BS EN ISO 23771:2015

BSI Standards Publication

Textile machinery — Guide to the design of textile machinery for reduction of the noise emissions

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National foreword

This British Standard is the UK implementation of EN ISO 23771:2015.

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.

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English Version

Textile machinery - Guide to the design of textile machinery for reduction of the noise emissions (ISO 23771:2015)

Matériel pour l'industrie textile - Guide pour la réduction de l'émission sonore à la conception des machines textiles (ISO 23771:2015)

Textilmaschinen - Konstruktive Maßnahmen zur Reduzierung der Geräuschemissionen von Textilmaschinen (ISO 23771:2015)

This European Standard was approved by CEN on 3 January 2015.

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EUROPÄISCHES KOMITEE FÜR NORMUNG

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Foreword

This document (EN ISO 23771:2015) 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of an identical text or by endorsement, at the latest by September 2015, and conflicting national standards shall be withdrawn at the latest by September 2015.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

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 ZA, which is an integral part of this document.

According to the CEN-CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

Endorsement notice

The text of ISO 23771:2015 has been approved by CEN as EN ISO 23771:2015 without any modification.

Annex ZA
(informative)

Relationship between this European Standard and the Essential Requirements of EU Directive 2006/42/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 of conforming to Essential Requirements of the New Approach Directive 2006/42/EC.

Once this standard is cited in the Official Journal of the European Union 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 relevant 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.

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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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

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For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword - Supplementary information

The committee responsible for this document is ISO/TC 72, *Textile machinery and accessories*, Subcommittee SC 8, *Safety requirements for textile machinery*.

Introduction

This International Standard is a type C standard as stated in ISO 12100. The machinery concerned and the extent to which hazards are covered are indicated in the scope of this International 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 over the provisions of the other standards, for machines that have been designed and built according to the provisions of this type C standard.

INTERNATIONAL STANDARD **ISO 23771:2015(E)**

Textile machinery — Guide to the design of textile machinery for reduction of the noise emissions

1 Scope

This International Standard provides technical information on the design of textile machinery with reduced noise emissions. Textile machines with a significant noise hazard are defined in ISO 11111 (all parts).

This International Standard supports the technical designer with the development of low-noise textile machinery. For this purpose, the significant sources of noise of the individual types of textile machines and suitable noise control measures are described.

Elements needed for the operation of the textile machine, which are, however, not part of the textile machine, are not covered by this International Standard (e.g. elements for transportation of process material, elements for provision of media).

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

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

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

ISO/TR 11688-2, *Acoustics — Recommended practice for the design of low-noise machinery and equipment — Part 2: Introduction to the physics of low-noise design*

ISO 11689, *Acoustics — Procedure for the comparison of noise-emission data for machinery and equipment*

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

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 12100, ISO 9902 (all parts), and the following apply.

3.1
significant noise hazard
noise hazard corresponding to an A-weighted emission sound pressure level at an operating position higher than 70 dB

Note 1 to entry: In this case, it is probable that for the machine user under real production conditions (environmental correction, environment noise, operation of several machines) an emission value of 80 dB(A) is attained or exceeded.

3.2
significant noise source
noise source which dominates the noise emission generated by a machine

4 Concept for noise emission control

4.1 Substantial requirements

For reduction of noise emissions from textile machines, the following substantial requirements should be considered for conceiving and designing textile machinery.

The machine shall be conceived and designed so as to reduce hazards from noise emissions to the attainable lowest load by taking into consideration the technical progress and the available means for noise control, primarily at the source.

4.2 Procedure

In order to achieve the substantial aims according to 4.1, the following procedure is recommended.

Step 1: Detection of noise emission by measurement according to ISO 9902 (all parts)

With an emission value of less than or equal to 70 dB(A) at a workstation, no further measures for noise control are required.

Step 2: Identification of significant noise sources

To identify machine elements and physical processes dominating the noise emissions, the following methods might be useful:

a) evaluation of revolutions and of the dominating frequencies of the radiated sound;

b) comparative noise measurements with changing the parameters so as to draw conclusions with regard to significant noise sources;

c) sound intensity measurements to be used for defining the loudest machine ranges;

d) calculation of structure-borne noise (simulation).

Step 3: Specifying and taking noise control measures

Noise control measures should concentrate on significant noise sources to allow good prospect of success of the measures taken. Thus, a favourable relation between expenditure and benefit might be expected.

The measures shall be taken in the following order:

a) reduction of sound generation;

b) reduction of sound propagation;

c) provision of conditions for installation, maintenance, inspection, repair, spare part specification, and quality of the used raw materials to be given for continuous low-noise operation of the machine;

d) necessity to wear hearing protectors during operation of the machine.

Step 4: Verification of the success of measures taken

The success of the measure shall be verified by noise measurements according to ISO 9902 (all parts). For these measurements, the machine should be operating in a mode specified by ISO 9902 (all parts). If the noise control attained is not sufficient, the procedure is repeated beginning with step 2. The measures for noise control may be concluded, if

— the A-weighted emission sound pressure level at a workstation is less than or equal to 70 dB or

— the standard attainable according to the state-of-the-art technology of the machine type has been achieved or is below that level.

NOTE The state-of-the-art technology represents the technical possibilities given at a certain time. The state-of-the-art technology also includes its economic feasibility.

Step 5: Documentation

The results of the working steps 1 to 4 shall be recorded in the technical documentation.

