



SLOVENSKI STANDARD
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Safety of machinery - Safety requirements for foundry moulding and coremaking machinery and plant associated equipment

Sicherheit von Maschinen - Sicherheitsanforderungen an Gießereimaschinen und -anlagen der Form- und Kernherstellung und dazugehörige Einrichtungen

Sécurité des machines - Prescriptions de sécurité applicables aux machines et chantiers de moulage et de noyautage en fonderie et à leurs équipements annexes

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English Version

Safety of machinery - Safety requirements for foundry moulding and coremaking machinery and plant associated equipment

Sécurité des machines - Prescriptions de sécurité
applicables aux machines et chantiers de moulage et de
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Gießereimaschinen und -anlagen der Form- und
Kernherstellung und dazugehörige Einrichtungen

This draft amendment is submitted to CEN members for unique acceptance procedure. It has been drawn up by the Technical Committee CEN/TC 202.

This draft amendment A1, if approved, will modify the European Standard EN 710:1997. If this draft becomes an amendment, CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for inclusion of this amendment into the relevant national standard without any alteration.

This draft amendment was established by CEN 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 CEN Management Centre has the same status as the official versions.

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Foreword

This document (EN 710:1997/FprA1:2009) has been prepared by Technical Committee CEN/TC 202 “Foundry machinery”, the secretariat of which is held by DIN.

This document is currently submitted to the Unique Acceptance Procedure.

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 Annexes ZA and ZB, which are an integral part of this document.

The new safety requirements as stated in this document comply with the additional relevant Essential Requirements of the new Machinery Directive 2006/42/EC complementing the existing Machinery Directive 98/37/EC.

EN 710:1997/FprA1:2009 (E)**1 Modification of the title**

Add as 1st element of the English, German and French titles the following:

"Safety of machinery"

"Sicherheit von Maschinen"

"Sécurité des machines"

2 Modification to "Contents"

Add list of "Tables" at the end of the content.

3 Modification to "Foreword"

Replace the 3rd paragraph with the following:

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

4 Modification to "Introduction"

Replace the existing text with the following:

"This European Standard 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 European Standard.

When provisions of this type C standard are different from those which are stated in type A or B standards, the provisions of this type C standard take precedence over the provisions of the other standards, for machines that have been designed and built according to the provisions of this type C standard.

Where for clarity an example of a preventive measure is given in this European Standard, this should not be considered as the only possible solution. Any other solution leading to the same risk reduction is permissible if an equivalent level of safety is achieved."

5 Modification to Clause 2, "Normative references"

Replace the 1st paragraph with the following:

"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."

Replace the list of normative references with the following:

"EN 349, Safety of machinery — Minimum gaps to avoid crushing of parts of the human body

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

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

EN 614-2, Safety of machinery — Ergonomic design principles — Part 2: Interactions between the design of machinery and work tasks

EN 746-2, Industrial thermoprocessing equipment — Part 2: Safety requirements for combustion and fuel handling systems

EN 842, Safety of machinery — Visual danger signals — General requirements, design and testing

EN 894-1, 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

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, Safety of machinery — Guards — General requirements for the design and construction of fixed and movable guards

EN 981, Safety of machinery — System of auditory and visual danger and information signals

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

EN 1005-2, Safety of machinery — Human physical performance — Part 2: Manual handling of machinery and component parts of machinery

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

EN 1093-1, Safety of machinery — Evaluation of the emission of airborne hazardous substances — Part 1: Selection of test methods

EN 1265, Noise test code for foundry machines and equipment

EN 1299, Mechanical vibration and shock — Vibration isolation of machines — Information for the application of source isolation

EN 1539, Dryers and ovens, in which flammable substances are released — Safety requirements

EN 13861, Safety of machinery — Guidance for the application of ergonomics standards in the design of machinery

EN 14253, Mechanical vibration — Measurement and calculation of occupational exposure to whole-body vibration with reference to health — Practical guidance

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

EN 61310-1, *Safety of machinery — Indication, marking and actuation — Part 1: Requirements for visual, acoustic and tactile signals (IEC 61310-1:2007)*

EN 61310-2; *Safety of machinery — Indication, marking and actuation — Part 2: Requirements for marking (IEC 61310- 2:2007)*

EN 60447, *Basic and safety principles for man-machine interface — Marking and identification — Actuating principles (IEC 60447:2004)*

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

EN ISO 7731, *Ergonomics — Danger signals for public and work areas — Auditory danger signals (ISO 7731:2003)*

EN ISO 11064-1, *Ergonomic design of control centres — Part 1: Principles for the design of control centres (ISO 11064-1:2000)*

EN ISO 11688-1, *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 13849-1, *Safety of machinery — Safety-related parts of control systems — Part 1: General principles for design (ISO 13849-1:2006)*

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

EN ISO 13857:2008, *Safety of machinery — Safety distances to prevent hazard zones being reached by upper and lower limbs (ISO 13857:2008)*

ISO 6184-1, *Explosion protection systems — Part 1: Determination of explosion indices of combustible dusts in air*

ISO 3864-1, *Graphical symbols — Safety colours and safety signs — Part 1: Design principles for safety signs in workplaces and public areas*

ISO 7000, *Graphical symbols for use on equipment — Index and synopsis"*

6 Modification to Clause 3, "Definitions"

Replace the entire Clause 3 with the following:

"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 and the following apply.

