



# SLOVENSKI STANDARD

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## Stroji za izdelavo obutve - Stroji za oblikovanje obutve - Varnostne zahteve

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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English Version

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

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

Maschinen zur Herstellung von Schuhwerk - Schuhformmaschinen - Sicherheitsanforderungen

This European Standard was approved by CEN on 3 November 2007.

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## Foreword

This document (EN 1845:2007) 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of an identical text or by endorsement, at the latest by June 2008, and conflicting national standards shall be withdrawn at the latest by December 2008.

This document supersedes EN 1845:1998.

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

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

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

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## Introduction

This document is a type C standard as stated in EN ISO 12100.

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 or B standards, the provisions of this type C standard take precedence over the provisions of the other standards, for machines that have been designed and built according to the provisions of this type C standard.

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## 1 Scope

**1.1** This European 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 (see Figures 1, 2 and 3);
- unit sole and footwear component moulding machines (see Figures 4 to 10);
- full shoe and boot moulding machines (see Figure 11).

This European Standard applies also to the mentioned machines when used for other products than footwear and footwear components, as far as these products require no other changes than a different mould.

**1.2** This European 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 deals with all significant hazards, hazardous situations and events relevant to footwear moulding machines, when they are used as intended and under conditions of misuse which are reasonably foreseeable by the manufacturer (see Clause 4).

**1.3** The following machines are excluded from the scope of this European 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** The European Standard does not deal with 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 European 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 also EN 201 and prEN 1612-2.

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

- spraying devices, injection units, casting units, nozzle cleaners, sprue pullers, mould front edge cleaners, activating devices, robots and equipment for preparatory and subsequent treatment (see Figure M.1).

**1.6** This European Standard assumes the machines:

- are operated by adequately trained persons;
- are used with adequate workplace lighting (see EN 12464-1).

**1.7** This document is not applicable to footwear moulding machines which are manufactured before the date of publication of this European Standard by CEN.



## 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 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 measurements — Part 2: Principles for determining the dimensions required for access openings*

EN 574:1996, *Safety of machinery — Two-hand control devices — Functional aspects — Principles for design*

EN 614-1:2006, *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 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 811:1996, *Safety of machinery — Safety distances to prevent danger zones being reached by the lower limbs*

EN 894-2:1997, *Safety of machinery — Ergonomics requirements for the design of displays and control actuators — Part 2: Displays*

EN 894-3:2000, *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 982:1996, *Safety of machinery — Safety requirements for fluid power systems and their components — Hydraulics*

EN 983:1996, *Safety of machinery — Safety requirements for fluid power systems and their components — Pneumatics*

EN 999:1998, *Safety of machinery — The positioning of protective equipment in respect of approach speeds of parts of the human body*

EN 1005-2:2003, *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 1037:1995, *Safety of machinery — Prevention of unexpected start-up*

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

## EN 1845:2007 (E)

EN 1760-1:1997, *Safety of machinery — Pressure sensitive protective devices — Part 1: General principles for the design and testing of pressure sensitive mats and pressure sensitive floors*

EN 1760-2:2001, *Safety of machinery — Pressure sensitive protective devices — Part 2: General principles for the design and testing of pressure sensitive edges and pressure sensitive bars*

EN 1837:1999, *Safety of machinery — Integral lighting of machines*

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

EN 60204-1:2006, *Safety of machinery — Electrical equipment of machines — Part 1: General requirements (IEC 60204-1:2005, modified)*

EN 60947-5-1:2004, *Low-voltage switch gear and control gear — Part 5-1: Control circuit devices and switching elements — Electro-mechanical control circuit devices (IEC 60947-5-1:2003)*

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

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

CLC/TS 61496-2:2006, *Safety of machinery — Electro-sensitive protective equipment — Part 2: Particular requirements for systems using active opto-electronic protective devices (APODs)*