The information for the machine user, which is obtained during performing working steps 1 to 4, should be included in the instruction handbook

5 Textile machinery with significant noise hazard

5.1 General

Textile machinery with significant noise hazard is defined in ISO 11111 (all parts) and listed in detail in 5.2. Clause 6 shows the significant noise sources and the usual measures for noise generation control and propagation, as well as information for low-noise load during operation, for selected machines.

5.2 List of textile machines with significant noise hazard

5.2.1 Spinning and spinning preparatory machines

Spinning and spinning preparatory machines with significant noise hazard are given in Table 1.

Table 1 — Spinning and spinning preparatory machines with significant noise hazard

Automated blending bale openers
Tearers, willows
Bale breaker, hopper feeder
Moving bin emptiers
Carding machines
Roller and clearer cards
Tape condensers
Converters and stretch breaking converters
Draw frames for short fibres, ribbon lap machine, and lap formers
Gill boxes including “intersecting” and “chain-gill” types
Combers
Speed frames
High-draft finishers
Ring spinning machine
Open-end spinning machine

5.2.2 Non-woven machinery

Non-woven machines with significant noise hazard are needle punching machines.

5.2.3 Yarn processing, cordage, and rope manufacturing machinery

Yarn processing, cordage, and rope manufacturing machines with significant noise hazard are given in Table 2.

Table 2 — Yarn processing, cordage, and rope manufacturing machinery

Doubling machines
Twisting machines
Texturing machines
Reeling and winding machines
Ball winding machines
Rope manufacturing machinery
Combined stranding and closing machines
Braiding machines

5.2.4 Weaving and knitting preparatory machinery

Weaving and knitting preparatory machines with significant noise hazard are given in Table 3.

Table 3 — Weaving and knitting preparatory machinery with significant noise hazard

Warping, beaming, and assembly beaming machines
Sizing machines

5.2.5 Fabric manufacturing machinery

Fabric manufacturing machines with significant noise hazard are given in Table 4.

Table 4 — Fabric manufacturing machinery with significant noise hazard

Weaving machines
Needle-type narrow fabric weaving machines
Circular knitting machines
Flatbed knitting machines
Warp knitting machines
Tufting machines

5.2.6 Dyeing and finishing machinery

Dyeing and finishing machines with significant noise hazard are given in Table 5.

Table 5 — Dyeing and finishing machinery with significant noise hazard

Brushing machines
Cropping machines, shearing machines
Singeing machines
Atmospheric dyeing machines and apparatus
High-temperature dyeing machines/apparatus
Jiggers
Stenters, coating, and laminating machines
Raising machines

6 Noise sources and noise control measures for particular textile machines

6.1 General

A general introduction to the physics of noise generation and noise control, as well as guidelines on the methodical development at all stages of design of noise control, are given in ISO/TR 11688-1 and ISO/TR 11688-2.

For a particular selection of textile machinery, Table 6 provides a summary of the significant noise sources, the measures currently used for reduction of noise generation at source and of noise propagation, and advice to operators on means to reduce exposure noise. The measures given are only examples of good practice and not exhaustive and that other measures with the same or higher effectiveness may be used.

Insulating covers found on textile machinery for safety or technological reasons are not referred to as a particular noise control measure although they might reduce noise generation.

Noise relevant equipment which is not part of the textile machinery is not covered by this clause.

NOTE For design examples for noise control measures, see Annex A.

Table 6 — Noise sources and noise control measures for particular textile machines

Machine type	Significant noise sources	Noise generation control	Noise propagation control	Information on the reduction of noise load
6.2 Automated blending bale openers	a) blending bale openers (milling roller and its drive) b) fibre transport and aggregates involved (pipelines, ventilators)	a) low-noise drive concepts (e.g. timing belt) b) reduction of masses moved c) aerodynamic optimized flow geometries d) elastic hanging of milling roller	—	a) speed data to be complied with b) control milling rollers for smooth running c) clean milling rollers, remove flock (ropes) d) control the condition of double teeth (unbalance) e) straighten or replace bended teeth f) control or replace flyer wheel of ventilator with respect to wear and damage g) clean and control covering slivers
6.3 Tearers, willows	a) main drive b) tambour c) material transport	—	—	—
6.4 Bale breakers, hopper feeders	a) condenser (if available) b) spiked feed lattice c) opening roller	—	—	—
6.5 Moving bin emptiers	a) feeding (material transport) b) clearing (drive, lattice, material transport)	—	—	—

Table 6 *(continued)*

Machine type	Significant noise sources	Noise generation control	Noise propagation control	Information on the reduction of noise load
6.6 Cards	a) flow noise b) web transfer area c) clearer roller d) licker-in rolls/ drive e) compressed air impacts	a) low-noise drive concepts (e.g. belt drive) b) aerodynamic optimized air flows c) sealed exhaust system d) low unbalance of rotating working organs e) high-quality bearing	—	a) care for leaking parts of the suction system/remove leaking parts b) clean ventilators c) correct belt tension
6.7 Roller and clearer cards	a) drives b) suction c) web transfer	a) low-noise drive concepts (e.g. belt drive) b) aerodynamic optimized air flows c) sealed exhaust system d) low unbalance of rotating working organs e) high-quality bearing	—	a) care for leaking parts of the suction system/remove leaking parts b) clean ventilators c) correct belt tension
6.8 Tape condensers	a) rubbing leathers	—	—	—
6.9 Cable cutter- and stretch breaking converters	a) breaking zone b) crimping device (stuffer box) c) drive d) blower	—	—	—
6.10 Draw frames for short fibres, ribbon lap machines, and lap formers	a) drive b) ventilator	a) low-noise drive concepts (e.g. tooth belts) b) determination of suitable lubricants	—	a) maintenances cycles with lubricant recommendation b) regular cleaning of fan wheel
6.11 Gillboxes including intersecting gillboxes and chain gill boxes	a) gill movement	—	—	—

