.13 a), do not apply to circular knitting machines.

5.3.2 Circular knitting machines

General safety requirements

The safety requirements and/or measures shall be according to 5.3.1.

Specific hazards

Mechanical, from the rotating take-down roller assemblies and fixed parts of the machine, in particular, shearing, from rotating cam boxes and fixed parts, in particular, shearing, and from the creels, in particular, impact and shearing.

Specific risks

During normal operation, in particular, insertion of bobbins, mending of broken ends or removing fabric, and during special operation (e.g. cleaning or repair), leading to a low probability of severe injury between the rotating and fixed parts of the machine.

Specific safety requirements

a) The shear points between the rotating take-down assembly and fixed parts of the machine shall be guarded by a combination of fixed and movable interlocked guards.

b) On machines fitted with rotating cam boxes, the shear points between the rotating cam box ring and fixed parts of the machine shall be fitted/provided with

   1) an interlocked cover, in which case, when the cover is open, the machine shall only run at crawl speed in accordance with [A2] ISO 11111-1:2016 [A2], Table A.1, by means of a hold-to-run control or shall be turned by hand, or

   [A1] 2) sensitive protective equipment, e.g. a pressure sensitive edge, in accordance with [A2] ISO 11111-1:2016 [A2], Table 3, or [A1]

   3) fixed guards where no adjustments and settings are necessary.

c) The creel shall not have sharp edges. Rotating creels shall not create crush or shear points.

5.3.3 Flat bed knitting machines

General safety requirements

The safety requirements and/or measures of 5.3.1 shall apply.

Specific hazards

Mechanical, from cam slide and other machine elements, in particular, crushing and shearing, from the drive wheel, pulley and chain, in particular, drawing-in or trapping and from ejected needle fragments.

Specific risks

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

Specific safety requirements

a) The crush and shear points between the reciprocating cam slide and fixed parts of the machine shall be protected by a movable interlocked enclosing guard which, when open, shall allow the machine to be run at normal speed only by using a hold-to-run control.

b) A warning shall be given in the instruction handbook of the risk from ejected needle fragments and the advisability of wearing safety glasses when the guard is open. An appropriate warning notice shall be fitted on the machine.

c) The intake at sprockets for the chain carriage drive shall be provided with fixed guards.

5.3.4 Warp knitting (including stitch bonding) and Raschel machines

General safety requirements

The safety requirements and/or measures shall be according to 5.3.1.

Specific hazards

[A1] Mechanical, from the warp beam, in particular, falling of heavy loads and crushing by heavy loads during beam changing; from the traversing weft insertion device, in particular, crushing and impact; from the pattern drive mechanism, in particular, drawing-in and shearing; from the take-up device, in particular, intake; from the knitting elements, such as needles and sinkers, in particular, stitching, crushing and shearing; falling from a height while unclamping and lifting the beam and mending yarn breaks. [/A1]

Specific risks

[A1] During normal and special operation, low probability of severe or fatal injury and moderate probability of minor to moderate injury and a moderate risk of falling. [/A1]

Specific safety requirements

[A1] a) Falling down of warp beams during operation shall be prevented, for example, by fall arrest devices to be positioned below the warp beam holdings.

Instructions about safe operation when changing the beams shall be given in the instruction handbook. [/A1]

b) On machines with a traversing weft insertion device, access to the operating area and the crushing points between the traverse and the transport chains shall be prevented, for example, by either

1) a fence guard in accordance with [A2] ISO 11111-1:2016 [/A2], [A1] A.3 and ISO 13857:2008 [/A1], Table 2, or

[A1] 2) sensitive protective equipment, e.g. AOPD, in accordance [A2] ISO 11111-1:2016 [/A2], Table 3, located so that the machine will stop before the danger zone is reached. [/A1]

[A1] c) The drawing-in points at the sprockets for the pattern chains shall be protected with fixed guards or movable interlocked enclosing guards.

d) The drawing-in points at the take-up device (e. g. between take-up rollers or between the warp knitted fabrics and the take-up devices) shall be safeguarded as follows:

— Guards in accordance with [A2] ISO 11111-1:2016 [/A2], 6.5.

— Alternatively, the take-up device can be safeguarded with sensitive protective equipment (SPE), provided the production speed does not exceed 8 m/min. The maximum stopping distance shall not be greater than 100 mm.

Deviating from EN 999, the SPE shall be attached at the machine frame in front of the front take-up roller at a minimum distance to the drawing-in point of 100 mm. The residual risk (low probability of minor to moderate injury) shall be given in the instruction handbook and indicated by warnings at the danger zone.

e) With regard to risks emanating from knitting elements such as needles or sinkers, instructions that allow a safe operation, in particular during adjusting and maintenance work shall be contained in the instruction handbook.

f) Permanent means of access shall be provided if, according to [A2] ISO 11111-1:2016 [/A2], 5.6, access to an elevated position is required more than once per week and both operability and function of the warp knitting machine are not affected by the stationary access.

