



# SLOVENSKI STANDARD

SIST EN 1845:2000

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## Footwear manufacturing machines - Footwear moulding machines - Safety requirements

Footwear manufacturing machines - Footwear moulding machines - Safety requirements

Maschinen zur Herstellung von Schuhwerk - Schuhformmaschinen -  
Sicherheitsanforderungen

Machines pour la fabrication des chaussures - Machines de moulage pour chaussures -  
Prescriptions de sécurité

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61.060

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English version

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Maschinen zur Herstellung von Schuhwerk - Schuhformmaschinen - Sicherheitsanforderungen

This European Standard was approved by CEN on 26 June 1998.

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This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Central Secretariat has the same status as the official versions.

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EUROPEAN COMMITTEE FOR STANDARDIZATION  
COMITÉ EUROPÉEN DE NORMALISATION  
EUROPÄISCHES KOMITEE FÜR NORMUNG

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## FOREWORD

This European Standard 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of an identical text or by endorsement, at the latest by January 1999, and conflicting national standards shall be withdrawn at the latest by January 1999.

This European Standard 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 standard.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

## 0 INTRODUCTION

The extent to which hazards are covered is indicated in the scope of this Standard. In addition, machinery should comply as appropriate with EN 292 for hazards which are not covered by this Standard.

This Standard contains safety requirements for footwear moulding machines. It is aimed at designers, manufacturers, suppliers and importers.

## 1 SCOPE

1.1 This Standard applies to footwear moulding machines which are intended for use in the shoe industry for the production of footwear and footwear components.

These machines are:

- direct-on sole moulding machines
- full shoe and boot moulding machines
- unit sole and footwear component moulding machines.

1.2 This Standard 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, foreseeable misuse, component and system failure.

1.3 The following machines are excluded from the scope of this Standard unless used for direct-on sole moulding or reaction moulding:

- moulding machines with static injection units and static mould stations (clamping units),
- moulding machines with static metering and mixing units and mobile stations with linear configuration (mould carriers).

1.4 This Standard covers all hazards relevant to the footwear manufacturing industry only. (List of hazards see clause 4).

The standard does not deal with

- precise technical measures for reducing the risks from fumes,
- hazards created by the mixing and metering unit.

**Note:** For metering and mixing units, see EN 1612-1.

The use of machines within the scope of this Standard in industries other than those specified in 1.1 may give rise to hazards not considered during its preparation.

**Note:** For this application see EN 201 and prEN 1612-2.

1.5 This Standard also applies to additional equipment for material handling and operation which are an integral part of the machine such as:

spraying devices, injection units, casting units, nozzle cleaners, sprue pullers, mould front edge cleaners, activating devices and robots for preparatory and subsequent treatment.  
The standard does not deal with precise technical measures for reducing the risks from fumes.

1.6 This Standard applies to machines manufactured after its date of publication.

## **2 NORMATIVE REFERENCES**

This European Standard incorporates by dated or undated reference, provisions from other publications.

These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

EN 201:1997	Rubber and plastics machines - Injection moulding machines - Safety requirements
EN 292-1:1991:	Safety of machinery - Basic concepts, general principles for design - Part 1: Basic terminology, methodology
EN 292-2:1991: + A1 :1995	Safety of machinery - Basic concepts, general principles for design - Part 2: Technical principles and specifications