Table 6 *(continued)*

Machine type	Significant noise sources	Noise generation control	Noise propagation control	Information on the reduction of noise load
6.12 Combers	a) main drive, gear noise b) comb equipment c) nipper movement/closing d) intermitting detaching/soldering roller movement e) vibrations by intermitting movements	a) clearance minimization of gears with alternating load (low tolerances, ground surface) b) use of plastic gears where technically feasible and useful c) optimization of movement processes d) reduction of masses moved e) clearance reduced bearings of nipper apparatus, connecting rods and levers f) determination of suitable lubricants	a) encapsulated comb area b) encapsulated gear	a) definition of requirements for machine installation b) maintenance cycles with lubricant recommendation c) adjustment instructions for noise-relevant machine elements (e.g. clearance adjustment of gear pairs with alternating load)
6.13 Speedframes	a) flyer b) flyer drive c) spindle drive d) drafting drive e) suction box	a) use of timing belts for spindle and flyer drive b) multi-motor drive c) use of balanced flyers	a) encapsulation of suction aggregate b) guidance of exhaust air directly into soil duct (short way)	a) compliance with maintenance and cleaning cycles with lubricant recommendation b) spare part specification (e.g. use of balanced flyers)
6.14 High draft finishers	a) rubber drawing b) drafting drive c) suction box	—	—	—

Table 6 *(continued)*

Machine type	Significant noise sources	Noise generation control	Noise propagation control	Information on the reduction of noise load
6.15 Ring spinning machines	a) spindles/spindle bearing b) drive system of spindle c) suction box d) ring traveller system	a) spindle: high-tolerance accuracy, balancing, low-tolerance bearing b) spindle drive: — designed for low belt speeds — use of narrow belts — use of belts with noise reducing properties c) suction: — aerodynamically optimized suction openings — fan blade with high-tolerance accuracy, balancing	a) guidance of exhaust air directly into soil duct (short way) b) sound insulation for different covering plates/housing	a) maintenance cycles with lubricant recommendation [e.g. cleaning of driving area (belt drive), spindle check for wear, failure time of wearing parts] b) spare part specification (e.g. for drive belts with noise reducing properties)

Table 6 *(continued)*

Machine type	Significant noise sources	Noise generation control	Noise propagation control	Information on the reduction of noise load
6.16 Open-end spinning machines	a) spinning box b) tangential belt c) suction box d) opening roller	a) rotor bearing — low ball bearing speed due to small rotor shafts and large diameter of supporting rings/ pressure rollers — high-quality ball bearing with sound-reducing lubricant — straightness and balance quality of rotor shaft/rotor — low pollution affinity of rotor shaft — high run-out tolerance and surface hardness of supporting ring — avoidance of critical speeds — decoupled attachment of spinning box to machine b) use of tangential belts with sound reducing properties c) optimization of fans and spiral housing with regard to low sound emissions	a) equipment of suction box with silencers b) partial enclosure if useful and feasible	a) information on the dependence of sound emission on maintenance condition of machine b) regular check of tangential belt; replacement and provision of failure time in case of damages, operating noise, or uneasy running (zebra effect) c) cleaning of rotor shaft in case of deposition d) cleaning/replacement of supporting rings in case of deposition/ damages
6.17 Needle machines	a) boom drive b) needle effect on the material	—	—	—
6.18 Doubling machines	a) drive b) drawing and take up	—	—	—
6.19 Twisting machines	a) drive b) thread balloon	a) use of tangential belts with sound-reducing properties b) drive variant single spindle drive	a) partial enclosure of drive area	a) maintenance instructions

Table 6 *(continued)*

Machine type	Significant noise sources	Noise generation control	Noise propagation control	Information on the reduction of noise load
6.20 Texture machines	a) drive b) texture aggregate c) turbulence injector d) thread suction pistol	—	—	—
6.21 Winding machines	a) drive b) suction	—	a) partial enclosure of drives	—
6.22 Ball winding machine	a) drives (flyer, winding mandrel) b) flow noise of winding	a) stable construction b) low-noise drive concepts (toothed belt better than gear mechanism) c) clearance reduced and robust bearing	—	a) mainenance instructions
6.23 Stranding and closing machine	a) drives (flyer, basket, take off) b) flow noise of braid lacer	a) stable construction b) low-noise drive concepts c) chain drive better than gear mechanism d) toothed belt better than chain drive e) clearance reduced and robust bearing	—	a) maintenance instructions
6.24 Braiding machines	a) transfer noise of braid lacer	a) sound reduction elements in the rotors b) use of plastics in balls, as far as possible	a) vibration-isolated installation b) encapsulation of braiding area, as far as possible	a) maintenance instructions

