BRITISH STANDARD

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13457:2004

Footwear, leather and imitation leather goods manufacturing machines — Splitting, skiving, cutting, cementing and cement drying machines — Safety requirements

The European Standard EN 13457:2004 has the status of a British Standard

ICS 59.140.40; 61.060

BSI
British Standards

National foreword

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The UK participation in its preparation was entrusted to Technical Committee MCE/3/12, Leather products machinery — Safety, which has the responsibility to:

— aid enquirers to understand the text;

— present to the responsible European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;

— monitor related international and European developments and promulgate them in the UK.

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

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Footwear, leather and imitation leather goods manufacturing machines - Splitting, skiving, cutting, cementing and cement drying machines - Safety requirements

Machines de fabrication de chaussures et d'articles en cuir et en matériaux similaires - Machines à refendre, à parer, à couper, à encoller et à sécher l'adhésif - Prescriptions de sécurité

Maschinen zur Herstellung von Leder- und Kunstlederewaren und Schuhwerk - Spalt-, Schärf-, Schneid-, Klebstoffauftrags- und Klebstofftrocknungsmaschinen - Sicherheitsanforderungen

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EUROPEAN COMMITTEE FOR STANDARDIZATION
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EUROPÄISCHES KOMITEE FÜR NORMUNG

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Foreword

This document (EN 13457:2004) has been prepared by Technical Committee CEN/TC 201 “Leather and imitation leather goods and footwear manufacturing machinery - Safety”, the secretariat of which is held by UNI.

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of an identical text or by endorsement, at the latest by April 2005, and conflicting national standards shall be withdrawn at the latest by April 2005.

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 Directives.

For relationship with EU Directives, 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, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

Introduction

The extent to which hazards are covered is indicated in the scope of this document.

This document is a type C standard as stated in EN 1070.

The machinery concerned and the extent to which hazards, hazardous situations and events are covered are indicated in the scope of this document.

When provisions of this type C standard are different from those which are stated in type A and B standards, the provisions of this type C standard take precedence over he provisions of the other standards, for information for use and maintenance according to the provisions of this type C standard.

This document contains safety requirements for splitting, skiving, trimming, cementing and cement drying machines. It is prepared for the use of designers, manufacturers, suppliers and importers.

1 Scope

1.1 This document applies to splitting, skiving, edge trimming, strip cutting, cementing and cement drying machines used in the manufacture of footwear, leather and imitation leather goods and other related components.

1.2 This document does not apply to:

— trimming machines with rotary milling tool for the purpose of trimming edges of material, see EN 930;

— splitting and band knife machines used in tanneries, see EN 13112;

— portable machines.

1.3 This document specifies safety requirements for construction, transport, installation, adjustment, setting, teaching or process change-over, operation, cleaning, maintenance, decommissioning, dismantling and, as far as safety is concerned, disposal for machines mentioned in 1.1.

It takes account of intended use, component and system failure.

1.4 This document deals with significant hazards relevant to the footwear, leather and imitation leather goods manufacturing industries. (For a list of hazards see Clause 4.)

The document does not deal with precise technical measures for reducing the risks of fumes and dusts detrimental to health.

The use of machines falling within the scope of this document for purposes other than those specified in 1.1, may give rise to hazards not considered during its preparation.

1.5 This document also applies to equipment for material handling and operations which are an integral part of the machine.

1.6 This document assumes the machines

— are operated by adequately trained persons

— are used with adequate workplace lighting conforming the local regulations or to EN 12464-1 and prEN 12464-2

1.7 This document applies to machines manufactured after its date of publication.

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.

EN 294:1992, *Safety of machinery – Safety distances to prevent danger zones being reached by the upper limbs.*

EN 349, *Safety of machinery – Minimum gaps to avoid crushing of parts of the human body.*

EN 418:1992, *Safety of machinery – Emergency stop equipment, functional aspects – Principles for design.*

EN 547-1, *Safety of machinery – Human body measurements – Part 1: Principles for determining the dimensions required for openings for whole body access into machinery.*

EN 547-2, *Safety of machinery – Human body measurements – Part 2: Principles for determining the dimensions required for access openings.*

EN 563:1994, *Safety of machinery – Temperatures of touchable surfaces – Ergonomics data to establish temperature limit values for hot surfaces.*

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

EN 626-1:1994, *Safety of machinery – Reduction of risks to health from hazardous substances emitted by machinery – Part 1: Principles and specifications for machinery manufacturers.*

EN 811, *Safety of machinery – Safety distances to prevent danger zones being reached by the lower limbs.*

EN 894-2: *Safety of machinery – Ergonomics requirements for the design of displays and control actuators – Part 2: Displays.*

EN 894-3, *Safety of machinery – Ergonomics requirements for the design of displays and control actuators – Part 3: Control actuators.*

EN 953:1997, *Safety of machinery – Guards – General requirements for the design and construction of fixed and movable guards.*

EN 954-1:1996, *Safety of machinery – Safety related parts of control systems – Part 1: General principles for design.*

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, *Safety of machinery – The positioning of protective equipment in respect of approach speeds of parts of the human body.*

EN 1005-2:2003, *Safety of machinery – Human physical performance – Part 2: Manual handling of machinery and component parts of machinery.*

EN 1005-3:2002, *Safety of machinery – Human physical performance – Part 3: Recommended force limits for machinery operation.*

EN 1037, *Safety of machinery – Prevention of unexpected start-up.*

EN 1050, *Safety of machinery – Principles for risk assessment.*

EN 1070:1998, *Safety of machinery – Terminology.*

EN 1088:1995, *Safety of machinery – Interlocking devices associated with guards – Principles for design and selection.*

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

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

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

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

prEN 12464-2, *Light and lighting – Lighting of work places – Part 2: Outdoor work places.*

EN 12545:2000, *Footwear, leather and imitation leather goods manufacturing machines – Noise test code – Common requirements.*

EN 13478, *Safety of machinery – Fire prevention and protection.*

EN 60204-1:1997, *Safety of machinery – Electrical equipment of machines – Part 1: General requirements (IEC 60204-1:1997).*

EN 60335-2-69:2003, *Household and similar electrical appliances – Safety – Part 2-69: Particular requirements for wet and dry vacuum cleaners, including power brush, for industrial and commercial use (IEC 60335-2-69:2002, modified).*

EN 60947-5-1:2004, *Low-voltage switchgear and controlgear – Part 5-1: Control circuit devices and switching elements – Electromechanical control circuit devices (IEC 60947-5-1:2003).*

EN 61496-1:2004, *Safety of machinery – Electro-sensitive protective equipment – Part 1: General requirements and tests (IEC 61496-1:2004, modified).*

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

EN ISO 4871, *Acoustics - Declaration and verification of noise emission values of machinery and equipment (ISO 4871:1996).*

EN ISO 11688-1:1998, *Acoustics – Recommended practice for the design of low-noise machinery and equipment – Part 1: Planning (ISO/TR 11688-1:1995).*

EN ISO 11688-2:2000, *Acoustics – Recommended practice for the design of low-noise machinery and equipment – Part 2: Introduction to the physics of low-noise design (ISO/TR 11688-2:1998).*

EN ISO 11689, *Acoustics – Procedure for the comparison of noise-emission data for machinery and equipment (ISO 11689:1996).*

EN ISO 12100-1:2003, *Safety of machinery – Basic concepts, general principles for design – Part 1: Basic terminology, methodology (ISO 12100-1:2003).*

EN ISO 12100-2:2003, *Safety of machinery – Basic concepts, general principles for design - Part 2: Technical principles (ISO 12100-2:2003).*

EN ISO 14122-1:2000, *Safety of machinery – Permanent means of access to machinery – Part 1: Choice of fixed means of access between two levels (ISO 14122-1:2001).*

EN ISO 14122-2:2001, *Safety of machinery – Permanent means of access to machinery – Part 2: Working platforms and walkways (ISO 14122-2:2001).*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN ISO 12100-1:2003, EN ISO 12100-2:2003, EN 1070:1998 and the following apply.

3.1
splitting machine (see Figure 1)
machine which separates leather or other splitable materials to a required thickness by cutting. The separated part is called split-leather. The material is fed to the cutting edge of the knife either between feeding rollers or, between a roller in a fixed or movable mounting, and a fixed guide

3.2
skiving machine (see Figure 2)
machine which profiles the edges of workpieces of leather or other materials. The material is fed to the cutting edge of a moving knife either between the feeding rollers and a following roller, or a fixed guide foot

3.3
cutting machines
edge trimming and last margin and strip cutting machines

3.4
edge trimming and last margin machine (see Figures 3 and 4)
machine for final preparation of the edges of lining and edges of the upper after lasting by means of reciprocating or oscillating knives

3.5
strip cutting machine (see Figure 5)
stationary machine with circular rotating knives, roller plates or reciprocating knives for cutting straps, belts and strips of all kinds of leather as well as artificial leather, rubber, felt, plastic material. Any required cutting width can be obtained by inserting spacers between the knives

3.6
cementing machine (see Figures 6, 7, 8, 9, 10 and 11)
machine applying cement to a workpiece by means of a roller, dipping device, nozzle, spraying nozzle or brush

3.7
cement drying machine (see Figure 12)
machine for removing the carrier medium (solvent or water) from adhesive coated material prior to activation. A reactivation device can be incorporated

3.8
hazardous movement
motion of a part of the machine or workpiece which may give rise to injury

3.9
danger points
points on splitting, skiving, edge trimming, strip cutting, cementing and cement drying machines which may give rise to personal injury due to controlled-path movements of drives, machinery parts, tools or workpieces

3.10
fixed cover
fixed guard installed to prevent by itself, or together with other parts, access to the danger zones from the covered side

3.11
fixed enclosing guard
fixed guard which prevents access to a danger zone from all sides

3.12
fencing
guard around danger zones of a machine or plant, which prevents uncontrolled access

3.13
operating area
zones in or around a machine which include:

— the area of manual loading and unloading;

— the operator standing or sitting area

3.14
processing area
area of the machine where the workpiece is being split, skived, trimmed, cut, cemented or cement dried

3.15
inlet safety device
device installed to prevent access from the feeding area into the processing area. This device can be:

— a fixed or movable guard;

— a trip device

3.16
feeding gap
area through which material is fed to the processing area

4 List of hazards

4.1 The significant hazards of splitting, skiving, edge trimming, strip cutting and cementing machines are outlined in 4.3 to 4.12 and set out in Table 1.

NOTE Typical outlines of these machines together with explanatory sketches of processing areas are given in Figures 1 to 12. The Figures are given for information only.