- EN 294:1992: Safety of machinery - Safety distances to prevent danger zones being reached by the upper limbs
- EN 349:1993: 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 457:1992: Safety of machinery - Auditory danger signals; general requirements, design and testing (ISO 7731:1986 modified)
- EN 547-1:1996: Safety of machinery - Human body measurements; Part 1: Principles for determining the dimensions required for openings for whole body access into machinery
- EN 547-2:1996: Safety of machinery - Human body dimensions; 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 574:1996: Safety of machinery - Two-hand control devices, functional aspects - principles for design
- EN 614-1:1995: Safety of machinery - Ergonomic design principles - Part 1: Terminology and general principles
- EN 626-1:1994: Safety of machinery - Reduction of risk to health from hazardous substances emitted by machinery; Part 1: Principles and specifications for machinery manufacturers
- EN 626-2:1996: Safety of machinery - Reduction of risk to health from hazardous substances emitted by machinery - Part 2: Methodology leading to verification procedures
- EN 775:1992:  
+ AC:1993 Manipulating industrial robots - safety (ISO 10218:1992, modified)
- EN 811:1996: Safety of machinery - Safety distances to prevent danger zones being reached by the lower limbs
- EN 842:1996: Safety of machinery - Visual danger signals; general requirements; design and testing
- EN 894-1:1997: Safety of machinery - Ergonomics requirements for the design of displays and control actuators - Part 1: General principles for human interactions with displays and control actuators

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- EN 894-2:1997: Safety of machinery - Ergonomics requirements for the design of displays and control actuators - Part 2: Displays
- prEN 894-3:1992: Safety of machinery - Ergonomics requirements for the design of displays and control actuators; Part 3: Control actuators
- EN 953:1997: Safety of machinery - 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 981:1996: Safety of machinery - System of auditory and visual danger and visual danger and information signals
- 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
- prEN 999:1993: Safety of machinery - The positioning of protective equipment in respect of approach speeds of parts of the human body
- prEN 1005-2:1993: Safety of machinery - Human physical performance - Part 2: Manual handling of objects associated to machinery
- prEN 1005-3:1993: Safety of machinery - Human physical performance - Part 3: Recommended force limits for machinery operation
- EN 1037:1995: Safety of machinery - Prevention of unexpected start-up
- EN 1050:1996: Safety of machinery - Principles for risk assessment
- ENV 1070 Safety of machinery - Terminology
- EN 1088:1995: Safety of machinery - Interlocking devices with and without guard locking; general principles and provisions for design
- prEN 1093-1:1993: SIST EN 1845:2000  
Safety of machinery - Evaluation of the emission of airborne hazardous substances - Part 1: Selection of test methods
- EN 1612-1:1997 Rubber and plastics machines; safety - Reaction moulding machines - requirements for the design and construction - Part 1: Metering and mixing unit
- prEN 1612-2:1995 Rubber and plastics machines; Safety - Reaction moulding machines - requirements for design and construction - Part 2: Reaction moulding plant



prEN 1760-1:1994:	Safety of machinery - Pressure sensitive protective devices - Part 1: General principles for the design and testing of pressure sensing mats and pressure sensing floors
prEN 1921:1995:	Industrial automation systems - Safety of integrated manufacturing systems - Basic requirements
prEN ISO 3740 <sup>1)</sup>	Acoustics - Determination of sound power levels of noise sources. Guidelines for the use of basic standards and for preparation of noise test codes
EN ISO 4871:1996	Acoustics - Declaration and verification of noise emission values of machinery and equipment
prEN ISO 9614-1 <sup>1)</sup>	Acoustics - Determination of sound power level of noise sources using sound intensity - Part 1: Measurement at discrete points
EN ISO 11200	Acoustics-Noise emitted by machinery and equipment. Guidelines for the use of basic standards for the determination of the emission sound pressure levels at work station and at other specified positions
ISO TR 11688-1	Acoustics-Recommended practice for the design of low-noise machinery and equipemtn - Part 1: Planning
ISO CD 11688-2 <sup>1)</sup>	Acoustics-Recommended practice for the design of low-noise machinery and equipment - Part 2: Noise generation principles
EN ISO 11689:1996:	Acoustics - Procedure for the comparison of noise-emission data for machinery and equipment
prEN 50100-1:1994:	Safety of machinery - Electrosensitive protective equipment - Part 1: General requirements and tests
prEN 50100-2:1994:	Safety of machinery - Electrosensitive protective equipment - Part 2: Particular requirements for systems using active opto-electronic protective devices
EN 60204-1:1992:	Safety of machinery - Electrical equipment of machines. Part 1: General requirements
EN 60947-5-1:1992:	Control circuit devices and switching elements; electro-mechanical control circuit devices

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<sup>1)</sup> These standards are under preparation in ISO (revision of ISO 3740, publication of ISO 11688-2 pending).