Table 6 *(continued)*

Machine type	Significant noise sources	Noise generation control	Noise propagation control	Information on the reduction of noise load
6.25 Beam warping, sectional warping and beaming machines	a) beam brakes b) suction devices c) fast-rotating grooved cylinders d) entangling device e) thread guide levers for pattern chain sectional warping machines	a) reduction of masses moved b) stable framework and housing construction c) low-noise brake lining d) foaming of fast-rotating, long cylinders	a) encapsulation for drive motors, brakes, and entangling devices b) vibration-isolated installation	a) maintenance instructions (chain maintenance)
6.26 Sizing machines	a) drives b) trough heating c) dryer suction	a) low-noise driving concepts b) use of sound optimized ventilators (suction)	—	a) maintenance instruction (chain maintenance) b) spare part specifications

Table 6 *(continued)*

Machine type	Significant noise sources	Noise generation control	Noise propagation control	Information on the reduction of noise load
6.27 Weaving machines	a) sley motion and beat-up b) weft insertion c) main drive d) heddle frame motion including shaft drive e) harness with jacquard device In addition, for shuttle weaving machines: f) shuttle entry in the shuttle box g) hydraulic system for shuttle picking In addition, for pile wire weaving machines: h) pile wire motion i) pile wire edge motion	a) optimization of motion laws b) reduction of moving masses c) low-clearance bearings and guides d) suitable material mating e) heddle frame construction (damping materials, clearances) In addition, for pile wire weaving machines: f) noise-reducing materials on pile wire edge In addition for shuttle weaving machines: g) noise-reducing shuttle brakes h) hydraulic system design using low pump r/min.	a) vibration-isolated installation b) damping of structure born noise [damping of sheet metal vibration (use of sandwich panels)] In addition, for pile wire weaving machines: c) protection of beat-up and pile wire edge insertion	a) maintenance instruction b) special maintenance instructions for shuttle brake (for shuttle weaving machines) c) information on vibration-isolated installation

Table 6 *(continued)*

Machine type	Significant noise sources	Noise generation control	Noise propagation control	Information on the reduction of noise load
6.28 Needle type narrow fabric weaving machines	a) loading movement with beat-up b) shaft movement c) main drive	a) optimization of movement processes b) reduction of movable masses c) clearance reduced bearing and guidance (e.g. needle cylinder bearing with pretension, plain bearing with oil pressure) d) belt wheel design (air gap) e) use of elastic separating element between individual machine components	Partial enclosure by a) acoustic-efficient coating of individual housing sheets b) vibration-isolated installation	a) maintenance instructions — periodically control all connecting part for fixed seating — periodically control laggings, replace defect laggings
6.29 Circular knitting machines	a) suction box b) blowing equipment c) needle movement d) drives e) gearbox f) pattern gear	a) optimization of the blowing operation b) optimization of the cam tracks c) optimized movement processes of coupled gears d) reduction of masses moved	a) noise absorber at ceiling b) silencer for suction fan-motor	a) maintenance instruction
6.30 Flatbed knitting machine	a) suction box b) blowing equipment c) needle movement d) thread guide carrying and magnets used for driving e) drives	a) keep mass of movable parts low b) optimization of cam tracks c) optimization of operating time of parts operated in intervals	a) encapsulation of working area	—

Table 6 *(continued)*

Machine type	Significant noise sources	Noise generation control	Noise propagation control	Information on the reduction of noise load
6.31 Warp knitting machines	a) stitch formation b) knitting tools c) coupling gear d) pattern gear	a) displacement of natural frequencies by changing stiffness or changed mass seizing b) reduction of radiating areas c) optimized movement processes of coupled gears d) avoidance of clearance in bearings and guides e) reduction of masses moved	a) vibration-isolated installation of machine	a) maintenances instructions
6.32 Tufting machines	a) needle penetration of the backing b) drive systems	a) stable framework construction b) reduction of moving masses c) balancing of rotating and oscillating elements d) design of individual balancing elements	a) vibration-isolated installation	a) maintenance and setup instructions b) specifications of spare parts
6.33 Suede finishing, Brushing, cropping, and shearing machines	a) running noise of working rollers (clearer, polishing, shear, sueding, beating, brushing rollers) b) suction c) drive motors	a) low-noise drive concepts (if relevant for working noise) b) aerodynamically optimized suction openings c) fan blade with high-tolerance accuracy, balancing	a) decoupling of enclosing b) vibration-isolated installation c) sound insulation for different covering/decoupling plates/ housing	a) maintenance instructions, e.g. control of ventilators (running accuracy, vibrations, bearing damages) b) spare part specification
6.34 Atmospheric dyeing machines and apparatus	a) drive motors b) pump motors c) direct or indirect heating	a) if possible, heat indirectly b) low-noise direct heating	—	a) maintenance instruction
6.35 High-temperature dyeing machines/apparatus	a) liquor pump b) pressure drain/ air removal	—	a) encapsulation of liquor pump optional	—

Table 6 *(continued)*

Machine type	Significant noise sources	Noise generation control	Noise propagation control	Information on the reduction of noise load
6.36 Jigger	a) trough heating with vapour b) flow noise in vapour and water valves c) external vent of main drives	a) vapour input of direct heating via injector b) installation of vapour and water valves according to flow direction	a) encapsulation by vapour blind head b) avoidance of large resonance areas	—
6.37 Stenters, coating, and laminating machines	a) good transport chain (in particular at the reverse points) b) ventilator for recirculated air and additional facilities (burner ventilation, pneumatic selvedge straightener, selvedge suction)	a) design of ventilators for low speed b) attenuation edges at the reverse points of chain	a) silencers at the suction openings b) suction openings to be positioned if possible far from the service area c) insulating covers	a) maintenance instructions — regular lubrication (chain, slide bar, ventilators) — control of attenuation edges — control of ventilators (running accuracy, vibrations, bearing damages)
6.38 Raising machines	a) drive b) external ventilator c) toothed belt d) gear drive e) cleaning with suction f) fabrics processing g) fabrics running (polygon effect)	a) low-noise drive concepts (single drives, cylindrical worm gear, bevel helical gear)	a) decoupling of construction elements b) vibration-isolation of large housing areas	—

7 Determination of compliance with the safety requirements and the efficiency of measures

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

7.1 Verification on the basis of noise emission values

ISO 9902 (all parts) provides the method for determining noise emission data from which the effectiveness of noise control measures can be assessed.