CLC/TS 61496-3:2003, *Safety of machinery — Electro-sensitive protective equipment — Part 3: Particular requirements for equipment using active opto-electronic responsive to diffuse reflection (AOPDDR)*

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 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 13732-1:2006, *Ergonomics of the thermal environment — Methods for the assessment of human responses to contact with surfaces — Part 1: Hot surfaces (ISO 13732-1:2006)*

EN ISO 13849-1:2006, *Safety of machinery — Safety related parts of control systems — Part 1: General principles for design (ISO 13849-1:2006)*

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

EN ISO 14121-1:2007, *Safety of machinery — Risk assessment — Part 1: Principles (ISO 14121-1:2007)*

EN ISO 14122-1:2001, *Safety of machinery — Permanent means of access to machinery — Part 1: Choice of a 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 and the following apply.

#### 3.1

##### **footwear moulding machines**

either injection, pouring or direct-on vulcanising 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 elastomere, 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**

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**

mould stations are arranged in a circle and rotate around a vertical axis

#### 3.8

##### **quadrant configuration**

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**

mould stations are arranged in a straight line

#### 3.10

##### **conveyor configuration**

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 consisting of 1 or more components which are cast or poured into an open mould

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**3.13  
vulcanizing process**

process where rubber material is placed in the mould (unit or direct-on). It is formed and cured using heat and pressure

**3.14  
fixed covers**

fixed guards installed directly at danger points to prevent alone, or together with other parts, unintentional access to the danger points from the covered side

**3.15  
fixed enclosing guards**

fixed guard which, when in position, prevents access to a danger zone by enclosure

**3.16  
fencing**

distance guard around danger zones of a machine or plant which prevents access from outside

**3.17  
integrated manufacturing system**

footwear moulding machine working together with other shoe machines and being operated by a supervisory control system

**3.18  
mould area**

area covered by the moving parts of the mould

**3.19  
power interlocking**

additional independent safety device not associated with a control system, designed to interrupt the power supply to the actuators of the hazardous movements

**3.20  
recurring access**

regular access into the mould area during the normal working cycle

## 4 List of significant hazards

This clause contains all the significant hazards, hazardous situations and events, as far as they are dealt with in this standard, identified by risk assessment as significant for this type of machinery and which require action to eliminate or reduce the risk (see 4.1 to 4.9 of Table 1).

NOTE Typical outlines of these machines together with significant danger areas are given in Figures 1 to 11, M.1. The figures are given for information only.

The list of significant hazards is based upon EN ISO 14121-1. Also shown are the subclause references to the safety requirements and/or protective measures in the present standard.

Before using the standard it is important to carry out a risk assessment of the footwear moulding machine to check that its significant hazards are identified in this clause.

Table 1 — List of hazards

Danger zone or source of hazard		Type of hazard	Figure/subfigure	Relevant clauses of this standard
4.1	<b>Mechanical hazards</b>			5.2.1.1, 5.2.1.2, 5.2.1.3, 5.2.1.4, 5.2.1.5
4.1.1	Mould area: closing, clamping and opening movements of <ul style="list-style-type: none"> <li>- last</li> <li>- dummy last</li> <li>- side ring</li> <li>- toe cap device</li> <li>- rising sole mould</li> <li>- lid or cover</li> <li>- ejector</li> </ul>	crushing and shearing	1 (1a) 2 (2a, 2d), 3 4 (4c), 5 (5b), 6, 7 8, 9 10 (10c) 11	5.3.1.1.1 5.3.1.2.1 5.3.2.1.1 5.3.2.2.1 5.3.2.3.1 5.3.3.1
4.1.2	Area between fixed safeguarding and parts of machine and moulds, when table rotates or conveyor moves	drawing-in, trapping, shearing or crushing	1 (1b) 4, 5, 6, 7 11	5.3.1.1.2 5.3.2.1.2 5.3.3.2
4.1.3	Operating area			5.3.2.1.3, 5.3.3.3
4.1.3.1	Power operated last rotation	crushing, shearing or impact	1 (1c)	5.3.1.1.3.1
4.1.3.2	Power operated lid rotation		2 (2d), 3	5.3.1.2.4
4.1.3.3	Sole mould turning and shuttling device	crushing and shearing	1 (1f) 2 (2d), 3	5.3.1.1.3.2 5.3.1.2.4
4.1.4	Area beneath rotary table	shearing, crushing, drawing-in, trapping	1 (1e) 4 (4d), 5 (5b), 6, 7 11 (11b2)	5.3.1.1.4 5.3.2.1.4 5.3.3.4