4.2 Before using this document it is important to carry out a risk assessment of the machine in question.

Table 1 — List of hazards

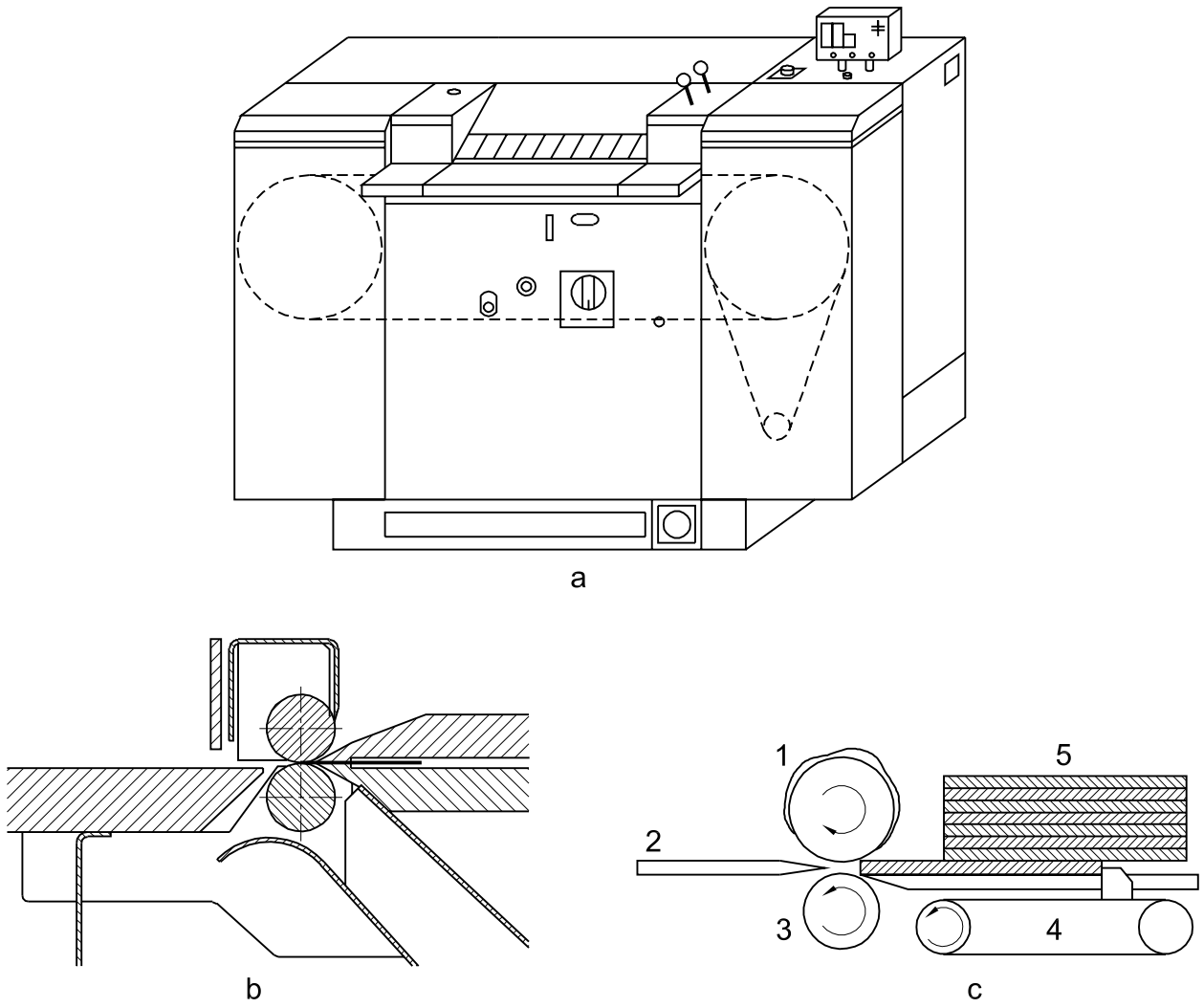
Danger zone or source of hazard		Type of hazard	Figure
4.3	Mechanical hazards		
4.3.1	Transmission and drive mechanisms	entanglement, drawing-in and trapping, friction, crushing, shearing	
4.3.2	Moving machinery parts of		
	- electrical		
	- hydraulic	crushing, shearing, impact, drawing-in	
	- pneumatic		
	- mechanical units and workpieces		
4.3.3	Loading and unloading area		
	- clamping device	crushing	
	- guiding rollers	drawing-in, crushing	J.1
	- handling device	crushing, shearing	
	- conveyor	shearing, drawing in	12
4.3.4	Processing area		
	a) Splitting, skiving, edge trimming, last margin and strip cutting machines		
	- cutting areas		
	edge of running or stationary		
	• splitting knife	cutting, severing	1
	• skiving knife		2
	• edge trimming knife		3
	• last margin trimming knife	cutting, severing	4
	• strip cutting knife		5
	- rotating grinding wheel	abrasion, ejection of parts, injury to eyes	

Table 1 — List of hazards (*continued*)

Danger zone or source of hazard		Type of hazard	Figure
	- setting, adjustment of		
	• skiving, splitting, strip cutting and • edge trimming knife	cutting, severing	
	• grinding wheel	abrasion, bursting	
	• sparks from dressing of grinding wheel	injuries to skin and eyes, ignition source	
	• falling down/out of the uptilted skiving machine by gravity	crushing, shearing	
	b) Cementing machines		
	area between transport roller and application roller	crushing, drawing-in, abrasion	6, 7
	area between fixed machine parts e. g. dip tank and moveable suspension device	shearing, crushing	8
	centrifugal device for counters and heels	trapping	8
	area between moving sole or last shoe and moving brush	crushing	11
	c) Cement drying machines		
	area between fixed machine parts and conveyor	trapping, drawing-in, shearing	12
4.3.5	Operator's standing area		
	- uneven, sloping, slippery platforms	slipping	
	- steps	tripping	
	- protruding parts	falling	
4.3.6	Movement of machine due to gravity while being transported	crushing, shearing	
4.4	Electrical hazards Electrical contact, directly or indirectly, caused by - component failure - insulation failure - incorrect design, installation or component specifications of the electrical equipment	electric shock, burns	
4.5	Thermal hazards Accidental contact with - roller dressed by hot melt cement - hot melt chamber - nozzle - reactivation unit - during suspension or by squirting	risk of burns	
4.6	Fire hazards splitting, skiving machines - the ignition of dust created by the action of the tool on the material being worked	burns	
	cementing and cement drying machines - the ignition of fumes of flammable liquid (solvent, solvent containing glue)	burns	

Table 1 — List of hazards (*concluded*)

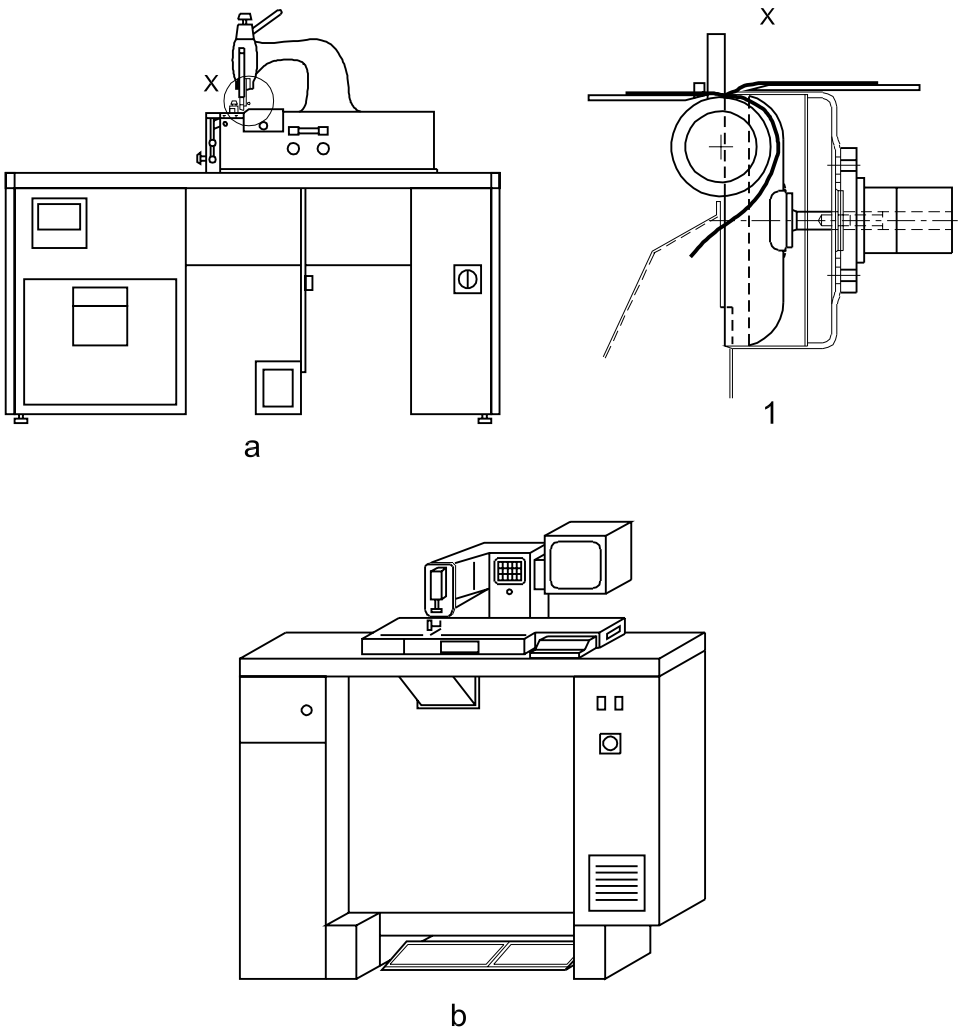
Danger zone or source of hazard		Type of hazard
4.7	Explosion hazards cementing and cement drying machines - the ignition of explosive atmosphere of inflammable liquid (solvent, solvent containing glue)	
4.8	Noise - hydraulic unit - pneumatic equipment - extraction equipment - machine parts and tools	loss of hearing, interference with speech communication and perception of acoustic signals
4.9	Emission of fumes or skin contact cementing and cement drying machines using solvent containing glue during - operation - setting - cleaning - overheating of hot melt - skin contact with solvents splitting and skiving machines - dust generated by cutting	risk of occupational disease (breathing system, skin, nervous system) (breathing system, skin)
4.10	Neglect of ergonomic principles - inadequate local lighting - poor operator posture - excessive effort during loading and unloading - poor control layout and display identification - unsuitable height and size in relation to human body dimensions	risk of occupational disease accidents resulting from poor visibility fatigue physical and mental stress psychological stress muscolo-skeletal injury/repetitive strain injury (work related upper limb disorder)
4.11	Functional disorders: - failure of control system (malfunction safety devices and machine control) - fault of energy supply (irregularity failure, unexpected reconnection) - electromagnetic disturbances	all possible hazards generated by unexpected dangerous movements (e. g. unexpected start or closing movement, prevention of stop function)
4.12	High pressure fluid ejection or ejection of part of a burst component by failure of hydraulic or pneumatic unit (broken hoses, fittings and pipework)	injury from hot oil or impact from flexible hoses



Key

a Band knife splitting machine
b Processing area
c Splitting machine with fixed knife profiling splitting machine
1 Profile roller
2 Profiling roller
3 Counter roll
4 Drawing in mechanism
5 Feeding table