7.2 Verification of noise control

Upon evaluation/publication of the noise-control performance determined for a textile machinery according to ISO 11689, the noise emission values determined according to 7.1 shall be compared with.

The measured noise emission value of textile machinery shall not exceed the verification value.

If the data for the emission level of one group of textile machines is not available, the manufacturer shall record the measures according to their efficiency.

7.3 Information for handbook

The instruction handbook shall contain the following data concerning the airborne sound from the machine:

— provision of conditions for installation, maintenance, inspection, repair, spare part specification, and quality of the used raw materials to be given for continuous low-noise operation of machine;

— necessity to wear hearing protectors during operation of machine;

— the A-weighted emission sound pressure level at workstations, where this exceeds 70 dB(A), and where this level does not exceed 70 dB(A), this fact shall be indicated;

— the peak C-weighted instantaneous sound pressure value at workstations, where this exceeds 63 Pa (130 dB);

— the A-weighted sound power level emitted by the machinery, where the A-weighted sound pressure level at workstations exceeds 80 dB(A);

— in the case of very large machinery, instead of the A-weighted sound power level, the A-weighted emission sound pressure levels at specified positions around the machinery may be indicated;

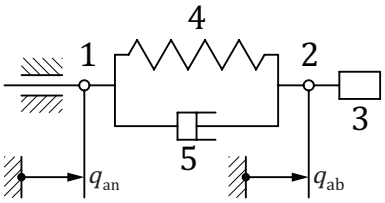
— the uncertainty factor for each emission value.

Annex A
(informative)

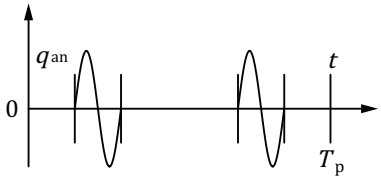
Design examples

A.1 Reduction of sound generation by analysis and optimization of movement

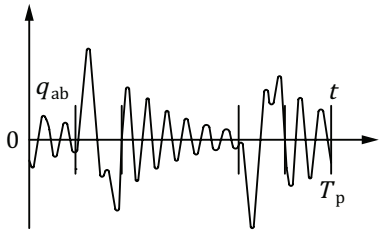
A.1.1 Reduction of sound generation



a) Dynamic replacement system



b) Movement response of the drive



c) Movement response of the mass

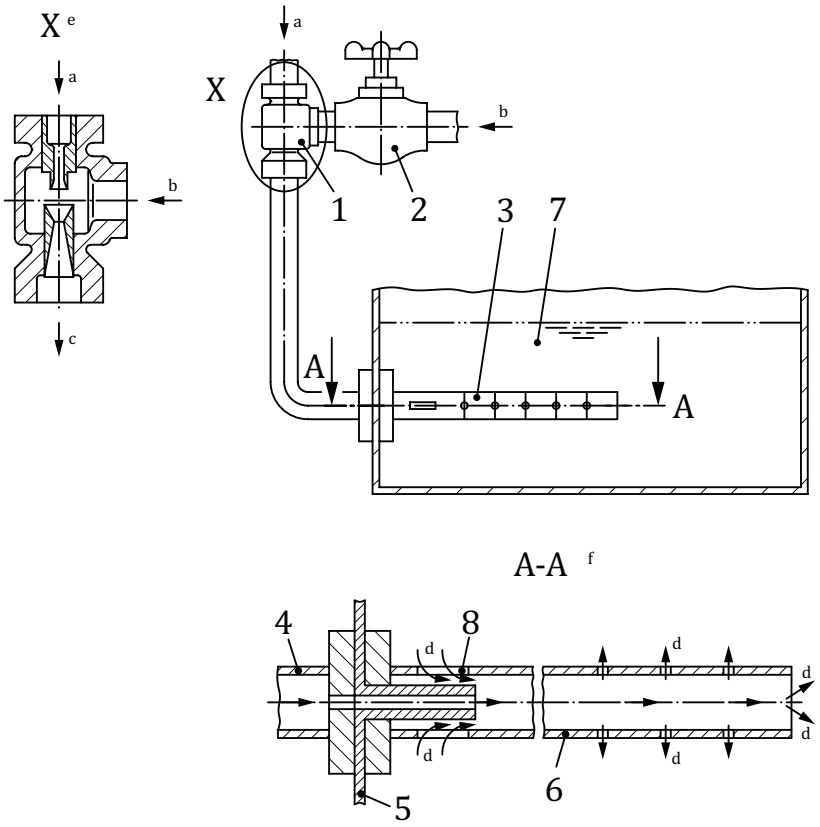
d) Movement response of the mass after analysis and optimization

Key

1 drive
2 gained speed
3 mass
4 spring
5 damper
q_{an} oscillation stimulation
q_{ab} oscillation response