### **3 DEFINITIONS**

For the purposes of this standard the definitions given in EN 292-1:1991, EN 292-2:1991 + A1:1995 and in ENV 1070:1993 are applicable. In addition, the following definitions apply:

**3.1 footwear moulding machines:** Either injection, pouring or direct-on vulcanizing machines used in the footwear manufacturing industry only. The moulding stations of these machines may be either single or multiple, static or mobile and may have linear, rotary or conveyor configuration. The processed material may be either thermoplastic, thermosetting plastic, thermosetting elastomer, 2-component liquid polyurethane (PU) or rubber.

**3.2 direct-on sole moulding machines:** Machines used to mould the sole directly onto a lasted upper. One side of the hollow mould is formed by the prepared base of the lasted upper.

**3.3 unit sole and footwear component moulding machines:** Machines used to mould complete soles, inserts and shoe components independently of the uppers.

**3.4 full shoe and boot moulding machines:** Machines used to mould a complete article of footwear by the injection of material into the cavity of a mould containing a mould last.

**3.5 static station machines:** The mould stations are fixed in position. The moulds are filled with material either by their own individual nozzles, or by one or more nozzles which move from station to station.

**3.6 mobile station machines:** One or more nozzles are fixed in position. The mould stations are indexed to the nozzle(s) for filling.

**3.7 rotary configuration:** The mould stations are arranged in a circle and rotate around a vertical axis.

**3.8 quadrant configuration:** The fixed mould stations are arranged around part of the circumference of a circle, and the nozzle is moved in an arc between stations.

**3.9 linear configuration:** The mould stations are arranged in a straight line.

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**3.10 conveyor configuration:** The moulds travel around a closed loop.

**3.11 injection process:** Process of delivering rubber, thermo-plastic or reaction-foaming material through a nozzle into a closed mould.

**3.12 casting (or pouring) process:** Delivery process used only with reaction-foaming materials consisting of 2 or more liquid constituents which are poured into an open mould from above.

3.13 **vulcanizing process:** A process where a piece of rubber sheet is preheated and placed in the mould (unit or direct-on). It is formed and cured using heat and pressure.

3.14 **hazardous movement:** A motion of a part of the machine which may give rise to injury.

3.15 **danger points:** Points on footwear moulding machines which may give rise to personal injury due to controlled-path movements of drives, machinery parts, tools or workpieces. Particular danger points are: Pinching and shearing points, stabbing and cutting points, drawing-in and trapping points.

3.16 **fixed covers:** Fixed guards installed directly at danger points to prevent alone, or together with other parts, access to the danger points from the covered side (as EN 292-1:1991 3.22).

3.17 **fixed enclosing guards:** A fixed guard which, when in position, prevents access to a danger zone by enclosure.

3.18 **pressure sensitive mats (PSM) and floors (PSF):** See prEN 1760-1:1994

3.19 **power interlocking:** Additional independent safety device associated with a control system designed to interrupt the power supply to the actuators of the hazardous movements.

3.20 **recurring access:** A regular access into the mould area during the normal working cycle.

3.21 **safety distance (S):** see 3.29 of ENV 1070:1993

3.22 **approach speed (K):** A constant giving the operator's speed of movement when using a two-hand control device, an electrosensitive protective device or a pressure sensitive safety device.

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3.23 **additional safety distance (C):** A distance which takes into account movement towards the hazard point prior to activation if using electrosensitive protective devices.

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3.24 **over-all response time (T):** The time between actuation of the safety device and the machine coming to a stop or the hazard being removed, taking into account wear and tear, maximum pressure and maximum closing speed of the machine; and assuming it to be equipped for normal intended use.

3.25 **fencing:** A guard around danger zones of a machine or plant which prevents access from outside.