Table 1 — List of hazards (continued)

Danger zone or source of hazard		Type of hazard	Figure/subfigure	Relevant clauses of this standard
4.1.5	Operator's standing area - protruding parts - uneven, sloping, slippery platform - steps	falling, slipping	1 (1g2), 2 (2d), 3, 4, 5 (5b), 6, 7, 8 (8b), 9, 10 (10e), 11	5.2.1.6
4.1.6	Movement of machine due to gravity while being transported	crushing, shearing		5.2.13
4.1.7	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 (1d) 2 (2b, 2c, 2d), 3 4 (4b), 5 (5b), 6, 7, 8 (8b), 9 11 (11b2)	5.3.1.1.5 5.3.1.2.3 5.3.2.1.5 5.3.2.2.2 5.3.3.5
4.1.8	Material feeding aperture in the barrel	trapping, shearing, severing, entanglement	8	5.2.10
4.1.9	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 (1g1) 6, 7	5.2.11
4.1.10	Area between machine with auxiliary equipment and means of transportation, other machines for pre-work and finishing (integrated manufacturing system), e.g. - conveyor for last transportation - handling robot - cooling tunnel	crushing, shearing, trapping and impact	M.1	5.2.12
4.1.11	Mould changing and adjustment	crushing, trapping, shearing, impact	1 (1g) 2, 3 4, 5 (5b), 6, 7 8, 9 10 11	5.2.9.3 5.3.1.2.2 5.3.2.1.6, 5.3.2.1.7 5.3.2.2.3 5.3.2.3.2, 5.3.3.6
4.1.12	Screw changing	Trapping, drawing in, crushing		5.2.9.4

Table 1 — List of hazards (continued)

Danger zone or source of hazard		Type of hazard	Figure/subfigure	Relevant clauses of this standard
4.2	<b>Electrical hazards</b> Electrical contact, directly or indirectly, caused by <ul style="list-style-type: none"> <li>- component failure</li> <li>- insulation failure</li> <li>- incorrect design, installation or component specifications of the electrical equipment</li> </ul>	electric shock, burns		5.2.2
4.3	<b>Thermal hazards</b> 4.3.1 Accidental contact with hot surfaces, e.g.: <ul style="list-style-type: none"> <li>- heater bands</li> <li>- nozzle</li> <li>- moulds</li> <li>- heating floors</li> </ul>	risk of burns		5.2.3.1
4.3.2	Squirting of hot moulding material <ul style="list-style-type: none"> <li>- parting line of the mould</li> <li>- between nozzle and mould</li> <li>- purging</li> </ul>	risk of burns		5.2.3.2
4.4	<b>Noise</b> Main sources: <ul style="list-style-type: none"> <li>- screw</li> <li>- hydraulic unit</li> <li>- pneumatic equipment</li> <li>- exhaust equipment</li> </ul>	loss of hearing, physiological disorders, interference with speech communication and perception of acoustic signals		5.2.4
4.5	<b>Emission of fumes or skin contact</b> Moulding, spraying and preparation areas: <ul style="list-style-type: none"> <li>- isocyanate from the PU-moulding material through spillage</li> <li>- overheating of thermo-plastic or rubber material</li> <li>- solvent from the mould release agents</li> <li>- skin contact with moulding materials and solvents</li> </ul>	risk of occupational disease (breathing system, skin, nervous system)		5.2.5