Figure 1 — Splitting machine



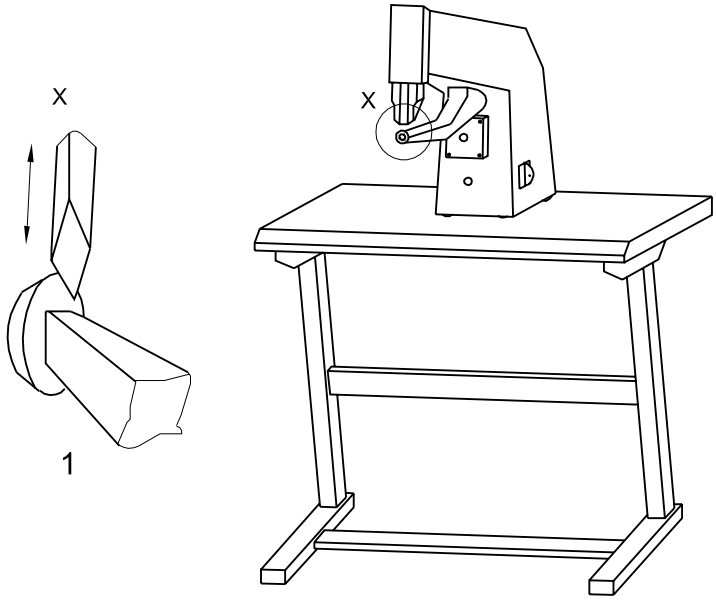
Key

a Skiving machine (front view) with bell shaped knife

b Computerised skiving machine with bell shaped knife

1 Processing area

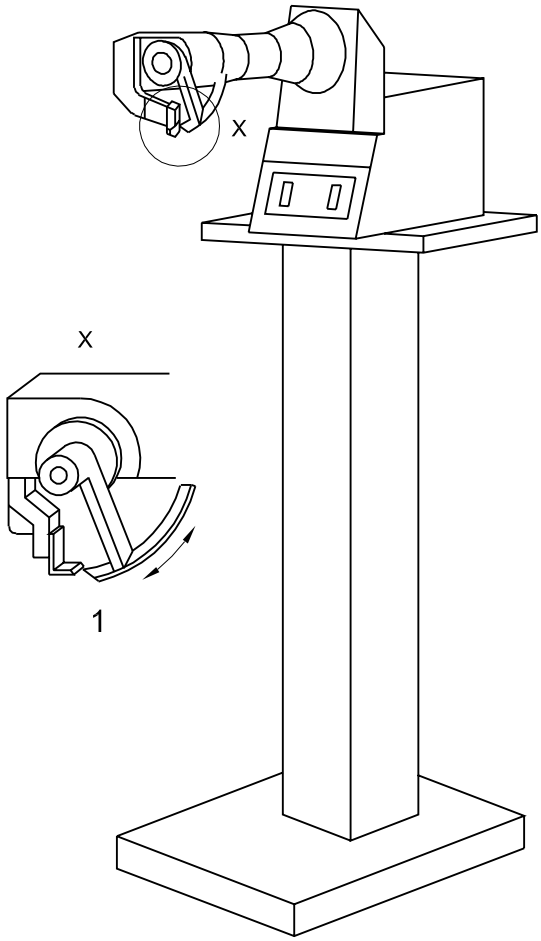
Figure 2 — Skiving machine



Key

1 Processing area

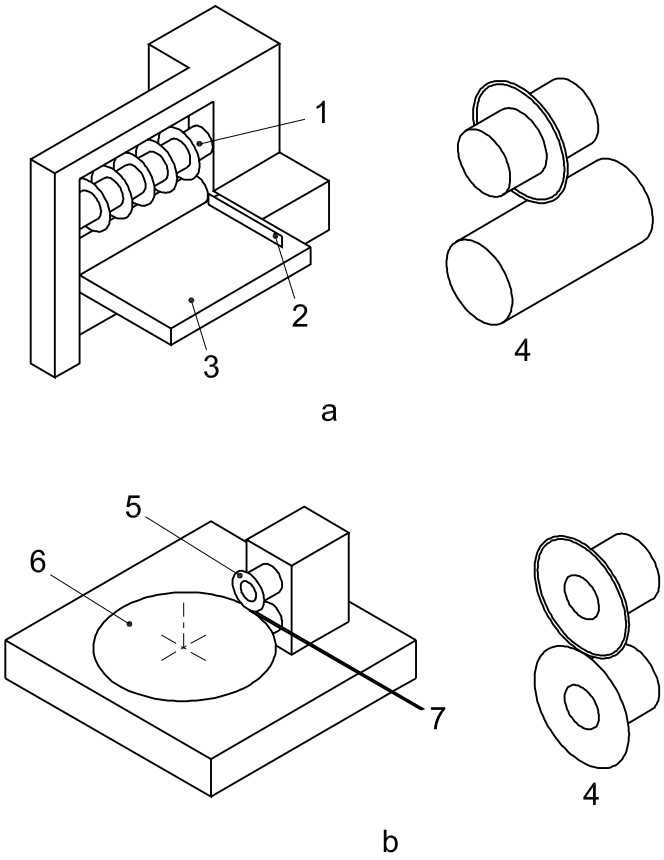
Figure 3 — Edge trimming machine for linings with oscillating knife



Key

1 Processing area

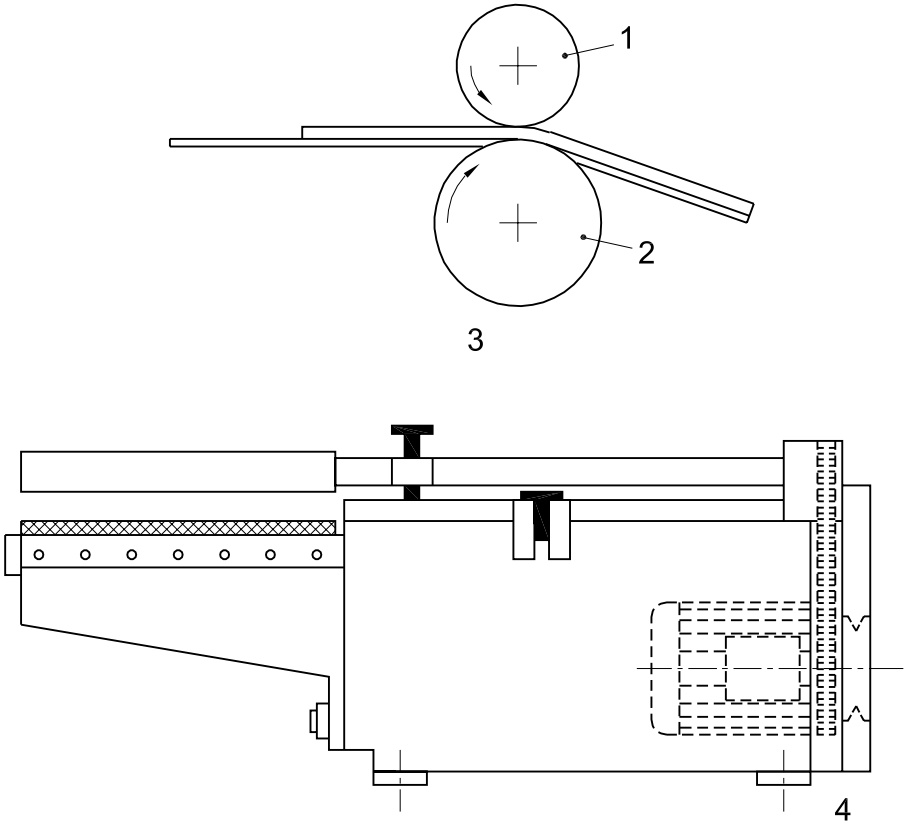
Figure 4 — Last margin trimming machine



Key

a Strip cutting machine with circular knives
b Continuous cutting machine
1 Knife shaft
2 Limit bar
3 Spreader table
4 Processing area
5 Knife pair
6 Material
7 Belt

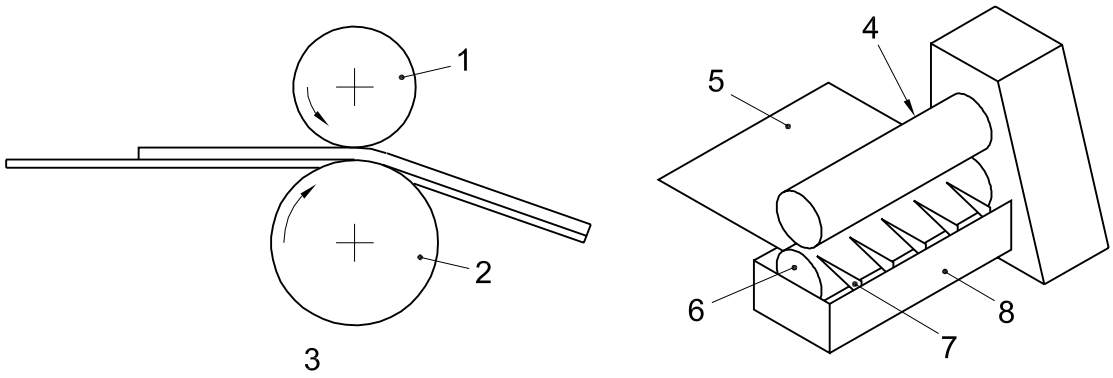
Figure 5 — Strip cutting machine



Key

1 Feed roller
2 Application roller
3 Processing area
4 Drive mechanism

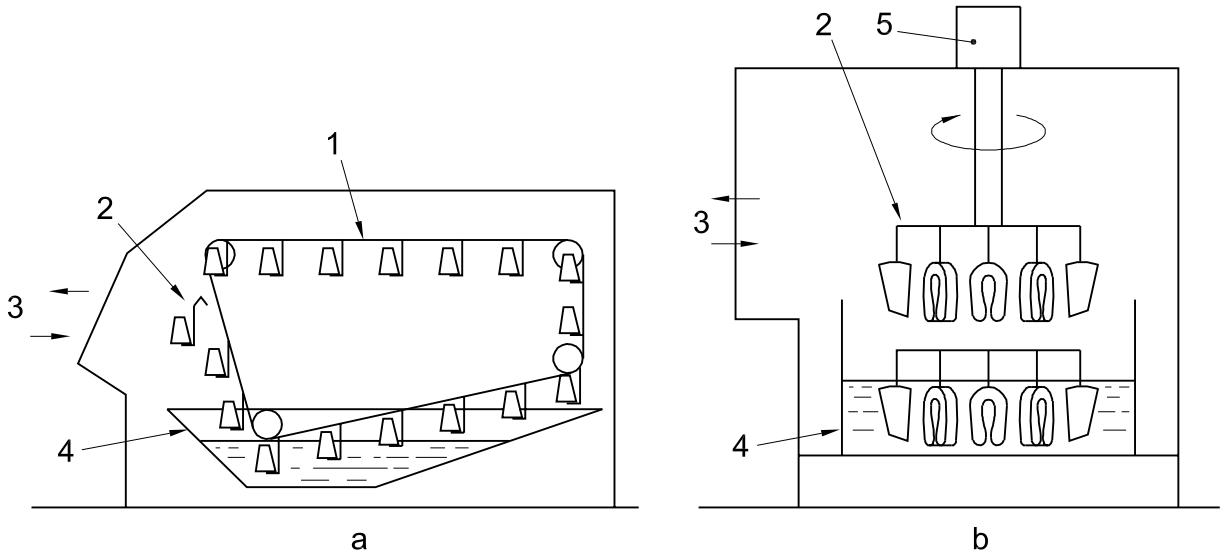
Figure 6 — Roller cementing machine designed for solvent based adhesive



Key

1 Feed roller
2 Application roller
3 Processing area
4 Tension roller
5 Spreader table
6 Application roller
7 Stripper
8 Adhesive tank

Figure 7 — Roller cementing machine designed for water based adhesive



Key

a Cement-dipping machine for heels
b Cement-dipping machine for counters (centrifugal method)
1 Conveyor
2 Hanging device
3 Feeding
4 Dip tank
5 Centrifugal drive

Figure 8 — Cementing machine

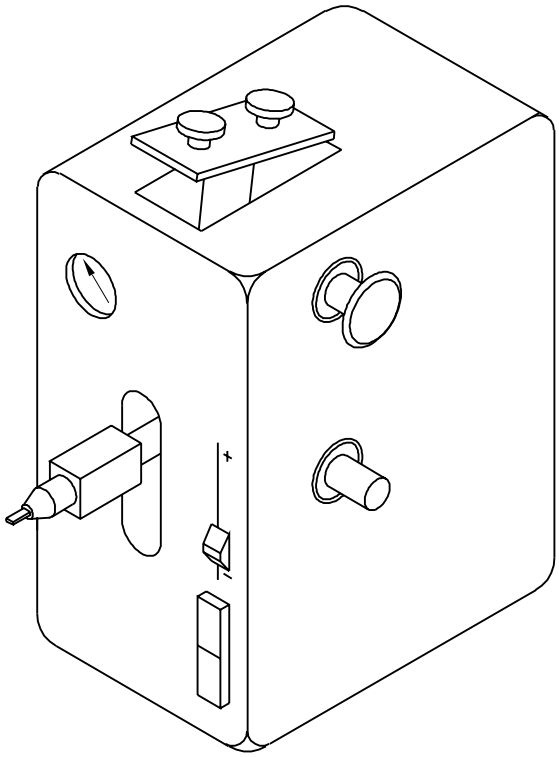
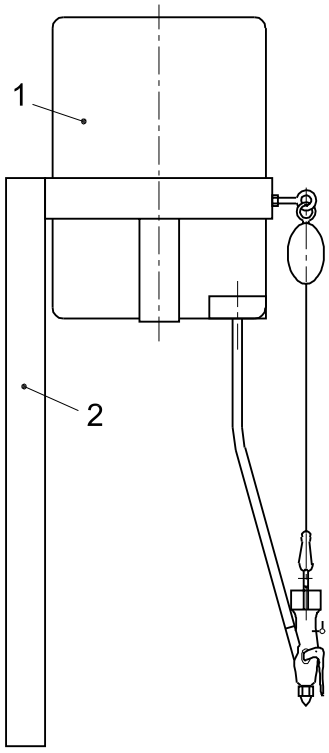