Figure A.1 — Reduction of sound generation

A.1.2 Low-noise steam heating



Key

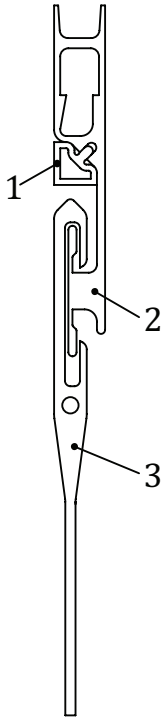
1 steam injector
2 restrictor valve
3 drilled pipe
4 steam inlet device
5 wall of apparatus
6 mixing tube
7 liquor
8 slots through which liquor is entrained

a Steam flow.
b Air flow.
c Steam and air outflow.
d Flow of energy transfer liquor.
e Presented in section.
f Presented in section.

Figure A.2 — Example of low-noise steam injector

A.2 Noise reduction of machine elements with play

A.2.1 Heddle damping



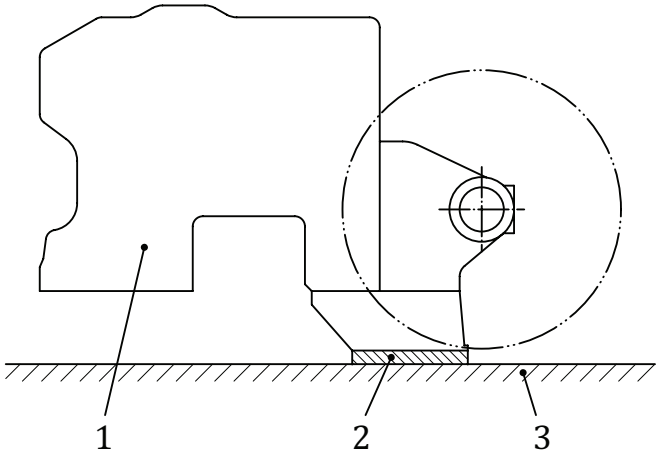
Key

1 damping strip
2 heddle frame
3 heddle

Figure A.3 — Heddle damping on a weaving machine

A.3 Decoupling

A.3.1 Decoupled installation of textile machinery

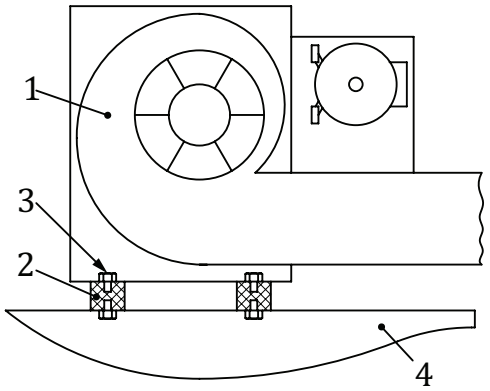


