SLOVENSKI STANDARD
oSIST prEN 14753:2019

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Varnost strojev - Varnostne zahteve za stroje in opremo za zvezno litje jekla

Safety of machinery - Safety requirements for machinery and equipment for continuous casting of steel

Sicherheit von Maschinen - Sicherheitsanforderungen für Maschinen und Einrichtungen zum Stranggießen von Stahl

Sécurité des machines - Prescriptions de sécurité pour les machines et équipements de coulée continue de l'acier

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13.110	Varnost strojev	Safety of machinery
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Safety of machinery - Safety requirements for machinery and equipment for continuous casting of steel

Sécurité des machines - Prescriptions de sécurité pour les machines et équipements de coulée continue de l'acier

Sicherheit von Maschinen - Sicherheitsanforderungen für Maschinen und Einrichtungen zum Stranggießen von Stahl

This draft European Standard is submitted to CEN members for enquiry. It has been drawn up by the Technical Committee CEN/TC 322.

If this draft becomes a European Standard, CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

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Recipients of this draft are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

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

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European foreword

This document (prEN 14753:2019) has been prepared by Technical Committee CEN/TC 322 “Equipment for making and shaping of metals - Safety requirements”, the secretariat of which is held by DIN.

This document is currently submitted to the CEN Enquiry.

This document will supersede EN 14753:2007.

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

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

Introduction

This document is a type C standard as stated in EN ISO 12100:2010.

This document is not applicable to continuous casting machines (according to the Scope) manufactured before the date of its publication.

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

Where for clarity an example of a preventative measure is given, 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.

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

It is assumed that continuous casting machines are operated and maintained by suitably trained personnel.

This document is of relevance, in particular, for the following stakeholder groups representing the market players with regard to machinery safety:

— machine and/or plant manufacturers (small, medium and large enterprises);

— health and safety bodies (regulators, accident prevention organizations, market surveillance, etc.).

Others can be affected by the level of machinery safety achieved with the means of the document by the above-mentioned stakeholder groups:

— machine and/or plant users/employers (small, medium and large enterprises);

— service providers, e.g. for maintenance (small, medium and large enterprises).

The above-mentioned stakeholder groups have been given the possibility to participate at the drafting process of this document.

1 Scope

This document applies for plant (containing machinery and equipment) used in the process of continuous casting of liquid steel (hereafter referred to as continuous casting machine, CCM) as defined in 3.1.

This document deals with all significant hazards, hazardous situations and events relevant to machinery and equipment for the continuous casting of steel, when they are used as intended and under conditions of misuse which are reasonably foreseeable by the manufacturer (see Clause 4).

This document specifies the safety requirements to be met during design, assembly, transport, commissioning, operation, maintenance (as described in Clause 5) and decommissioning of the equipment.

This document assumes that the machinery and equipment of the plant is operated and maintained by adequately trained and competent personnel (see 7.5). Manual intervention for setting, adjustment and maintenance is accepted as part of the intended use of the plant.

This document assumes that the machinery is used with adequate workstation lighting conforming to EN 12464-1.

National regulations regarding lighting should be considered and could differ from requirements of EN 12464-1.

This document applies to:

— CCM for the transformation of molten liquid steel into solid products in sections (e.g. square, rectangular, beam blank, circular);

— CCM's from the point where overhead cranes or other transport systems deposit ladles to CCM (e.g. in a ladle turret, ladle car or ladle stand);

— via casting process and solidification process;

— via cutting equipment;

— thru the run-out-area where the cut product is finished, collected and removed from that area.

This document does not cover safety requirements for:

— horizontal-CCM for steel;

— auxiliary plants (e.g. water treatment, refractory handling);

— ladles;

— cranes;

— winches and hoists;

— conveyors or handling systems;

— workshop equipment (mould and segment shop, tundish workshop).

It is recommended to use this standard in case of modernization for the parts to be modernized.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 298:2012, *Automatic burner control systems for burners and appliances burning gaseous or liquid fuels*

EN 349:1993+A1:2008, *Safety of machinery — Minimum gaps to avoid crushing of parts of the human body*

EN 614-1:2006+A1:2009, *Safety of machinery — Ergonomic design principles — Part 1: Terminology and general principles*

EN 614-2:2000+A1:2008, *Safety of machinery — Ergonomic design principles — Part 2: Interactions between the design of machinery and work tasks*

EN 842:1996+A1:2008, *Safety of machinery — Visual danger signals — General requirements, design and testing*

EN 894-1:1997+A1:2008, *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 894-2:1997+A1:2008, *Safety of machinery — Ergonomics requirements for the design of displays and control actuators — Part 2: Displays*

EN 894-3:2000+A1:2008, *Safety of machinery — Ergonomics requirements for the design of displays and control actuators — Part 3: Control actuators*