Figure 9 — Hot melt fixed applicator for multi use

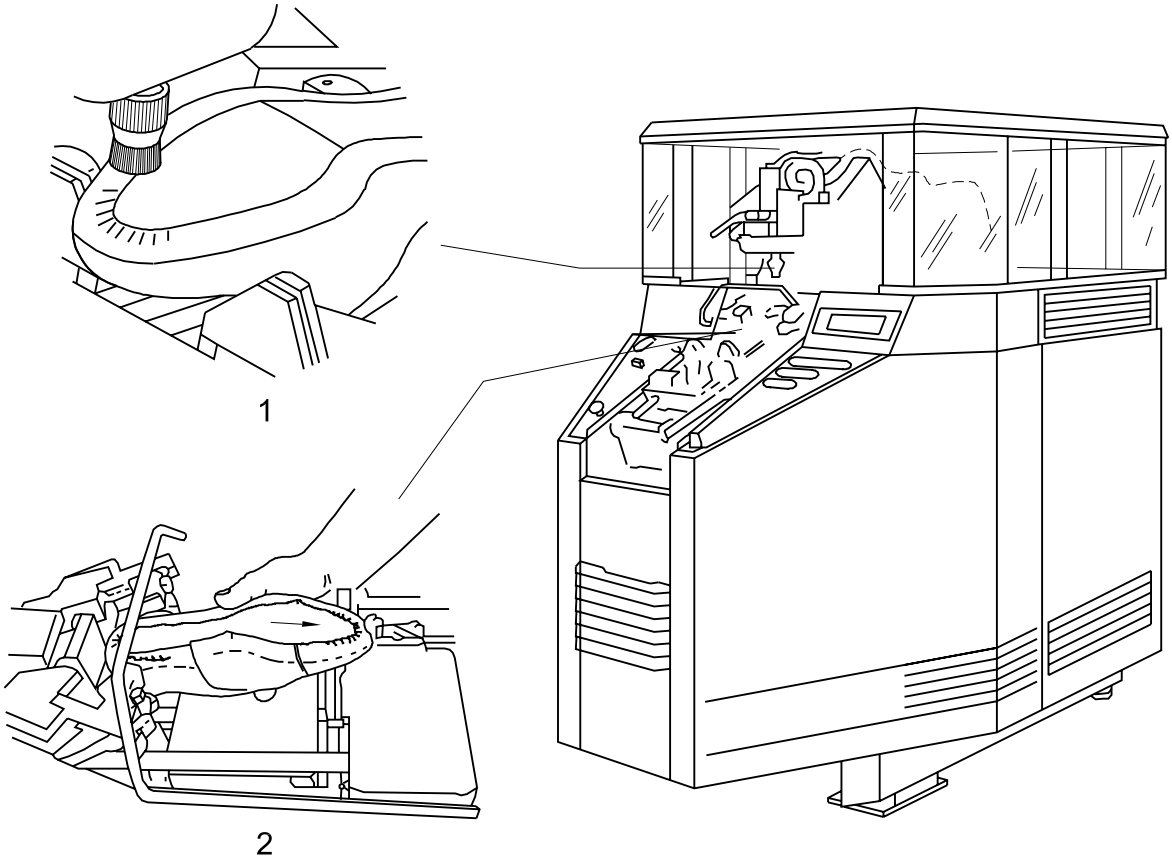


Key

1 Cement container

2 Support

Figure 10 — Spraying applicator for water based adhesive

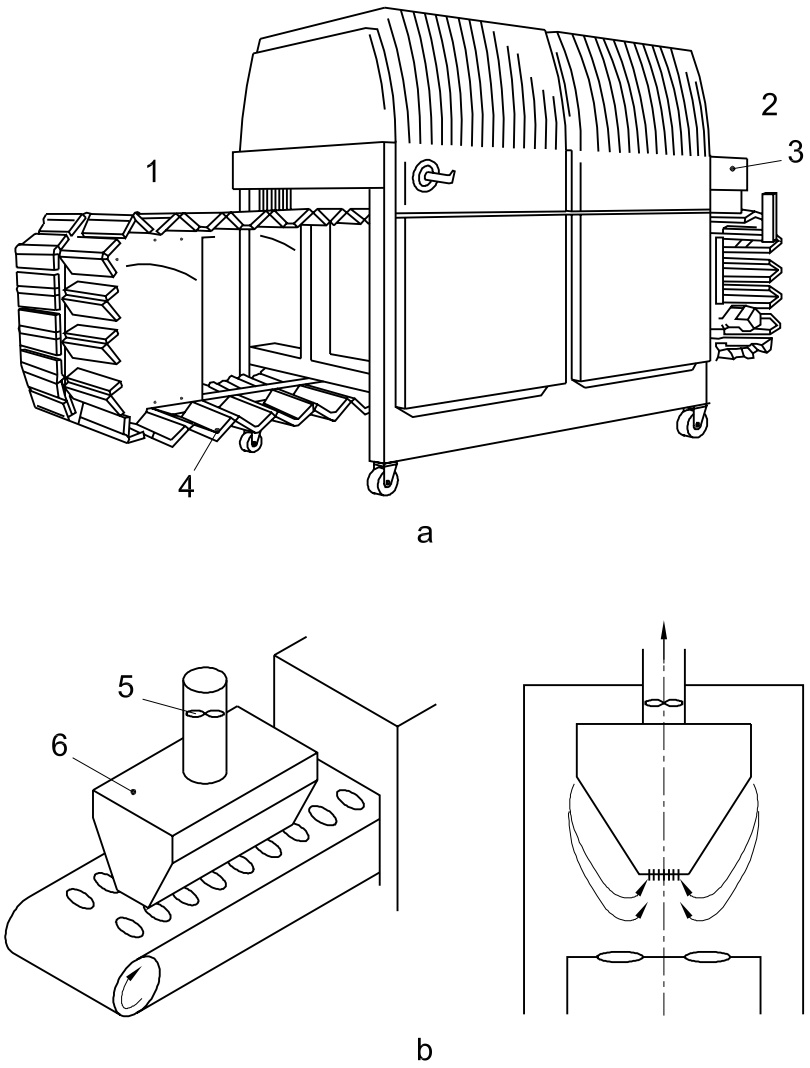


Key

1 Processing area

2 Feeding area

Figure 11 — Automatic bottom cementing machine with rotary brush



Key

a Cement drying machine with conveyor configuration
b Cement drying machine with conveyor with additional ventilation system
1 Loading end
2 Unloading end
3 Reactivation system
4 Conveyor
5 Fan
6 Ventilation system

Figure 12 — Cement drying machine

5 Safety requirements and/or measures

5.1 General principles

Machines conforming to this standard shall satisfy the requirements and all measures set out in this clause. For the reduction of hazards not identified in this document the principles contained in EN ISO 12100 (all parts) should be applied.

For hazards which are reduced by application of a B-Level standard such as EN 294, EN 418, EN 60204-1 etc., the manufacturer shall carry out a risk assessment to establish the requirements of the B-standard to be applied. This specific risk assessment shall be part of the general risk assessment of the machine.

5.2 Common requirements for all machines within the scope

5.2.1 Mechanical equipment

5.2.1.1 Transmission and drive mechanisms

All transmission machinery and drive mechanisms shall be enclosed by fixed enclosing guards which meet the requirements of EN 953.

5.2.1.2 Machinery parts, tools and workpieces

5.2.1.2.1 Unless otherwise specified by 5.3 and with consideration of a risk assessment in accordance with EN 1050, hazardous movements of machinery parts, tools and workpieces shall be safeguarded by the means shown in the following listing given in order of preference:

— fixed enclosing guards which meet the requirements of EN 953 or

— fencing which meets the requirements of A.3, or

— fixed covers which meet the requirements of A.1 and A.2, or

— interlocking guards which meet the requirements of B.2

of this document.

5.2.1.2.2 Where the protective measures given in 5.2.1.2.1 cannot be provided, devices shall be provided which will effect a shut down of the hazardous motion before the danger point is reached.

Devices which will effect this are:

— trip devices which meet the requirements of Annex C of this document, such as electrosensitive protective devices or mechanical trip devices;

— pressure sensitive bars which meet the requirements of EN 1760-2;

— hold to run control devices which meet the requirements of Clause D.1 of this document, unless otherwise specified in 5.3.

5.2.1.2.3 Safety distances and gap limitations for guard shall comply at least with Tables 1, 3, 4 of EN 294:1992, unless otherwise specified in 5.3.

5.2.1.2.4 Safeguards at crushing, shearing, drawing-in, trapping and friction points are not required if the maximum force of moving parts is limited to 150 N and the contact pressure is limited to 50 N/cm².

5.2.1.3 Operator's standing area

The surface of an area where the operator stands for recurring manual intervention shall give a good grip and steps and protruding parts shall be avoided, to prevent slipping, tripping and falling according to EN ISO 14122-1.

5.2.2 Electrical equipment

5.2.2.1 Electrical systems and equipment shall be in accordance with EN 60204-1.

With respect to some clauses of EN 60204-1:1997, stated hereafter, the following shall apply:

— **4.3**:
A.C. supplies: 4.3.2;
D.C. supplies: 4.3.3;

— **6.2:**
Protection in accordance with 6.2.2 or 6.2.3 and, where applicable 6.2.4;

— **9.2.5.3/4**:
stop function and emergency switching off: Category 0;

— **9.4**:
the safety related parts of the control system shall meet the requirements of 5.2.9.4 and 5.2.9.5 of this document;

— **12.3**:
degree of protection: at least IP 54 (in case of fine dust, a higher degree than IP 54 can be necessary).

5.2.2.2 All operating control devices requiring frequent adjustment for altering process settings shall be located outside the electrical control cabinet.

NOTE Controls for routine electrical adjustment are, for instance, to vary feed, speed, time, temperature or pressure.

5.2.3 Thermal protection

Hot surfaces within reach shall be avoided or safeguards provided against accidental contact such that, the temperatures of burn threshold for the material concerned and a contact time of less than 1 s, given in EN 563, are not exceeded. Selected values on the basis of Figures 2, 5 and 6 of EN 563:1994 are given in Annex H.

5.2.4 Protection against fire

5.2.4.1 Machines which generate dust shall be designed and constructed such, that dust accumulation which may be ignited by a machine overheating or by sparks is prevented, according to EN 13478.

5.2.4.2 Enclosed zones of a machine where dust accumulation could cause a fire hazard shall be cleanable by the operator without the need for auxiliary means to gain access. These zones shall not contain danger points caused by mechanical hazards.

Information on these zones and cleaning methods shall be included in the instructions for use, together with recommendations on disposal of the dust.

5.2.4.3 For collection, transportation and disposal of generated dust the machines shall be equipped with a provision for dust removal (e.g. dust collection bag or bin). Dust collectors shall be made out of non-flammable materials. Dust filters shall be made flame retardant.

5.2.4.4 Internal dust exhaust equipment shall be interlocked with the drive mechanism of the machine. The interlocking shall meet category 1 of EN 954-1:1996 or better.

