



SLOVENSKI STANDARD

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Nadomešča:
SIST EN 15093:2008

Varnost strojev - Varnostne zahteve za valjarne (vroče valjanje)

Safety of machinery - Safety requirements for hot flat rolling mills

Sicherheit von Maschinen - Sicherheitsanforderungen an Warmflachwalzwerke

Sécurité des machines - Prescriptions de sécurité relatives aux laminoirs à chaud pour produits plats

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ICS:

13.110	Varnost strojev	Safety of machinery
25.120.20	Valjalni stroji, stroji za vbrizgovanje in vlečni stroji	Rolling, extruding and drawing equipment

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EUROPEAN STANDARD
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**Safety of machinery - Safety requirements for hot flat
rolling mills**

Sécurité des machines - Prescriptions de sécurité
relatives aux laminoirs à chaud pour produits plats

Sicherheit von Maschinen - Sicherheitsanforderungen
an Warmflachwalzwerke

This European Standard was approved by CEN on 26 December 2021.

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

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European foreword

This document (EN 15093:2022) 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 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of an identical text or by endorsement, at the latest by September 2022, and conflicting national standards shall be withdrawn at the latest by September 2022.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN 15093:2008.

Any feedback and questions on this document should be directed to the users’ national standards body. A complete listing of these bodies can be found on the CEN website.

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Introduction

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

This document is not applicable to hot rolling mills for flat products manufactured before the date of its publication.

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.

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

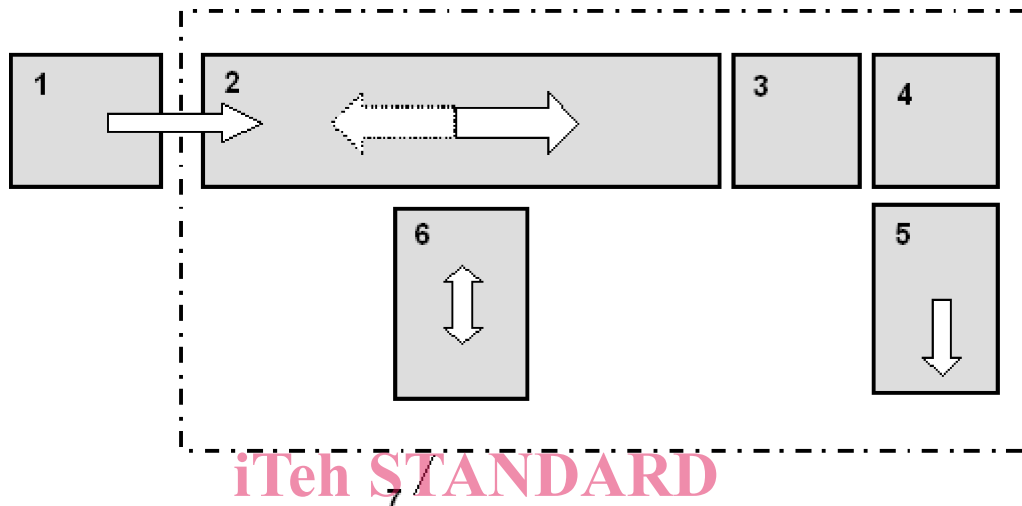
Where for clarity an example of a preventative measure is given, this should not be considered as the only possible solution. Any other solution leading to the same risk reduction is permissible if an equivalent level of safety is achieved.

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.

1 Scope

This document specifies the general safety requirements for hot rolling mills for flat products as defined in 3.1.

This document is applicable to: Plant (machinery, equipment, devices according Annex D) used for the manufacturing of metal hot rolled flat products from the from entry (1), via the mill stands (2) with roll changing devices (6), to the exit (5) (see Figure 1).