3.26 **integrated manufacturing system:** A footwear moulding machine working together with other shoe machines and being operated by a supervisory control system.

**3.27 operating area:** The zone of a machine which includes

- the area of manual loading and unloading,
- the operator's standing area.

**3.28 mould area:** An area covered by the moulding parts.

#### **4 LIST OF HAZARDS**

4.1 The significant hazards of footwear moulding machines are outlined in table 1, 4.3 to 4.10.

4.2 The danger zones which give rise to mechanical hazards are illustrated in figures 1 to 11. The figures are given for information only.

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Table 1: List of hazards

Danger zone or source of hazard	Type of hazard	Figure	Sub-Figure
<b>4.3 Mechanical hazards</b>			
4.3.1 Moulding area: closing, clamping and opening move- ments of: - last - dummy last - side ring - toe cap device - rising sole mould - lid or cover - ejector	crushing and shearing	1;2;3 4;5;6;7;8 9;10;11	1.1;2.1;2.3 4.1;5.1;8.1 10.1
4.3.2 Area between fixed safeguarding and parts of machine and moulds, when table rotates or conveyor moves	drawing-in, trapping, shearing or crushing	1 4;5;6;7 11	1.2
4.3.3 Operating areas:			
4.3.3.1 Power operated last rotation	crushing, shearing or impact	2;3;4;5;6 7;8;9 10;11	2.3 8.1 10.3
4.3.3.2 Power operated lid rotation		1	1.3
4.3.3.3 Sole mould turn- ing and shuttl- ing device	crushing and shearing	1	1.4
4.3.4 Area beneath rotary table or conveyor	shearing, crushing, drawing-in, trapping	1;4;5 6;7;11	1.5;4.2;5.1 11.1
4.3.5 Operator's standing area - protruding parts - uneven, sloping, slippery platform - steps	falling, slipping, tripping	1;2;3;4 5;6;7;8 9;10	1.6;2.3 5.2;5.4;8.1 10.3
4.3.6 Movement of machine due to gravity while being trans- ported	crushing, shearing		

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Danger zone or source of hazard	Type of hazard	Figure	Sub-Figure
4.3.7 Area of injection and pouring mixing unit - movement of nozzle up to mould - traversing movements between filling nozzle and moulds or parts of the machine - at the moving parts of the injection or pouring units	crushing, shearing, drawing-in trapping entanglement	1;2;3 4;5;6;7 8.1;10.1; 11	1.7;2.2;2.3 4.3; 5.3 8.1; 10.1; 11.2
4.3.8 Material feeding aperture in the barrel	trapping, shearing, severing entanglement		
4.3.9 Area between rotary or conveyor configuration and auxiliary equipment, e.g. - nozzle cleaner, - spraying device, - sprue-puller - robots - activating devices	crushing, shearing, trapping and impact	1 6; 7	1.8
4.3.10 Area between machine with auxiliary equipment and means of transportation, other machines for prework and finishing, e.g. - conveyor for last transportation - handling robot - cooling tunnel	crushing, shearing, trapping, and impact	12	
4.3.11 Mould changing and adjustment	crushing, trapping, shearing, impact	1;2;3;4 5;6;7;8 9;10;11	1.9 5.2; 5.4

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Danger zone or source of hazard	Type of hazard		
<b>4.4 Electrical hazards</b>  Electrical contact, directly or indirectly, caused by  - component failure - insulation failure - incorrect design, installation or component speci- fications of the electrical equipment	electric shock, burns		
<b>4.5 Thermal hazards</b>  <b>4.5.1</b> Accidental contact with hot surfaces, e.g. - heater bands - nozzle - moulds - heating floors  <b>4.5.2</b> Squirting of hot moulding material  - parting line of the mould - between nozzle and mould - purging	risk of burns            risk of burns		
<b>4.6 Noise</b> - screw  - hydraulic unit  - pneumatic equipment	loss of hearing, interference of speech communication and perception of acoustic signals		

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