5.2.5 Noise control at the design state

When designing the machine, the available information and technical measures to control at source the noise from machine parts, tools, hydraulic, pneumatic and extraction equipment, shall be taken into account, according to EN ISO 11688-1 and EN ISO 11688-2. Examples of noise control measures are:

a) reduction of vibration through static and dynamic balancing of rotation parts;

b) reduction of vibration within the machine by reducing both the mass of moving parts and their acceleration;

c) reduction of impactive over-clearance of rotational bearings by application of positive preloading;

d) proper choice and design of energy transfer-components to eliminate bouncing;

e) proper choice and design of transmission components (gears, pulleys, belts, bearings etc.);

f) proper design of machine structures taking into account vibration damping and avoidance of structural resonance;

g) sound deadening of pneumatic discharges, vibration damping of hydraulic circuits.

The above list is not exhaustive. Other noise control measures with the same or better efficacy can be used by a manufacturer.

5.2.6 Fumes and dust detrimental to health

Reduction of risk to health from fumes and dusts shall be carried out by observing the state of the art and Clause 6 of EN 626-1:1994. The machine shall either be designed with its own filter system or designed to enable it to be fitted to a suitable capture hood.

Because of the range of materials concerned in the process covered by this document, it is not possible to give more precise precautions. In recirculating systems dust filter shall meet dust class L and penetration 1 % of Annex AA of EN 60335-2-69:2003.

5.2.7 Ergonomics

Machine design shall incorporate the ergonomic principles described in 4.8 of EN ISO 12100-2:2003 and EN 614-1.

In particular, the design shall consider:

— the working height;

— operator posture and movement;

— operator physical strength especially during setting, in accordance with EN 1005-2 and EN 1005-3;

— ease of access and compatibility of control actuators in accordance with EN 894-3;

— operator access to the working area in accordance with EN 547-1 and EN 547-2; if necessary, a suitable platform in accordance with EN ISO 14122-2 shall be provided; the platform shall be non-sloping;

— design of displays in accordance with EN 894-2;

— additional local lighting on the machine in accordance with EN 12464-1 and prEN 12464-2.

5.2.8 Pressurized fluid systems

Equipment of hydraulic and pneumatic systems shall meet the requirements of 4.10 of EN ISO 12100-2:2003, EN 982 and EN 983.

Flexible pipes containing pressurized hydraulic or pneumatic fluids shall be protected by sufficient distances or by guards to prevent wear caused by other machine parts.

5.2.9 Control systems

5.2.9.1 Control systems shall comply with the following general requirements:

— for electrical systems: 5.2.2 of the present standard and Clause 9 of EN 60204-1:1997;

— for pneumatic systems: the requirements of EN 983;

— for hydraulic systems: the requirements for EN 982.

5.2.9.2 Safety related parts of the control systems shall be designed in accordance with the principles of EN 954-1. Safety related parts are for example emergency stopping systems, safety interlocking systems for guards, safety devices, the monitoring, emergency system for the ventilation in case of explosion risk.

5.2.9.3 In general the following principles apply:

— safety related parts of pneumatic and hydraulic safety related parts of the control system shall at least comply with category 1 of EN 954-1:1996;

— safety related parts of electrical/electronic control systems shall normally at least comply with category 3 of EN 954-1:1996. Depending on the risk assessment, the safety related part of the control system related to the emergency stop system shall at least comply with category 1.

This requirement includes that safety related functions shall not solely rely on normal traditional programmable electronic systems (PES): the required safety category shall be realised by the use of, for example, an additional hardwired circuit, a redundant solid state channel, or other provisions for redundancy.

— when using a category 2 (based on the risk assessment) the test interval shall be as short as required and not more than 4 hours.

— the parts of the control system processing the signal of a safety device shall comply at least with the safety category of that device.

5.2.9.4 Interlocking devices for safeguards and devices for muting of safeguards shall only be operated by position sensors (pressure, time or programme controlled commands of interlocks alone are not permitted). Electrical position sensors shall comply with EN 60947-5-1 and be appropriate for functioning in the positive mode according to EN 1088. According to 5.1 of EN 1088:1995, non-positive mode actuation is only allowed in conjunction with a detector with positive mode actuation, notably to avoid common cause failures.

5.2.9.5 Appropriate provisions shall be provided, taking into account the requirements of EN 1037, EN 982, EN 983, EN 60204-1, against all hazards related to failure of the power supply, including irregularities, unexpected reconnection after interruption of the power supply, or when the control circuit has been switched off.

5.2.9.6 Foot-actuated controls which actuate hazardous motion and which are not fixed to the machine, and foot-actuated controls at standing working positions, shall be provided with a cover around the foot-actuated control to prevent accidental operation.

5.2.9.7 The machine shall have sufficient immunity in relation with electromagnetic disturbances to enable them to operate safety as intended and not fail to danger when exposed to the levels and types of disturbances intended by the manufacturer.

The manufacturer shall select or design, install and wire the equipment and sub-assemblies taking account of the recommendations of the suppliers of the sub-assemblies.

5.2.10 Additional safety devices

5.2.10.1 Emergency stop

The emergency stop shall meet the requirements of EN 418. Electrical emergency stops shall comply with EN 60204-1:1997, 9.2.5.4.2. For other types of energy, the emergency stops shall comply with the first two paragraphs of that clause.

5.2.10.2 Mode selection device

Machines designed for several operating modes or which can be operated by means of various safety devices operating at different levels shall be equipped with mode selection devices which meet the requirements of 4.11.9 and 4.11.10 of EN ISO 12100-2:2003. Each position shall be secured e.g. by the use of a lock, or an access code, etc.

Operating modes are, e.g. automatic operation, hand controlled operation, tool changing, adjustment, etc.

The act of mode selection by itself shall not initiate an operation. Separate actuation by the operator shall be required.

5.2.11 Aids for transportation

Splitting, skiving, edge trimming, strip cutting, cementing machines, cement dryers and their auxiliary equipment shall be constructed and equipped in such a manner that they can be safely transported.

The requirement is met by providing points for fitting the transport means and a machine frame design which allows the use of a fork lift truck or a roller truck. Any special equipment or procedure required for safe transportation or installation of the machine shall be supplied with the machine, and described in the Instructions for use.

NOTE Information for use and removal see 7.1 of this document.

5.3 Additional requirements for specific machines

5.3.1 Splitting machines (see Figure 1)

5.3.1.1 Splitting machines with either a fixed knife or rotary band knives shall be designed so that all operator adjustment and knife blunting can be carried out from outside the guards.

5.3.1.2 Access to the rotating band knife except for the area of cutting shall be prevented by fixed enclosing guards which meet the requirements of EN 953.

5.3.1.3 The feeding area shall be protected by an inlet safety device which meets the requirements of EN 294. On machines with a reverse running function the same requirement shall apply to the rear side.

If access to the danger area is necessary for removing material from the outlet, the guarding shall meet the requirements of Clause B.2 of this document.

NOTE See Annex J (informative).

5.3.1.4 Opening of machine covers for maintenance and knife changes shall not expose the operator to danger zones other than those necessary for the maintenance or knife changing operations.

5.3.1.5 The machine shall be equipped with a knife blunting device. The grinding wheel shall be safeguarded by a fixed eye protection guard satisfying Clause A.1 of this document.

5.3.1.6 The emergency stop system shall include devices capable of being activated by the operator without the use of hands (e.g. knee or foot bar).

5.3.2 Skiving machines (Figure 2)

Access to the rotating bell knife except for the area of processing shall be prevented by:

— fixed enclosing guards which meet the requirements of EN 953, or

— movable guards which meet the requirements of Clause B.2 of this document.

5.3.3 Cutting machines (Figures 3 and 4)

On edge trimming and last margin machines the maximum opening of the leading edge shall not exceed 4 mm.

5.3.4 Strip cutting machines (Figure 5)

5.3.4.1 The feeding area shall be protected by an inlet safety device conforming to EN 294. This requirement is met, for example, by using transport rollers installed on the inlet side which in-running nip is safeguarded by a fixed cover satisfying Clause A.1 of this document.

5.3.4.2 Circular rotating knife machines shall be fitted with devices according to Clause A.1 of this document to cover the unused section of the knife. At the rear side this requirement is met if an additional slip off device is provided.

5.3.5 Cementing machines (Figures 6, 7, 8, 9, 10 and 11)

5.3.5.1 Cementing machines having rollers which are supported on one side only shall meet the force limitation according to 5.2.1.2.4 of this document.

It shall be possible to open the gap between the transport roller and applicator roller to at least 50 mm.

Access to the drive mechanism according to 5.2.1.1 of this document shall be prevented over the whole range of opening.

5.3.5.2 On cementing machines with rollers supported on both sides access between the transport roller and applicator roller from the feeding side shall be prevented by an inlet safety device which meets the requirements of EN 294.

5.3.5.3 On dip devices for counters and heels using power operated conveyor systems, access into the processing area from the rear and the sides shall be prevented by fixed guards which satisfy EN 953. Openings shall meet the criteria of interlocking guards in accordance with Clause B.2 of this document.

From the operator's side, hazardous movements shall require to be manually initiated by a push-button for each dipping and the operator shall be protected by the means shown in the following listing given in order of preference:

— fixed guards in accordance with EN 953 or

— a gap limitation which satisfies 5.2.1.2.3 of this document or

— clearance exceeding 120 mm or

— speed limitation of 2 m/min.

5.3.5.4 Each diptank shall be provided with a lid.

5.3.5.5 On centrifugal devices for counters and heels the opening for loading and unloading shall meet the criteria of interlocking guards with guardlocking in accordance with Clause B.4 of this standard. Guardlocking is not

required if the stopping time is short enough for avoiding the moving parts to be reached before they are at standstill.

5.3.5.6 On hot melt nozzle applicator machines the hazard caused by the flow of hot melt shall be reduced by a hold-to-run control device in accordance with Annex D of this document. Surfaces of hot melt chambers shall comply with 5.2.3.

5.3.5.7 On cementing machines with rotary brush, access from rear, top and the sides into the processing area shall be prevented by fixed guards conforming to EN 953. Where access is required at rear, top and sides, the openings shall be safeguarded with interlocking guards in accordance with Clause B.2 of this document.

From the operator's side, access into processing area shall be prevented by:

— a control guard as defined in 3.25.6 of EN ISO 12100-1:2003 which satisfies the requirements of Annex I of this document or

— a trip device satisfying Annex C of this document.

5.3.5.8 To prevent an explosion hazard, cementing machines using solvent containing glue shall be:

— equipped with an integral vapour disposal system, or

— designed to enable extraction equipment to be connected.

An integral vapour disposal system shall be designed such that:

— the vapour from cementing machines is discharged into a duct together with an air flow sufficient to dilute the vapour to a concentration of 25 % of its lower explosion limit, and

— it conforms to the requirements of Annex F of this document, and

— it is provided with advice on the final disposal of the vapour.

Machines designed to enable extraction equipment to be connected shall:

— be provided with details for connecting to ducts and interlocks, and

— be provided with information concerning the requirements of the extraction system such as the volumes of vapour generated, explosion limits of the vapour, and recommendations for the final disposal of the diluted vapours, and

— conform to the requirements of Annex F of this document.

NOTE Suction conditions at the source is preferred.

5.3.6 Cement drying machines (Figure 12)

5.3.6.1 Cement drying machines conveyor systems shall be protected by:

— force limitation satisfying 5.2.1.2.4, or

— trip device satisfying Annex C of this document, or

— in-running nips guards satisfying EN 294.

If the machine is fitted with a reactivation system 5.2.3 of this document shall apply.