EN 981:1996+A1:2008, *Safety of machinery — System of auditory and visual danger and information signals*

EN 1299:1997+A1:2008, *Mechanical vibration and shock — Vibration isolation of machines — Information for the application of source isolation*

EN 12094-1:2003, *Fixed firefighting systems — Components for gas extinguishing systems — Part 1: Requirements and test methods for electrical automatic control and delay devices*

EN 12464-1:2011, *Light and lighting — Lighting of work places — Part 1: Indoor work places*

EN 14253:2003+A1:2007, *Mechanical vibration — Measurement and calculation of occupational exposure to whole-body vibration with reference to health — Practical guidance*

EN 15004-1:2019, *Fixed firefighting systems — Gas extinguishing systems — Part 1: Design, installation and maintenance (ISO 14520-1:2015, modified)*

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

EN 12254:2010, *Screens for laser working places — Safety requirements and testing*

EN 61310-1:2008, *Safety of machinery — Indication, marking and actuation — Part 1: Requirements for visual, acoustic and tactile signals (IEC 61310-1:2007)*

EN 61310-2:2008, *Safety of machinery — Indication, marking and actuation — Part 2: Requirements for marking (IEC 61310 1:2007)*

EN 60825-1:2014, *Safety of laser products — Part 1: Equipment classification and requirements (IEC 60825-1:2014)*

EN 60825-4:2006, *Safety of laser products — Part 4: Laser guards (IEC 60825-4:2006)*

EN ISO 4413:2010, *Hydraulic fluid power — General rules and safety requirements for systems and their components (ISO 4413:2010)*

EN ISO 4414:2010, *Pneumatic fluid power — General rules and safety requirements for systems and their components (ISO 4414:2010)*

EN ISO 4871:2009, *Acoustics — Declaration and verification of noise emission values of machinery and equipment (ISO 4871:1996)*

EN ISO 7731:2008, *Ergonomics — Danger signals for public and work areas — Auditory danger signals (ISO 7731:2003)*

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

EN ISO 11202:2010, *Acoustics — Noise emitted by machinery and equipment — Determination of emission sound pressure levels at a work station and at other specified positions applying approximate environmental corrections (ISO 11202:2010)*

EN ISO 11688-1:2009, *Acoustics — Recommended practice for the design of low-noise machinery and equipment — Part 1: Planning (ISO/TR 11688-1:1995)*

EN ISO 12100:2010, *Safety of machinery — General principles for design — Risk assessment and risk reduction (ISO 12100:2010)*

EN ISO 13732-1:2008, *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 13849-1:2015, *Safety of machinery — Safety-related parts of control systems — Part 1: General principles for design (ISO 13849-1:2015)*

EN ISO 13850:2015, *Safety of machinery — Emergency stop function — Principles for design (ISO 13850:2015)*

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

EN ISO 14118:2018, *Safety of machinery — Prevention of unexpected start-up (ISO 14118:2017)*

EN ISO 14120:2015, *Safety of machinery — Guards — General requirements for the design and construction of fixed and movable guards (ISO 14120:2015)*

EN ISO 14119:2013, *Safety of machinery — Interlocking devices associated with guards — Principles for design and selection (ISO 14119:2013)*

EN ISO 14122-1:2016, *Safety of machinery — Permanent means of access to machinery — Part 1: Choice of fixed means and general requirements of access (ISO 14122-1:2016)*

EN ISO 14122-2:2016, *Safety of machinery — Permanent means of access to machinery — Part 2: Working platforms and walkways (ISO 14122-2:2016)*

EN ISO 14122-3:2016, *Safety of machinery — Permanent means of access to machinery — Part 3: Stairs, stepladders and guard-rails (ISO 14122-3:2016)*

EN ISO 14122-4:2016, *Safety of machinery — Permanent means of access to machinery — Part 4: Fixed ladders (ISO 14122-4:2016)*

EN ISO 14123-1:2015, *Safety of machinery — Reduction of risks to health resulting from hazardous substances emitted by machinery — Part 1: Principles and specifications for machinery manufacturers (ISO 14123-1:2015)*

EN ISO 14123-2:2015, *Safety of machinery — Reduction of risks to health resulting from hazardous substances emitted by machinery — Part 2: Methodology leading to verification procedures (ISO 14123-2:2015)*

EN ISO 19353:2019, *Safety of machinery — Fire prevention and fire protection (ISO 19353:2019)*

ISO 361:1975, *Basic ionizing radiation symbol*

ISO 7745:2010, *Hydraulic fluid power — Fire-resistant (FR) fluids — Requirements and guidelines for use*

EN 62598:2013, *Nuclear instrumentation — Constructional requirements and classification of radiometric gauges (IEC 62598:2012)*