Permanent means of access shall be provided according to [A2] ISO 11111-1:2016 [/A2], 6.13 a). The width of walkways between two warper beams may be reduced to the minimum value of 500 mm as defined in ISO 14122-2:2001, 4.2.2.

If, in a given knitting or warp knitting room, the available place for the installation of permanent work platforms and walkways is not allowed on individual new machines, information shall be given in the instruction handbook concerning the need for movable platforms. This exception shall be justified by the manufacturer in the instruction handbook. [/A1]

5.4 Tufting machines

Including tufting machines for manufacturing carpets and towelling and similar type of fabrics, pass (custom tufting) type machines.

General safety requirements

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

Specific hazards

Mechanical, due to unintended or unexpected start-up of the upper yarn-feed rollers and other rollers (spiked rollers, tension rollers), in particular, drawing-in or entanglement.

Specific risks

During normal operation, when the operator could have to approach various parts of the machine, and during special operation (e.g. setting, threading-up or removing laps), leading to low probability of severe injury.

Table 5 — General safety requirements relating to tufting machines

Application	Reference [A2] ISO 11111-1:2016 [A2]
All machines:	
Electrical equipment in general	5.4.2.1 and 5.4.2.2
Electrical control systems	5.4.2.3
Starting and stopping	5.4.2.4
Reduction of risks by design	5.3.2
Reduction of risks by safeguarding	5.3.3
— with guards	Table 2
— with safety devices	Table 3
Fluid power systems and components	5.4.5
Noise	5.4.7, 7, 8.2
Materials and substances	5.4.10
Fire	5.4.11
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
Rotating shafts	6.6
Handwheels	6.7.2
Walk platforms and walkways	6.13
Automatic machines and equipment	6.21
Floor-mounted and overhead rails (tracks)	6.21.5
Overhead transport of process material	6.21.6
Complex installations	6.22

Specific safety requirements

a) Controls shall be designed so as to reduce the risk of unintended or unexpected start-up, see [A2] ISO 11111-1:2016 [A2], Table 6. This may take the form of a portable control station (hand-held control) which is the only control for the machine and which may have start, stop, hold-to-run and limited movement controls.

   On pass machines (custom tufting machines), a covered foot-operated hold-to-run control shall be provided;

b) The upper and lower yarn feed rollers shall be in accordance with [A2] ISO 11111-1:2016 [A2], [A1] 6.5. In deviation, the upper yarn feed rollers may be positioned 100 mm apart. Rough surfaced rollers shall be safeguarded in accordance with [A2] ISO 11111-1:2016 [A2], 6.5 h), e.g. by AOPD in accordance with ISO 11111-1:2009 [A1], Table 3, that stop the rollers immediately.

c) For the backing cloth feed mechanism, rear take-off tension rollers and spiked rollers, see [A2] ISO 11111-1:2016 [A2], 6.5. Protection, preferably in the form of fixed guards, shall be provided for the surface of the spiked roller and the intake between the backing cloth and the spiked roller.

d) Items a) to c) do not apply to pass machinery. For the needle bar and draw rollers of pass machines (custom tufting), a guide roller shall be positioned up-stream of the needle bar to warn the operator of approach to the danger zone.

5.5 Storage equipment for beams

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

General safety requirements

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

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

Application	Reference [A2] ISO 11111-1:2016 [A2]
All machines:	
Electrical equipment in general	5.4.2.1 and 5.4.2.2
Electrical control systems	5.4.2.3
Starting and stopping	5.4.2.4
Reduction of risks by design	5.3.2
Reduction of risks by safeguarding	5.3.3
— with guards	Table 2
— with safety devices	Table 3
Ergonomics	5.4.13
Elevated servicing positions	5.6
Fitting of parts	5.8
Particular machine elements:	
Drive and transmission enclosures	6.2
Handwheels	6.7.2
Conveyors	6.10

Specific hazards

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

Specific risks

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

Specific safety requirements

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

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

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

6 Verification of the safety requirements and/or measures

Final verification shall be carried out when the machine is in a fully commissioned condition, in accordance with [A2] ISO 11111-1:2016 [A2], Clause 7 and Annex C.

Noise emission values shall be determined for all machines covered by this part of ISO 11111 in accordance with ISO 9902-1 and ISO 9902-6, 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 [A2] ISO 11111-1:2016 [A2], 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 9902-6, whether or not noise is a significant hazard.

Bibliography

Text deleted

[1] ISO 12100, *Safety of machinery — General principles for design — Risk assessment and risk reduction*

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