5.3.6.2 In respect to explosion hazards the machine shall meet the requirements of 5.3.5.8 of this document.

6 Verification of safety requirements and/or measures

Aspects of machine design and construction shall be subject to verification by inspection, calculation and testing, and final verification shall be accomplished in a fully commissioned condition by checking that:

— all "A" and "B" standards referred to in Clause 5 are interpreted correctly (in particular see EN ISO 12100-1, EN ISO 12100-2, EN 294, EN 60204-1, EN 954-1),

— the categories of all safety related parts of control systems are correct,

— particular specifications (e.g. velocities and forces) are within specified limits,

— all guards and safety devices are in place, effective and adequately constructed,

— adequate information is contained in the instruction handbook.

This clause contains the methods of testing for the presence and adequacy of the safety requirements stated in Clause 5. All safety measures in Clause 5 contain self-evident criteria of acceptance. Other criteria for acceptance can be found in Table 2.

These criteria of acceptance shall be met.

Table 2 — Methods of testing

Clause	Subject	rel. standards	Verification method/clause of rel. standard
5.2	Common requirements for all machines within the scope		
5.2.1.1	Transmission machinery and drive mechanism		Measurement of distances, visual inspection in accordance with
	fixed enclosing guards	EN ISO 12100-2	Clause 5.1 and Annex A of this document
		EN 294:1992	Tables 1, 3 and 4
		EN 349	minimum gaps
		EN 953:1997	Clause 8
5.2.1.2	Moving machinery parts, tools and workpieces		Measurement of distances, visual inspection in accordance with
		EN ISO 12100-2	Clause 5.1 and Annex A of this document
		EN 294:1992	Tables 1, 3 and 4
		EN 349	minimum gaps
5.2.1.2.1	- fixed enclosing guard	EN 953:1997	Clause 8
	- fixed covers		Clause A.1 of this document
	- fencing		Clause A.3 of this document
	- interlocking guard		practical examination of function in accordance with
		EN 1088:1995	Clause 7
			Clauses B.2/A.2 of this document

Table 2 — Methods of testing (*continued*)

Clause	Subject	rel. standards	Verification method/clause of rel. standard
5.2.1.2.2	- trip devices		check of safety component certification of the manufacturer according to
	• electrosensitive protective devices	EN 61496-1:2004 IEC 61496-2:1997	Clause 8 (general) Clause 5 (optoelectric) Clauses C.2, C.3 of this document (level, function, separation, distances)
	• mechanical trip devices		Clause C.1 of this document
	• pressure sensitive bars	EN 1760-2	
	• hold to run control device		Clause D.1 of this document
5.2.1.2.3	Safety distances and gap limitation	EN 294:1992	Tables 1, 3 and 4 measurement of distances and gaps as specified in 5.1.1.2.3 of this document
5.2.1.2.4	Force limitation		measurement of force,
	Pressure limitation		calculation of pressure, as specified in 5.2.1.2.4 of this document
5.2.1.3	Operator's standing area		visual inspection as specified in 5.2.1.3 of this document
5.2.2	Electrical equipment		examination with suitable measuring instruments in accordance with
5.2.2.1	- electrical equipment	EN 60204-1:1997	Clause 19
	- electrical components	EN 60204-1	visual inspection and check in accordance with Clauses 4 to 18 and 5.2.2.1 of this standard
5.2.2.2	operating controls		visual inspection in accordance with 5.2.2.2 of this document
5.2.3	Thermal protection	EN 563:1994	in accordance with 5.2.3 and Annex H of this document, measurements of surface temperatures, visual check of precautions adopted
5.2.4	Protection against fire		
5.2.4.1	design (general)	EN 13478	visual inspection in accordance with
5.2.4.2	design (dust zones)		visual inspection as specified in 5.2.4.2 of this document
5.2.4.3	design (collector, filter)		visual inspection check of manufacturer's documentation as specified in 5.2.4.3 of this document

Table 2 — Methods of testing (*continued*)

Clause	Subject	rel. standards	Verification method/clause of rel. standard
5.2.5	Noise		visual inspection and measurement, check of manufacturer's documentation in accordance with
	- noise control at the design stage		
		EN ISO 11688-1	General technical information
		EN ISO 11688-2	5.2.5 of this document
	- noise measurement		
			measurement conditions according to
		EN 12545	noise test code (common) and Annex E of this document (specific)
	- collection and comparison of noise emission data	EN ISO 11689	
5.2.6	Fumes and dust detrimental to health		verification of exhaust ventilation system efficiency according to
	- Technical means		
		EN 626-1:1994	Clause 6
		EN 626-2:1996	verification procedures
			quality of filter in accordance with
		EN 60335-2-69:2003	Annex AA
5.2.7	Ergonomics		visual inspection in accordance with
		EN ISO 12100-2:2003	4.8 and 5.2.7 of this document
		EN 614-1	
		EN 1005-2:2003 and EN 1005-3:2002	5.3.6
		EN 894-3	
		EN 547-1 and EN 547-2	
		EN ISO 14122-2	
		EN 894-2	
		EN 12464-1 and prEN 12464-2	
5.2.8	Pressurized fluid systems		check of manufacturer's documentation (design and material used) in accordance with
		EN ISO 12100-2:2003	4.10
	- design	EN 982:1996, EN 983:1996	Clause 7 and 5.1.8 of this document
	- labelling		visual inspection in accordance with 7.2.3 of this document

Table 2 — Methods of testing (*continued*)

Clause	Subject	rel. standards	Verification method/clause of rel. standard
5.2.9	Controls		visual inspection examination of safety of function checking manufacturer's documentation (e.g. circuit diagrams) according to
5.2.9.1	- electrical system	EN 60204-1:1997	Clause 9 5.2.2 of this document
	- pneumatic system	EN 983	
	- hydraulic system	EN 982	
5.2.9.2	- safety related parts	EN 954-1	
5.2.9.3	- categories (pneumatic, hydraulic components)	EN 954-1	
	- categories (electrical components)	EN 954-1:1996	Clause 9 5.2.9.2 to 5.2.9.3 of this document
5.2.9.4	- position sensor	EN 1088	
		EN 60947-5-1:2004	Clause 9 5.2.9.4 of this document
5.2.9.5	- uncontrolled movements	EN 1037, EN 982 EN 983, EN 60204-1	5.2.9.5 of this document
5.2.9.6	- foot actuated controls		5.2.9.6 of this document
5.2.10.1	Emergency stop		visual inspection examination of function in accordance with
		EN ISO 12100-2:2003	5.5.2
	- design	EN 418:1992	Clause 4 9.2.5.4.2
	- category	EN 60204-1	5.2.10.1 of this document
5.2.10.2	Mode selection device		visual inspection and examination of function in accordance with
		EN ISO 12100-2:2003	4.11.9 and 4.11.10
	- design		Clause 5.2.10.2 of this document
5.2.11	Aids for transportation - means		visual inspection according to Clause 5.2.11 and 7.1.i of this document
5.3	Additional requirements for specific machines		
5.3.1	Splitting machines		
5.3.1.1	- adjustment and knife blunting		practical examination 5.3.1.1 of this document
5.3.1.2	- fixed enclosing guard		measurement of distances, visual inspection in accordance with
		EN 953:1997	Clause 8

Table 2 — Methods of testing (*continued*)

Clause	Subject	rel. standards	Verification method/clause of rel. standard
5.3.1.3	Inlet safety device	EN 294:1992	measurement of distances, visual inspection in accordance with Table 4 5.3.1.2, Clause B.2 and Annex J (informative) of this document
5.3.1.4	Opening for maintenance and knife changes		visual inspection in accordance with 5.3.1.4 of this document
5.3.1.5	Knife blunting device eye protection at grinding wheel		visual inspection in accordance with 5.3.1.5 of this document
5.3.1.6	emergency stop system - operation control		practical examination of function in accordance with 5.3.1.6 of this document
5.3.2	Skiving machines - fixed enclosing guard - movable guard	EN 953:1997	measurement of distances, visual inspection in accordance with Clause 8 Clause B.2 of this document
5.3.3	Cutting machines leading edge - limitation of opening		measurement of distances in accordance with 5.3.3 of this document
5.3.4 5.3.4.1 5.3.4.2	Strip cutting machines inlet safety device cover - operator's side - rear side	EN 294:1992	measurement of distances, visual inspection in accordance with Table 4 visual inspection in accordance with 5.3.4.2 and Clause A.1 of this document
5.3.5 5.3.5.1 and 5.3.5.2	Cementing machines Cementing machines with roller - force limitation - minimum of gap - drive mechanism - inlet safety device	EN 294:1992	measurement of force calculation of pressure and gap in accordance with 5.2.1.2.3 and 5.2.1.4 of this document examination in accordance with 5.2.1.1 of this document measurement of distances, visual inspection in accordance with Table 4

Table 2 — Methods of testing (*continued*)

Clause	Subject	rel. standards	Verification method/clause of rel. standard
5.3.5.3	Dip devices for counters and heels		
	- fixed guard		examination in accordance with
		EN 953:1997	Clause 8
	- interlocking guard	EN 1088:1995	Clause 7 and AClause B.2 of this document
	- gap limitation	EN 294:1992	Tables 1, 3, 4
	- clearance		5.3.5.3 of this document
	- speed limitation		5.3.5.3 of this document
5.3.5.4	- lid		5.3.5.3 of this document
5.3.5.5	- centrifugal devices		practical examination in accordance with
	- interlocking guards with guard locking		AClause B.4 of this document
5.3.5.6	Nozzle applicator		
	- hold-to-run control device		test of function in accordance with Annex D of this document
	- thermal protection		measurement in accordance with 5.2.3 of this document
5.3.5.7	Cementing machine with rotary brush		
	- fixed guard		examination in accordance with
		EN 953:1997	Clause 8
	- control guard		inspection in accordance with
		EN ISO 12100-2:2003	5.3.2.5 and Annex I of this document
	- trip device		Annex C of this document
5.3.5.8	Prevention against explosions		calculation and check of measures in accordance with
	- technical ventilation system		Annex F of this document
	- design		
5.3.6	Cement drying machine		
5.3.6.1	- force limitation		measurement and calculation in accordance with 5.2.1.5 of this document
	- trip device		in accordance to Annex C of this document

Table 2 — Methods of testing (*concluded*)

Clause	Subject	rel. standards	Verification method/clause of rel. standard
	- running nips guard - thermal protection		inspection in accordance with Clause A.1 of this document in accordance with 5.2.3 of this document
5.3.6.2	Prevention against explosions technical ventilation system - design		calculation and check of measures in accordance with Annex F of this document

7 Information for use

7.1 Instruction handbook (operating manual)

Basic information shall be provided in accordance with 6.5 of EN ISO 12100-2:2003.

In addition, the instruction handbook shall include the following information:

a) Exhaust equipment

Information on the safe operating procedures for the exhaust system on splitting, skiving, cementing and cement drying machines and measures to be avoided including inadequate sealing of the duct openings. Details of the arrangements made for connecting the exhaust system to disposal ducts.

b) To avoid explosion hazard for cementing and cement drying machines without integral vapour disposal system and intended to be connected to a duct on installation the manufacturer shall give information based on Annex F of this document including details:

— on volumes of vapour generated by the working process;

— of minimum volumes of diluting air to be provided for their safe disposal;

— of means of collection, dilution, and disposal of the diluted vapours, and

— how to connect interlocks.

c) To reduce fire hazard and risk to health on splitting, skiving machines, etc which generate dust the manufacturer shall give information about details on how to clean and dispose of the dust (e.g. frequency of filter cleaning and dust removal).

d) The manufacturer shall provide instructions for knife blunting, knife changing and maintenance in the knife area and about the safe disposal of a removed knife.

Further information shall include details for the safe maintenance, setting and trouble shooting, including disconnection of the machine from the power supply, all hazardous motion to have ceased and the steps to be taken to prevent its restarting.

e) The manufacturer shall give information and specification for the lubricants and hydraulic fluids to be used in the machine, and for their safe storage, handling and disposal.

f) Information about the importance of closing the dip tank lid when the machine is not in use.

g) Information about selection and use of personal protection equipment.

h) The manufacturer shall give information about safe cleaning materials including avoidance of fire hazard from solvents, and any toxic or other undesirable characteristics.

i) The manufacturer shall give information about safe movement or installation of the machine and where necessary the use of specific equipment.