NOTE Definitions used in EN and ISO standards referred to in this European Standard are also valid for this European Standard.

3.1

moulding machinery

machines used to make sand moulds. There are various machinery types which compact granular moulding materials including:

- jolt moulding machines (compaction by jolting the moulding machine deck),
- squeeze moulding machines (compaction by squeezing the pattern equipment and the moulding sand together),
- jolt and squeeze moulding machines,
- shoot-/blow- and squeeze moulding machines,
- impulse moulding machines (the moulding sand is compacted by a compression wave which acts on the top of the sand fill),
- air-flow-squeeze moulding machines (similar to impulse-moulding machines, except that the compressed air escapes through nozzles in the pattern plate),
- dynamic squeeze moulding machines (compensating pressure squeeze pistons act on the top of the sand fill),
- suction and squeeze moulding machines (the pressure differential between the moulding box and the pattern draws in the moulding sand),
- vacuum-moulding machines (unbonded sand is compacted by vacuum),
- sand slingers (the moulding sand is flung into the moulding box by the centrifugal force of a rotating wheel).

3.2

moulding plant

equipment used to make ready-to-pour sand moulds. A moulding plant consists of moulding stations (automatic moulding machines for complete moulds) or several moulding machines (moulding group) that produce the moulding parts separately. It may also include lines for core setting, mould closing, weighting or clamping, pouring, cooling, knocking-out of the mould parts and emptying of the boxes as well as integral transfer systems linking the various stations and lines

3.3

disposable mould

mould that is destroyed to remove the casting

3.4

core making machinery

machines used to make solid and/or hollow cores and they are classified into core shooters and core blowers. The principle of core shooting is to rapidly expand compressed air via the sand reservoir into the sand. The sand is then fluidized by the airstream and the sand-air-mix is transported into the core box. The principle of core blowing is to transport the sand by means of compressed air into the core box (direct working). The sand is conveyed along in front of the compressed air

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- 3.5
coremaking plant**
equipment used to make ready-to-use cores (single cores and/or core assemblies). A plant may consist of a sand preparation plant, core making machine, equipment for handling, deflashing, assembling, coating and drying of cores
- 3.6
conditioning equipment**
equipment and plant used to prepare ready-to-use bonded sands, including equipment for its conveyance and storage
- 3.7
sand mixers and mills**
machines for batch mixing (blending, coating, kneading) of moulding or core sand with bonding agents, water and complementary mould material additions. The machines are provided with rotating paddles and/or milling rollers and fast rotating paddles for the aeration of the material. Typically, machines consist of a circular container in which are mounted rotating ploughs and/or mill wheels (mullers).
- 3.8
machines for continuous mixing**
machines in which the contents are continuously mixed and conveyed to the discharge gate
- 3.9
sand aerators**
machines used to aerate the mixed sand such as belt aerators (conveyor belt with impact bars) or wheel aerators (drum with impact bars)
- 3.10
spike disintegrators**
disintegrators with a horizontal or a vertical rotating axis. Used and lump sand is conveyed axially to the disintegrator wheels. The disintegrator wheels are normally provided with projections and rotate in opposite directions
- 3.11
installations for the storage and pneumatic conveyance of coal dust or coal dust substitutes and their mixtures with bonding agents**
silos and pipework that are filled pneumatically with such material and by which the material is supplied pneumatically to the next operation (e. g. sand mixers)
- 3.12
sand dryers and heaters**
plant consisting of a heating system and/or subsequent cooling equipment
- 3.13
reclamation equipment**
equipment and plant including storage and conveying facilities used for the reclamation of used sands by mechanical and/or thermal processing means
- 3.14
sand lump crushers**
machines used to break down lumps of used sand by mechanical means
- 3.15
thermal reclamation ovens**
machines used to destroy the binder by thermal means
- 3.16
mechanical reclamation machines**
machines used to destroy the binder by mechanical means

3.17**magnet separators**

machines used to separate ferro-magnetic material from the used sand

3.18**screening installations**

machines used to classify used sands (this may be achieved by vibration, rotation or other means)

3.19**gassing equipment**

equipment used to produce and/or condition reactive gasses and supply them to the gassing station or into the sand mixture. Typical processes are:

<u>binder system</u>	<u>reactive gas</u>
silicate	CO ₂
urethane (coldbox)	amine
furane resin/peroxide or epoxy resin/peroxide	SO ₂
alkaline resin	methyl-formate
inorganic binders	hot air (as dehydration assistance)