Key

1 machine
2 damping
3 ground

Figure A.4 — Decoupled installation of textile machinery

A.3.2 Decoupled attachment of transport ventilator

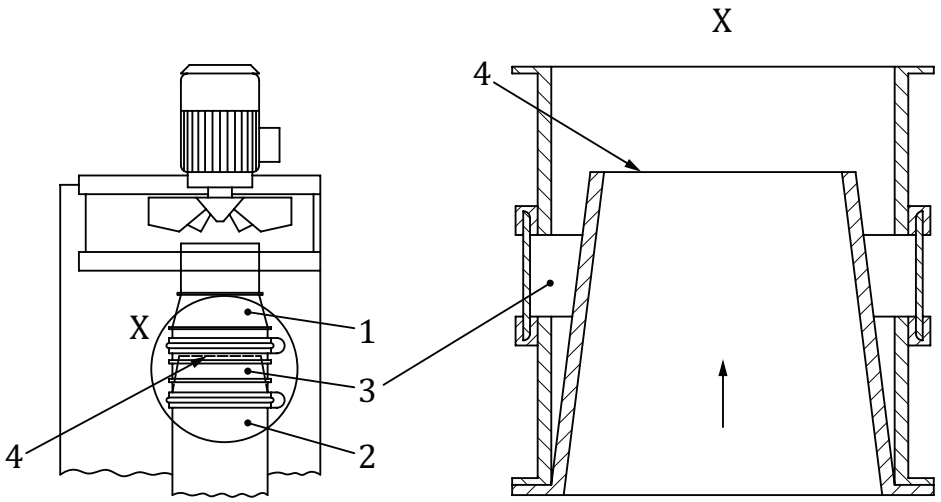


Key

1 ventilator
2 damping element
3 fixing screws
4 machine frame

Figure A.5 — Decoupled attachment of transport ventilator

A.3.3 Decoupled connection between transport ventilator and pipes

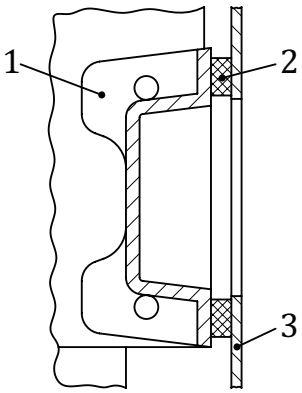


Key

1 upper tube
2 lower tube
3 rubber element
4 guiding sheet

Figure A.6 — Decoupled connection between transport ventilator and pipes

A.3.4 Decoupled connection between covers and machine elements

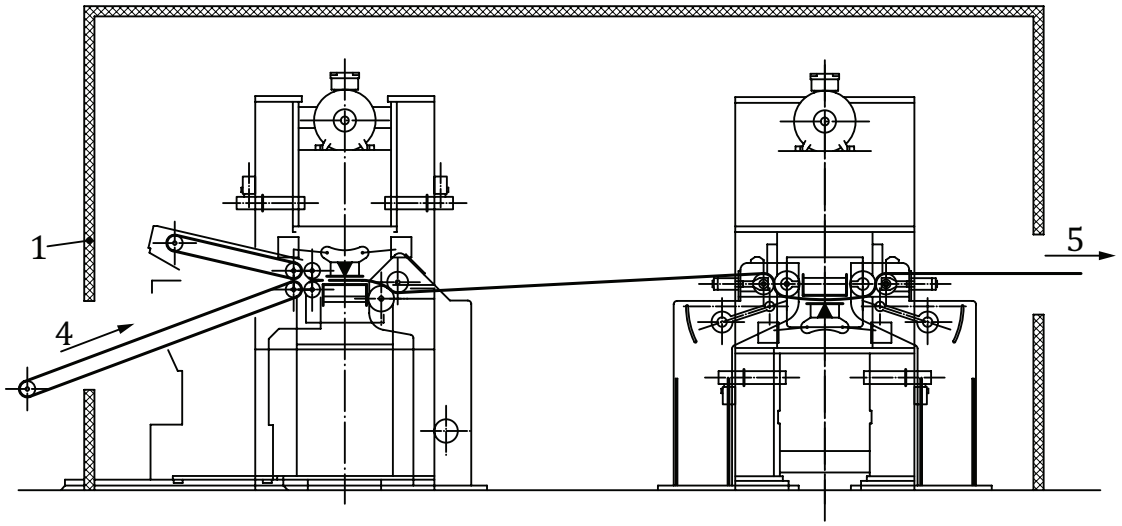


Key

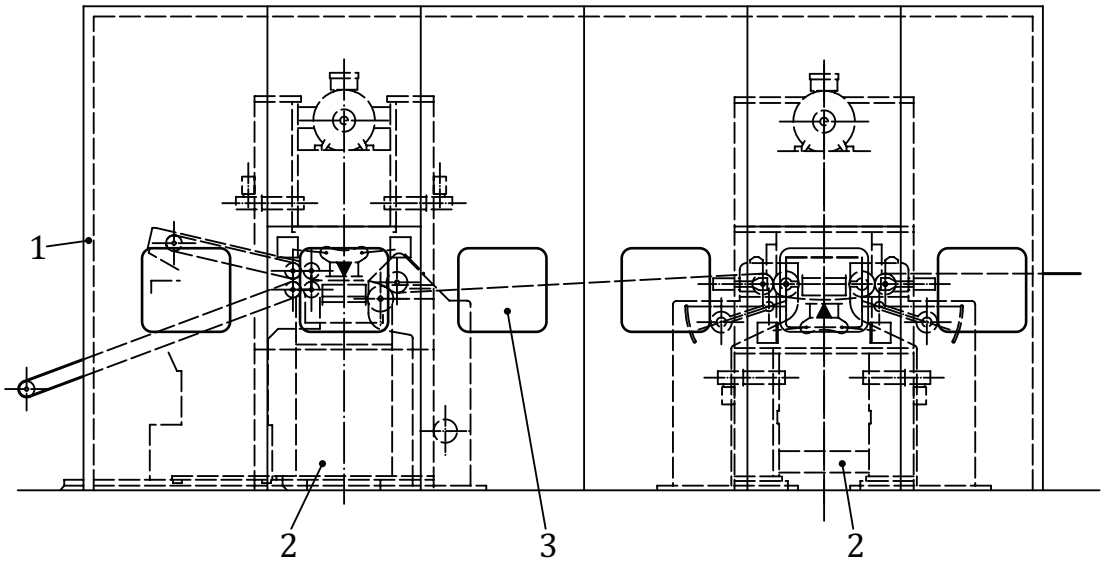
1 machine element
2 damping
3 insulating cover