7.2 Declared noise emission values

The instruction handbook and the technical documentation shall give:

— the A-weighted emission sound pressure level at the operator's position, where this exceeds 70 dB; where this level does not exceed 70 dB, this fact shall be indicated,

— the A-weighted sound power level emitted by the machinery where the A-weighted emission sound pressure level at the operator's position exceeds 85 dB.

The declaration shall be a dual-number declaration as defined in EN ISO 4871.

Declared values shall be determined from measurements carried out in accordance with EN 12545 and Annex E of this document.

7.3 Minimum marking

7.3.1 Basic marking shall be in compliance with 6.4 of EN ISO 12100-2:2003 .

In addition, the net weight shall be given.

7.3.2 Electrical equipment shall be labelled in accordance with Clause 17 of EN 60204-1:1997.

Supply data about pressure range for hydraulic and pneumatic systems shall be labelled in accordance with EN 982 and EN 983.

Flexible pipes containing pressurized hydraulic or pneumatic fluids shall be labelled indicating maximum permitted working pressure in kPa.

7.3.3 The manufacturer shall label an appropriate part of the machine with information concerning the necessary specification for lubricants and hydraulic fluids.

Annex A
(normative)

Requirements for guards

A.1 Fixed covers

— Fixed covers shall conform to EN 953.

In addition, the following shall apply in cases where no complete enclosure by the fixed guard is technically possible:

— the fixed cover shall prevent access as much as possible, taking into account EN 294. In any case it shall prevent at least unintentional access from the operator's side to the dangerous part.

A.2 Movable enclosing guards and covers

— Movable enclosing guards and covers shall conform to EN 953 and shall be interlocked according to Annex B.

In addition, the following shall apply:

— movable enclosing guards and covers shall be prevented from moving under gravity by some form of restraint acting as a balance.

The requirement is met for example by the use of

— a mechanical spring, or

— a gas spring, or

— weights.

A.3 Fencing

The height of fencing shall be at least 1,8 m from the floor and the clearance between lowest barrier of the fence and floor shall not exceed 0,3 m and shall meet Table 1 of EN 294:1992 and EN 811.

The fencing mesh dimensions shall be in accordance with EN 294.

The fencing shall be fixed and it shall be impossible to remove it without tools. Apertures in fences, e.g. doors, may only be opened by tools or key,

or

— its opening shall actuate the shut down of dangerous movements; and shall be interlocked in accordance with EN 1088 and Clause B.2.

Wherever possible, the fencing shall be arranged in such a manner that it is not possible to stand inside the danger area.

This requirement is met if the floor space behind the guard is less than 150 mm when measured horizontally, or if any surface has an incline of more than 45°.

If the danger area can be entered, the following additional requirements shall be fulfilled. It shall not be possible to restart the machine by closing the door alone. Manual actuation of a start control is necessary in addition. This start control shall be positioned so that it is not possible to reach it from within the danger area.

Also, it shall not be possible to restart the machine from outside while a person remains inside the enclosure.

This may be achieved by

— pressure sensitive safety devices which satisfy Annex G, or

— trip devices in accordance with Annex C (e.g. electrosensitive barriers) such that the machine or dangerous parts shall be stopped when the operator enters the fence enclosure and cannot be restarted until the operator leaves.

The door shall be designed so that it can be opened from inside.

Annex B
(normative)

Requirements for interlocking guards

B.1 Interlocking guards with and without guard locking

The associated safety related parts of the control system shall be designed taking account of the philosophy of EN 954.

B.2 Interlocking guards without guard locking with one interlocking system and one position sensor

The arrangement shall comply with EN 1088 and EN 294.

In addition, the following shall apply:

— For interlocking devices using only mechanically actuated position detectors according to EN 1088:1995, 6.2.1 of that standard shall be applied.

— Movement of the guard into a position preventing access to the danger zone shall not on its own initiate dangerous movement.

B.3 Interlocking guards with one interlocking system and two position sensors

The arrangement shall comply with EN 1088: and EN 294.

In addition, the following shall apply:

— For interlocking devices only mechanically actuated position detectors according to EN 1088:1995, 6.2.2 of that standard shall be applied.

— Movement of the guard into a position preventing access to the danger zone shall not on its own initiate dangerous movement.

B.4 Interlocking guards with one interlocking system and one position sensor with guard locking

See B.2 of this annex.

In addition, the following shall apply:

— The opening of the enclosing guards shall be possible only after the dangerous movement has stopped.

— The required interlocking time shall be at least as long as the run down time. The use of time relays which satisfy category B of EN 954-1:1996 is permitted.

— If the power supply is cut, the lock shall remain in position, rendering the guard immobile.

— The position of the lock shall be monitored.

Annex C
(normative)

Requirements for trip device

C.1 Mechanical trip device with one position sensor

C.1.1 When the trip bar is not operated the sensor shall:

— not be actuated;

— produce a positive output to the control system as an enabling condition for a dangerous movement.

C.1.2 When the trip bar is operated, it shall activate the sensor by opening directly and positively the (enabling) contacts, rendering impossible the dangerous movement.

C.1.3 The electrical position sensor shall meet the requirements of 10.1.4 of EN 60204-1:1997.

C.1.4 Return of the trip bar to its rest position shall not in itself cause initiation of dangerous movement.

C.1.5 Actuation of mechanical trip devices shall result in the dangerous movements being interrupted before the danger zone is reached, in accordance with EN 999.

C.1.6 Pressure sensitive bars shall meet the requirements of EN 1760-2.

C.2 Electrosensitive protective devices (ESPD) with normal level

C.2.1 ESPD with normal level shall meet the requirements of EN 61496-1 and IEC 61496-2.

C.2.2 Access to the danger zone shall be limited by the extent of the barrier. If necessary, additional safeguarding in accordance with EN 294 is required.

C.2.3 It shall not be possible to initiate any dangerous movement while any part of the body is actuating the electrosensitive protective devices.

C.2.4 Actuation of the electrosensitive protective devices shall result in interruption of the dangerous movements before the danger zone is reached in accordance with EN 999.

C.2.5 When the electrosensitive protective devices have been actuated, it shall not be possible to initiate dangerous movements until the electrosensitive protective devices have been re-set by a manual re-set control.

C.2.6 The machine start control shall be so positioned that the operator has a clear view of the area protected by the electrosensitive protective devices.

C.2.7 Electrosensitive protective devices shall comply with IEC 61496-2:1997, type 2 (testing device; for machines where recurring access is not required).

C.3 Electrosensitive protective devices (ESPD) with high level

C.3.1 The requirements shall conform to C.2.1 to C.2.6.

C.3.2 The electrosensitive protective devices shall conform to IEC 61496-2:1997, type 4 (self-monitoring device, for machines where recurring access is required).

C.4 Verification for trip devices

C.4.1 Verification for mechanical trip device

C.1.1 and C.1.2: In accordance with the specification given in C.1 of this document, examination of function and circuit diagram

C 1.3: Examination according to 10.1.4 of EN 60204-1:1997, and EN 60947-5-1.

C.1.4: Practical inspection of function

C.1.5: Verification of observance of safety distances according to EN 999, taking into consideration the following calculation:

$$S = K \times T$$

where

S is the safety distance, in millimetres [mm]

K is the approach speed = 1,6 [m/s]

T is the overall system stopping performance, in seconds [s]

C.4.2 Verification of electrosensitive protective devices (C.2, C.3)

C.2.2 and C.3.1: Measurement, visual inspection and practical examination

C.2.3 and C.3.1: Practical examination of function, calculation, measurement in accordance with EN 999

C.2.4 and C.3.1: Verification of observance of safety distances, taking into consideration the following calculation:

$$S = K \times T + C$$

where

S is the safety distance, in millimetres [mm]

K is the approach speed = 1,6 [m/s]

T is the overall system stopping performance, in seconds [s]

C is the additional safety distance, in millimetres [mm]

Depending on the size of obstacle (H) to be detected, the additional safety distance (C) requires the following:

size of obstacle to be detected H [mm]	**additional safety distance C [mm]**
≤ 14	0
> 14 ≤ 20	80
> 20 ≤ 30	130
> 30 ≤ 40	240
> 40	850

C.2.5 and C.3.1: Practical examination of function

C.2.6 and C.3.1: Visual inspection

C.2.7, C.2.8, C 3.1 and C.3.2: Check of the operating mode, examination of manufacturer's documentation (especially circuit diagram and component specification).

Annex D
(normative)

Requirements for hold-to-run control device

D.1 Hold-to-run control devices (stop function, see Figure D.1)

D.1.1 Hold-to-run controls shall be designed such that dangerous movement of the machinery is possible only as long as the control is being actuated.

D.1.2 When the control is released all dangerous movement shall stop.

D.1.3 The control (button, lever etc.) shall be;

— protected against unintended start-up (e.g. shrouded control or protective collar),

— should be mounted on vertical surfaces,

— shall be positioned such as to ensure a complete view of the danger zone.

D.1.4 Muting of the hold-to-run function shall be possible only by a path-dependent sensor.

D.1.5 A single fault in a component of the device shall not render the stop function inoperative. The requirement is met according to category 1 of EN 954-1:1996 if in the actuator two springs or one safety spring is installed.

D.2 Hold-to-run control devices (reverse function, se Figure D.2).

D.2.1 The requirements shall comply with D.1.1 and D.1.3 to D.1.5.

D.2.2 When released, motion shall be reversed immediately.

Verification of hold to-run control devices

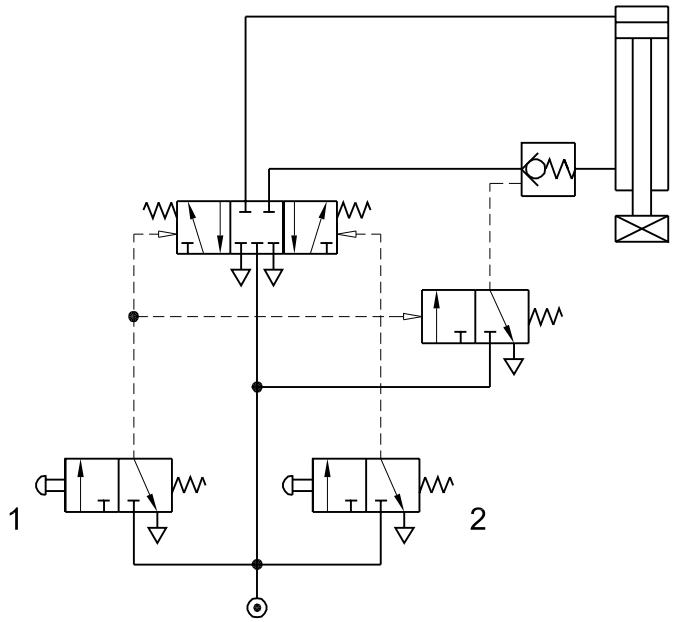
D.1.1 and D.1.2: Practical examination of function.

D.1.3: Visual inspection

D.1.4 and D.1.5: Examination of manufacturer's documentation (especially circuit diagram, component specification)

D.2.1: See verification for D.1.1, D.1.3 to D.1.5

D.2.2: Practical examination of function

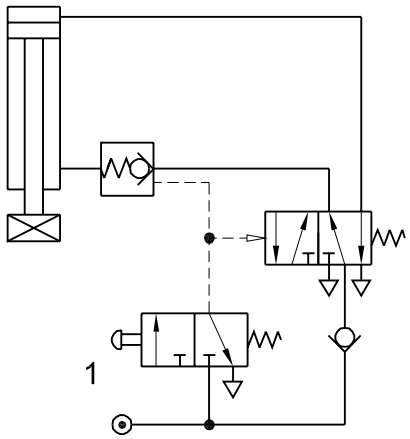


Key

1 Down

2 Up

Figure D.1 — Hold-to-run control device (stop function)



Key

1 Down

Figure D.2 — Hold-to-run control device (reverse function)

Annex E
(normative)

Noise test code for splitting-, skiving-, cutting-, cementing- and cement drying machines

E.0 This annex is valid only in connection with EN 12545.