Key

- | | | | |
|---|---|---|--------------------------------------|
| 1 | material supply (excluded from the Scope),
e.g. continuous casting machine (according to EN 14753) or
furnace (according to EN 746-1) | 4 | coiler or plate transport |
| 2 | mill stands, including e.g. descaling unit, roller tables | 5 | material removal or plate processing |
| 3 | cooling line | 6 | roll changing devices |
| | | 7 | border of the hot rolling mill |

Figure 1 — Exemplary layout of a hot flat rolling mill

This standard does not cover:

- thermo process equipment, e.g. in accordance with the EN 746 series; including furnaces of a steckel mill;
- continuous casting machines according to EN 14753;
- hook conveyors according to EN 619;
- non-fixed load lifting attachments, e.g. according to EN 13155;
- roll shop equipment;
- storage equipment (e.g. high-bay warehouses);
- cranes, fork lifts, trucks and railway trucks and other vehicles;
- process technology (e.g. treatment of water, rolling lubricant, compressed air, etc.);

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- separate cleaning system for exhaust air;
- firefighting system;

NOTE 1 Please refer to Annex C for information regarding the special requirements for protection of persons in case of using asphyxiant gases used in firefighting system.

- the design of the building, halls and civil works.

This document deals with significant hazards, hazardous situations or hazardous events relevant to hot rolling mills for flat products, when it is used as intended and under conditions of misuse which are reasonably foreseeable by the manufacturer. It provides the requirements to be met by the manufacturer to ensure the safety of persons and property during transport, commissioning, operation and de-commissioning, as well as in the event of foreseeable failures or malfunctions that can occur in the equipment.

NOTE 2 For modernization, this document (C-type standard) can be applied for the part to be modernized.

This document is not applicable to hot rolling mills for flat products manufactured before the date of its publication.

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 614-1:2006+A1:2009, *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 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 981, *Safety of machinery — System of auditory and visual danger and information signals*

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

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

EN 12254, *Screens for laser working places - Safety requirements and testing*

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

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

EN 60204-1:2006, *Safety of machinery - Electrical equipment of machines - Part 1: General requirements*

EN 60825-1, *Safety of laser products - Part 1: Equipment classification and requirements*

EN 60825-4, *Safety of laser products - Part 4: Laser guards*

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

EN 61496-1, *Safety of machinery - Electro-sensitive protective equipment - Part 1: General requirements and tests*

EN 62598, *Nuclear instrumentation - Constructional requirements and classification of radiometric gauges*

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

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

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

EN ISO 7010, *Graphical symbols - Safety colours and safety signs - Registered safety signs (ISO 7010)*

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

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

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

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

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 13854, *Safety of machinery - Minimum gaps to avoid crushing of parts of the human body (ISO 13854)*

EN ISO 13855, *Safety of machinery - Positioning of safeguards with respect to the approach speeds of parts of the human body (ISO 13855)*

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

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

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

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

EN ISO 14122 (all parts), *Safety of machinery - Permanent means of access to machinery (ISO 14122)*

EN ISO 14123-1, *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)*

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

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

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

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

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

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

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3 Terms and definitions

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

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <https://www.electropedia.org/>
- ISO Online browsing platform: available at <https://www.iso.org/obp>

3.1

hot rolling mills for flat products

interconnected equipment for hot rolling of flat material in which several components of the machinery or forming stages are linked by dedicated transport facilities, including associated devices

Note 1 to entry: Plant and equipment which are covered by this document are listed in Annex D.

3.2

safety layout

graphic overview of the hot rolling mill with arrangement of safety-related elements

3.3

hazard zone

danger zone

any space within and/or around machinery in which a person can be exposed to a hazard

[SOURCE: EN ISO 12100:2010, 3.11]

3.4

take-over-point(s)

point(s) where the hot flat rolling mill is connected to incoming/outgoing material (e.g. coils), media, electricity (e.g. power supply and communication like input/output parameters)

Note 1 to entry: For example, coil take-over-point: Point where overhead cranes or other transport systems deposit or remove coils.