EN 61800-5-2:2017, *Adjustable speed electrical power drive systems — Part 5-2: Safety requirements - Functional (IEC 61800-5-2:2016)*

EN 12464-1:2011, *Light and lighting — Lighting of work places — Part 1: Indoor work places*

ISO 3864-1:2007, *Graphical symbols — Safety colours and safety signs — Part 1: Design principles for safety signs and safety markings*

EN ISO 7010:2012, *Graphical symbols — Safety colours and safety signs — Registered safety signs (ISO 7010:2011)*

EN ISO 7731:2008, *Ergonomics — Danger signals for public and work areas — Auditory danger signals (ISO 7731:2003)*

EN 746-2:2010, *Industrial thermoprocessing equipment — Part 2: Safety requirements for combustion and fuel handling systems*

EN 61496-1:2013, *Safety of machinery — Electro-sensitive protective equipment — Part 1: General requirements and tests (IEC 61496 1:2012)*

EN 62061:2017, *Safety of machinery — Functional safety of safety-related electrical, electronic and programmable electronic control systems (ISO 62061:2012*

EN 12198-3:2002+A1:2008, *Safety of machinery — Assessment and reduction of risks arising from radiation emitted by machinery — Part 3: Reduction of radiation by attenuation or screening*

EN 13480-1:2017, *Metallic industrial piping — Part 1: General*

EN 13480-2:2017, *Metallic industrial piping — Part 2: Materials*

EN 13480-3:2017, *Metallic industrial piping — Part 3: Design and calculation*

EN 13480-4:2017, *Metallic industrial piping — Part 4: Fabrication and installation*

EN 13480-5:2017, *Metallic industrial piping — Part 5: Inspection and testing*

EN 60447:2004, *Basic and safety principles for man-machine interface, marking and identification — Actuating principles*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN ISO 12100:2010 and the following apply.

3.1
continuous casting machines (CCM)
equipment for pouring liquid steel by one or more strands

Note 1 to entry: The CCM can be vertical, bow-shaped or mixed type.

3.2
casting platform
area where liquid steel is poured

3.3
cooling chamber / strand guiding area
closed area located underneath the casting platform from where steam, generated through the casting process, is exhausted

Note 1 to entry: Within this area, thermal hazards due to liquid steel (e.g. due to breakout of strand) or high temperature (caused by liquid/solidified steel) and/or steam (caused by water cooling) exist.

3.4
crop and/or sample collecting system
device to collect crops or samples

3.5
cutting equipment
equipment to cut the product to desired length

3.6
run-out-area (cooling bed and product collecting system)
area following the cutting system with devices to transport, cool down, finish, mark and/or collect the products

3.7
dummy bar system
device to start casting

3.8
electromagnetic braking device (EMBR)
device to brake liquid steel movement in the mould

3.9
electromagnetic mould stirring device (EMS)
device to stir the liquid steel

3.10
electromagnetic strand stirring device
device to stir the liquid steel in the solidification area

3.11
ladle
vessel to collect, transport and discharge molten steel

3.12
emergency launder, emergency ladle
system to convey and collect liquid steel in case of uncontrolled steel flow from ladle

3.13
tundish emergency system
system to stop or convey and collect liquid steel in case of uncontrolled steel flow from tundish

3.14
ladle supporting system
installed on the casting platform to move and/or support the ladles received from the charging area into casting position

3.15
ladle/tundish shrouding system
movable protection for liquid steel stream between ladle to tundish

3.16
slide gate, stopper rod
system installed on the ladle/tundish to control the liquid steel flow

3.17
deburring system
equipment to remove and collect burrs from the product

3.18
skull
solidified, random shaped piece of steel/slag

3.19
emergency cutting by manual torch
manual cutting by hand with a torch lance during casting process in a defined emergency cutting area

3.20
marking system
equipment to mark the product

3.21
mould
device that solidifies the strand shell

3.22
mould level control system
system to control the steel level in the mould

3.23
oscillating device
device for oscillating movement of the mould

3.24
transfer system
device to transfer the strand product, e.g., roller table

3.25
scale collecting system
device to collect scale

3.26
slag detecting system
system to detect the slag flow from the ladle into the tundish

3.27
strand guide system
device to support the steel product of each strand

3.28
submerged entry nozzle (SEN)
device to pour the steel from the tundish into the mould

3.29
tundish
trough to collect the liquid steel poured from the ladle and/or distribute it to the strand(s)

3.30
tundish launder and slag box system
system installed on the casting platform to collect and/or divert liquid steel poured out of the ladle/tundish in case of failure of the level control system

3.31
tundish supporting system
system, installed on the casting platform, that contains the tundish and carries it between parking/preheating and casting position

3.32
withdrawal and straightening system
device to withdraw and straighten the strands and transfer them to the cutting machine area

3.33
safety layout
graphical description of plant-related equipment with regard to safety