E.1 Description of machinery family

As defined in 3.1 to 3.7.

E.2 Definitions

E.2.1 Material

The material normally processed by the machine as specified by the manufacturer. This may be leather, leather substitute materials, imitation leather, adhesives.

E.2.2 Processing temperature

The temperature of the material processed should be the same as the environment temperature of the work place.

E.2.3 Test cycle

A test cycle is one complete working cycle. Depending upon the machine type, this will include:

a) material handling into feeding area;

b) feeding and processing area;

c) unloading and removal.

E.2.4 Operating area

Where there is no defined operator position, the area according to machine type and as specified by the manufacturer in the instructions for use within which the operator stands or sits.

E.3 Position of microphone for determination of emission sound pressure levels at the workstation

E.3.1 The microphone shall be located adjacent to the operator in a position as defined in E.3.2 and E.3.4, with an operator within the operating area as defined by the manufacturer.

E.3.2 The microphone's position is defined relative to a reference point on the ground plane on which the operator is standing or sitting as usual.

E.3.3 The reference point shall be at a horizontal distance of 0,4 m $\pm$ 0,05 m in front of the processing area, measured in a direction parallel to the centre line of the processing area and displaced a distance of 0,20 m $\pm$ 0,02 m to the right or left of the centre line.

E.3.4 The microphone shall be located directly above this reference point at a height of:

— 1,60 m ± 0,05 m for standing workstation;

— 1,20 m ± 0,05 m for sitting workstation.

E.4 Operating conditions

E.4.1 The machine shall operate to simulate fully the normal working conditions for which the machine has been designed.

E.4.2 The machine shall operate with the material at processing temperature. Flow rate of the material shall be at least a minimum of 80 % of the maximum indicated by the machine manufacturer.

E.4.3 The test period shall be 5 min or 10 test cycles.

E.4.4 If vibration dampers are fitted, that fact shall be recorded and reported.

E.4.5 The machine under test shall be switched on and left to idle for a period of at least 30 min before the test commences.

E.5 Measurement of A-weighted time-average emission sound pressure level

The machine shall be operated three times through its test period. The measurement shall be carried out in accordance with EN 12545.

E.6 Documentation

Test- and result report shall be carried out in accordance with Clauses 10 and 11 of EN 12545:2000. The stipulation is met, if the attached data sheet is used.

E.7 Measurement uncertainties

For measurement uncertainties the requirements in accordance to Clause 9 of EN 12545:2000 shall be considered.

Data Sheet

Splitting-, skiving-, cutting-, cementing- and cement drying machine

Manufacturer/Supplier's name and address: .....

Machine Model .....

Machine Serial Number .....

Material .....

Material temperature .....

Test cycle (time or number of cycles) .....

Flow rate .....

Vibration damper mountings fixed Yes ❒ No ❒

Emission Sound pressure level at workstation

Basic standard used .....

L_{pA} value in dB 1 [ ] 2 [ ] 3 [ ] Logarithmic mean [ ]

If required,

Sound Power Level

Basis standard used .....

L_{WA} value in dB 1 [ ] 2 [ ] 3 [ ] Logarithmic mean [ ]

Are there any possible deviations from Annex E of this document, EN 12545 and/or from the basic standard(s) used?

Yes ❒ No ❒

If yes, describe .....

Annex F
(normative)

Prevention against explosions

F.1 General

The process ventilation system shall be designed in accordance with category 3 of EN 1127-1:1997 that is, explosive atmospheres caused by solvent vapours are considered as unlikely to occur or, if they do occur, are likely to do so only infrequently and for short periods.

This requirement is met if the design of the technical ventilation system is based on the following:

F.2 The minimum air volume per kg of solvent Q is 250 m^3. The required air flow can be calculated as follows:

$$\dot{V}_{min} = Q \times \dot{m} \ [m^3/h]$$

where

Q (m^3/kg) is the minimum air volume per kg of solvent

$\dot{V}_{min}$ (m^3/h) is the required minimum air volume flow in m^3/h

$\dot{m}$ (kg/h) is the processed solvent quantity (mass flow) per hour

F.3 The minimum air volume flow can also be calculated according to the following formula, using the lower explosion limit of the working substance:

$$\dot{V}_{min} = \frac{k}{C_{adm.}}$$

where

$\dot{V}_{min}$ is the required minimum air volume flow (air flow) in m^3/h

k is the consumption of flammable working substance in g/h

$C_{adm.}$ is the admissible concentration of flammable working substances in g/m^3 - 25 % of the lower explosion limit of the working substance used or 10 g/m^3

F.4 The control system of the process ventilation system shall be such that a failure of ventilation

— is recognized by a flow-sensor within the duct,

— leads immediately to appropriate emergency measures, such as "switching off" the solvent vapour source (switch off glue transport, lock dip tank, switch off heating, discharge of work pieces newly coated with solvent containing glue).

F.5 Safety related parts of process ventilation system shall meet category 1, 2 or 3 of EN 954-1:1996.

F.6 If category 3 of EN 954-1:1996 is met, the electrical equipment shall satisfy category 3 of EN 1127-1:1997. If categories 1 or 2 of EN 954-1:1996 are met the higher probability of failure (defined as occasionally) is to be expected and the electrical equipment shall meet the requirements of category 2 of EN 1127-1:1997.

F.7 The control system shall be designed such that processing is only possible when the process ventilation system is operative and shall meet category 3 of EN 954-1:1996.

Annex G
(normative)

Requirements for pressure sensitive mats and floors

G.1 Pressure sensitive mats and floors shall comply with EN 1760-1.

G.2 Pressure sensitive mats and floors shall be placed in such a position and manner that actuation results in a shut down of dangerous movement, before the danger zone can be reached in accordance with EN 999.

G.3 Access to the danger zone shall be limited to the extent of cover given by the pressure sensitive device.

G.4 Step-on surfaces of pressure sensitive mats or floors shall be designed in materials such that risks of slipping and tripping are reduced.

G.5 To prevent easy muting the dimension towards the danger zone of pressure sensitive mats or floors shall not be less than 1,2 m. To prevent stepping over a pressure sensitive mat or floor from the sides a rail shall be provided.

Verification

G.1: Practical test by using two test pieces with a diameter of 80 mm.

G.2: Verification of observance of safety distances according to EN 999, taking into consideration the following calculation:

$$S = K \times T + C$$

where

S is the safety distance, in millimetres [mm]

K is the approach speed = 1,6 [m/s]

T is the overall system stopping performance, in seconds [s]

C is the additional safety distance = 850 mm

G.3: Visual inspection

G.4: Visual inspection

G.5: Measurement and visual inspection

Annex H
(normative)

Temperatures of burn threshold

In order to avoid burns by accidental contact with hot surfaces (at a contact time of less than 1 s) the following temperatures of the surfaces shall not be exceeded:

Table H.1

Material	Temperature of surface °C
Uncoated metal surfaces	65
Plastic surfaces	85
Wooden surfaces	110

For contact times exceeding 1 s lower temperatures are required (see EN 563).

Verification

Measurement of surface temperatures, visual check of precautions adopted.

Annex I
(normative)

Requirements for control guards (interlocking guard with start function)

I.1 Control guards shall have the following features:

I.2 all requirements of Annex B of this document for interlocking guards are satisfied;

I.3 the cycle time of the machine does not exceed 1 min, so that, if this time is exceeded, the hazardous movements cannot be initiated only by the closing of the control guard;

I.4 the dimensions or shape of the machine do not allow an operator or another person or a part of his body to stay in the hazard zone or between the hazard zone and the guard while the guard is closed;

I.5 entry into the hazard zone is possible only by opening an interlocking guard with a start function or another interlocking guard;

I.6 the interlocking device associated with the interlocking guard with a start function is designed in such a way that its failure cannot lead to an unintended/unexpected start up;

I.7 the guard is securely held open (e.g. by a spring or counterweight) so that it cannot initiate a start if it falls under its own weight.

Verification

I.1: Practical examination of function, examination of manufacturer's documentation

I.2: Practical examination of function depending on time limitation of 1 min.

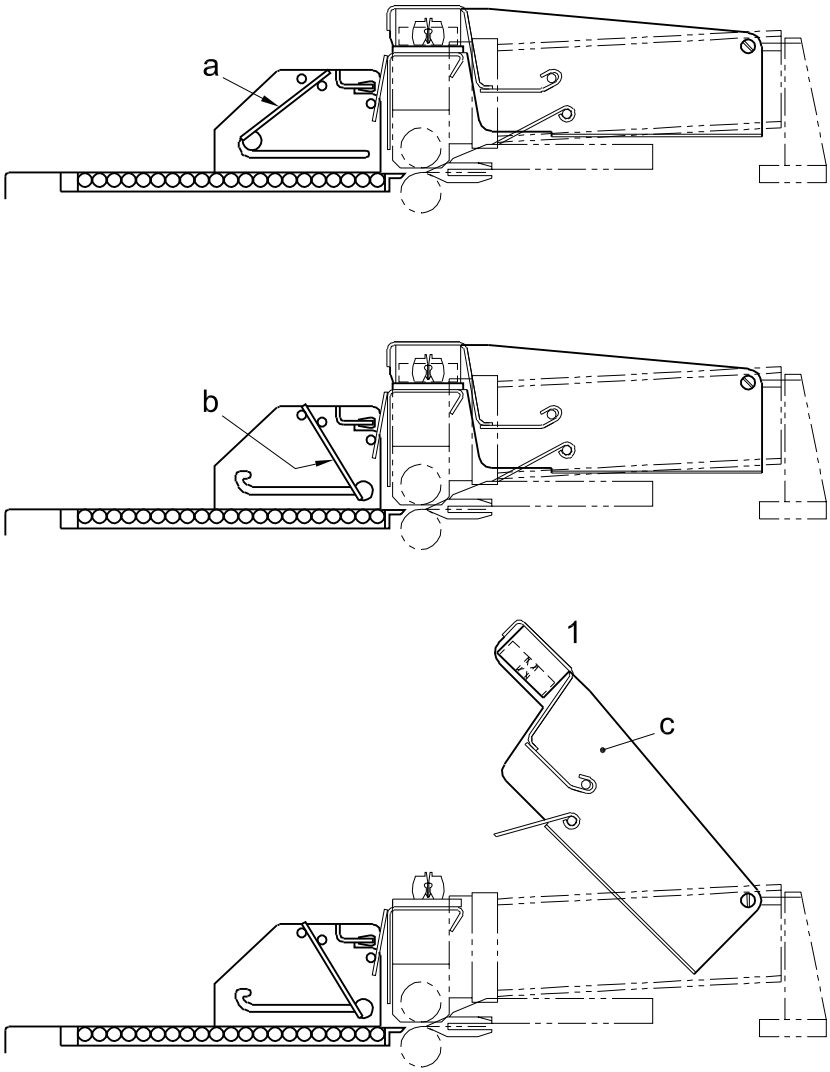
I.3 and I.4: Visual inspection

I.5: Examination of manufacturer's documentation

I.6: Practical examination

Annex J
(informative)

Splitting machines: Safety devices for feeding and processing area



Key

a Position of the inlet safety device for thickness of material from 8 mm to 20 mm
b Position of the inlet safety device for thickness of material up to 8 mm
c Interlocking guard open for removal of small parts and waste
1 Position sensor

Figure J.1 — Splitting machines - Safety devices for feeding and processing area

Annex ZA
(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 one means of conforming to Essential Requirements of the New Approach Directives Machinery 98/37/EC, amended by 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 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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