Figure A.7 — Decoupled connection between insulating covers and machine elements

A.4 Typical enclosure elements



a) Presented in section

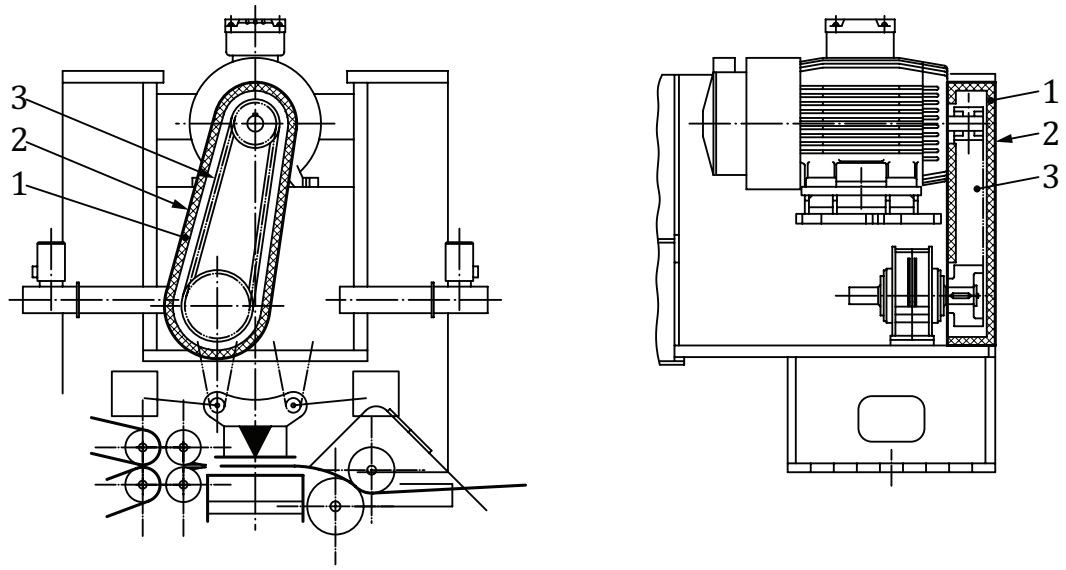


b) Outside view

Key

1 enclosure with capsule wall elements
2 access into the indoor environment (also used for changing needle boards)
3 window for observing the needling process
4 opening for feeding of process material
5 opening for delivery of process material

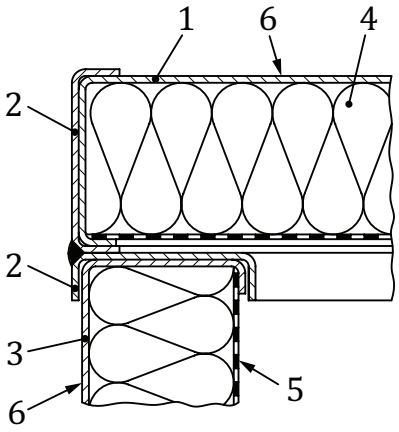
Figure A.8 — Enclosure needling machine



Key

1 sound-absorbing lining
2 containment enclosure (completely closed)
3 toothed belt drive

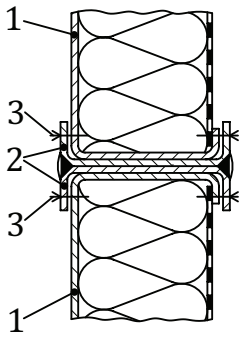
Figure A.9 — Measures for noise emission reduction on drive elements



Key

1 capsule ceiling element
2 welded U-profiles
3 capsule wall element
4 sound-absorbing lining
5 mechanical protection (perforated covering)
6 impermeable outer surface

Figure A.10 — Example for the connection of housing elements



Key

1 capsule wall element
2 welded U-profiles
3 screwed connection

Figure A.11 — Example for vertical connection of housing elements

a) On smooth ground **b) On rough (concrete-)ground**

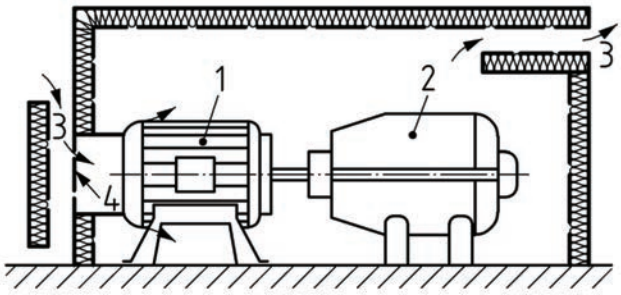
Key

1 capsule wall element
2 U-profile
3 auto-adhesive rubber sealing
4 plasticine sealing
5 mastic adhesive

Figure A.12 — Example for the installation of the housing wall

A.5 Silencer

A.5.1 Air ventilation of machine capsules



Key

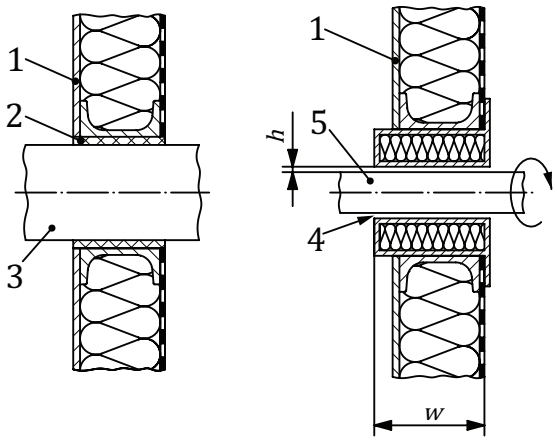
1 electric motor
2 turbine-type compressor
3 sound-reduced inlet and outlet ducts
4 protective grating

NOTE The cooling blower serves the electric motor for forced air ventilation of capsule.

Figure A.13 — Capsule with silencers with ventilation

A.6 Sealing

A.6.1 Penetrations through capsule walls

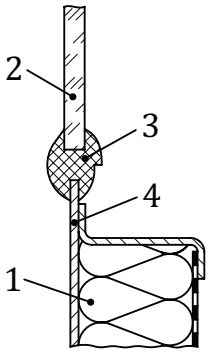


Key

1 capsule wall
2 sealing
3 tube
4 length of silencer of $w \geq 20h$
5 shaft

Figure A.14 — Example for the design of sound-reduced wall passages of tubes, shafts, handles, etc.

A.6.2 Window sealings



Key

1 capsule wall element
2 pane, thickness ≥6 mm
3 profile rubber sealing
4 sheet rim

Figure A.15 — Example for sealing of a window with rounded edges

Bibliography

[1] ISO 11111 (all parts), *Textile machinery — Safety requirements*

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