3.20**knock-out equipment**

equipment used to separate castings from the moulding box and/or the mould and/or cores from castings

3.21**punch-out equipment**

equipment used to separate the mould and castings from the moulding box by vertical or horizontal movement of a punch-out piston

3.22**rotary knock-out and/or cooling drum**

rotating or reciprocating cooling drum through which sand and castings are conveyed and separated. The rolling movement of the castings breaks up the lumps of sand as the drum rotates

3.23**knock-out grid**

a grid provided with a vibrating facility for the separation of moulding sand from the moulding box and/or from the casting

3.24**knock-out tray**

oscillating conveyor for the separation of casting and moulding material

3.25**modes of operation**

moulding/core making machinery and equipment (single machines or groups of interconnected parts) can function under different modes of operation

a) setting

all the steps within a process can be initiated separately and manually in any sequence, e. g., mould changing or pattern changing

EN 710:1997/FprA1:2009 (E)**b) manual**

all the steps within a process can be initiated separately in the sequence of, or out of the sequence of, the programme, e. g., termination of a moulding cycle or continuation of a moulding cycle for testing or fault detection

c) step

each part of a cycle is initiated manually and then proceeds to completion in the pre-determined sequence

d) semi-automatic

after a start-initiation a complete manufacturing cycles is completed in the pre-determined sequence

e) automatic

each cycle is initiated by the previous cycle, e. g., continuous operation"

7 Modifications to Clause 4, "Hazards"

Replace Clause 4 and its heading with the following:"

4 Significant Hazards

"The significant hazards, hazardous situations and events, as far as they are dealt with in this document, identified by risk assessment as significant for these types of machinery and which require action to eliminate or reduce the risk, are listed in Clause 5, Table 1, together with the appropriate safety measures."

8 Modifications to Clause 5, "Safety requirements and measures"

Replace the heading of Clause 5 with the following: "Safety requirements and/or protective measures".

Replace in Clause 5 the hanging paragraph at the beginning and sub-clause 5.1 with the following:

"5.1 General

5.1.1 Machinery shall comply with the safety requirements and/or protective measures formulated in Table 1 in relation with the different significant hazards. In addition, the machine shall be designed according to the principles of EN ISO 12100-2 for relevant but not significant hazards which are not dealt with by this document.

5.1.2 Fixed guards

These guards shall be designed in accordance with EN ISO 12100-2, EN ISO 13857 and EN 953.

These guards shall also be designed to contain processed materials, fluids or parts that can foreseeable be ejected or to contain emissions of substances or noise if applicable.

Where practical, these guards shall be fixed to the machine structure.

If floor mounted, these guards shall be securely fixed and have a minimum height of 1,4 m and be positioned at a sufficient distance from the danger zone in accordance with Table 1 of EN ISO 13857:2008.

The installation of fixed covers is sufficient for safeguarding danger zones when there is no need to reach in or walk in during normal operation.

5.1.3 Movable guards

5.1.3.1 Detection and monitoring

Movable guards in danger zones with fixed cycle intervention or access (e.g. during loading and unloading of parts), set-up activities, periodical manual cleaning or spraying or troubleshooting is required, shall incorporate guard interlocking according to EN 1088.

When the guard is open, the drive power supply for the relevant hazardous movements shall be positively disconnected.

5.1.3.2 Interlocking guard with guard locking

An interlocking guard with guard locking effective within the hazardous period shall be used when the stopping time of the hazardous movement is greater than the access time of a person in reaching the danger zone.

5.1.3.3 Closing the guards

Closing the guards shall not initiate operation of hazardous movements. If movement was interrupted by opening of an interlocked danger zone guard, the restart shall be performed by actuation from outside the guard.

5.1.3.4 Power operated guards

Power operated guards shall not create a trap. Either the power provided shall be insufficient to cause injury in the event of trapping, or the guard shall be provided with a safety trip device to prevent injury.

Actuation of the safety trip device shall stop or reverse the direction of movement of the movable guard.

5.1.4 Electro-sensitive protective devices (ESPD)

If electro-sensitive protective devices (see EN 61496-1) are used then the following requirements shall be met:

- a) the control system of the machine shall be able to interrupt the hazardous movement in time when it receives the output signal from such a protective device;
- b) they shall switch on if the control system of the machine is connected,
- c) they shall be tested at each machine cycle;
- d) they shall not act as control devices;
- e) they shall not be adjustable neither in the vertical nor in the horizontal direction;
- f) they shall be interlocked with the hazardous movements of the machine;
- g) the output-signals of such devices shall be independent of the electronic control system of the machine or shall be connected to failsafe PLC;
- h) the protective field of such devices shall cover the access area;
- i) they shall be positioned so that persons cannot remain between the protective field of the device and the danger zone and initiate a machine cycle;
- j) their position, in relation to the danger zone, shall take into account the machine stopping time, the approach speed of the operator and the initiation time of the device (see EN 999).