3.5

main route(s)

marked traffic route

3.6

safeguard(ing)

guard or protective device

[SOURCE: EN ISO 12100:2010, 3.26]

3.7

reel (sleeve)

cylindrical hollow body used for coiling the material

3.8

trained person(nel)

person with the knowledge of systems, background, experience and ability to operate and/or maintain the equipment in the intended use and proper operation of the machinery/equipment

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3.9

authorized person(nel)

trained person who is instructed by the user to perform a specific task on a specific equipment

Note 1 to entry: In contrast, an unauthorized person does not have the required qualification and is not adequately equipped, e.g. PPE.

3.10

maintenance

combination of service, inspection, repair and functional test of the equipment

Note 1 to entry: The purpose is to preserve the working condition or returning to this condition so that the hot flat rolling mill is able to perform the required function (including safety requirements).

3.10.1

service

measure to maintain the nominal condition

Note 1 to entry: The nominal condition can be maintained in general without dismantling/disassembling major parts of the equipment, e.g. by cleaning and lubrication of the work equipment as well as addition or replacement of agents or by replacing tools or operational changing parts (e.g. rolls, knives).

3.10.2

inspection

measure to observe and assess the current condition as well as fault finding

Note 1 to entry: Measures, e.g. measuring, testing, diagnostics including the determination of the causes of wear or damage and the derivation of the necessary consequences for the continued use.

Note 2 to entry: 3.10.2 does not cover “material inspection”, see 3.17.

3.10.3

reconditioning

foreseeable measure to return to the nominal condition requiring dismantling/disassembling

Note 1 to entry: Measure to replace worn parts, damaged parts, or parts having expired the foreseen lifetime (could require dismantling/disassembling). These parts should meet manufacturers' specifications.

3.10.4

functional test

checking of the functionality of the exchanged or repaired parts

Note 1 to entry: It is maybe required to carry out adjustment work, e.g. test runs, verifying safety functions.

3.11

repair

not foreseeable measure(s) to return to the nominal condition

Note 1 to entry: Measure to replace damaged parts, requires in general dismantling/disassembling. These parts should meet manufacturers' specification.

3.12

material

metal being hot-rolled

3.13**coil**

coiled material

3.14**strip**

flat material

3.15**material supply**

devices feeding material to the hot rolling mill and which are linked by control with the hot rolling mill

3.16**material removal**

devices removing material from the hot rolling mill and which are linked by control with the hot rolling mill

3.17**material inspection**

observe and assess the current condition of the material

3.18**cobbling**

material leaving its intended path

3.19**pulpit**

enclosed room in which the control desk and monitoring facilities for a machine or equipment are located, used as a permanent workstation

3.20**control stand**

free standing control desk (usually situated adjacent to the machine or equipment), used as a temporary workstation

3.21**portable control device**

control device which can be used in different places (e.g. control pendant, enabling button, radio control)

3.22**enabling (control) device**

additional manually actuated device used in conjunction with a start control which, when continuously actuated, permits machine function

[SOURCE: EN ISO 12100:2010, 3.28.2]

3.23**hold-to-run control device**

control device which initiates and maintains machine functions only as long as the control device is actuated

[SOURCE: EN ISO 12100:2010, 3.28.3]

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3.24

control mode(s)

single machines or groups of interlinked machines of hot flat rolling mills can be operated by different control modes

Note 1 to entry: This standard distinguishes between control mode and operating mode. It shall be stated that the meaning is not in line with EN ISO 12100 and EN 60204-1. The operating mode (see 3.25) corresponds to the "control mode" of EN ISO 12100:2010, 6.2.11.9.

3.24.1

manual control mode(s)

3.24.1.1

hold-to-run control

every function is controlled by an operator by means of a button or equivalent device according to 3.28.3 of EN ISO 12100:2010

Note 1 to entry: Release of the button/device stops the function (e.g. movement) immediately.

3.24.1.2

single function

functions are started and/or stopped by an operator

3.24.2

semi-automatic control

sequence of functions released once by an operator

Note 1 to entry: The released sequence is automatically stopped at its end. For the initiation of another sequence, a new command by the operator is required.

3.24.3

automatic control

cycles of successive or parallel sequences once initiated by the operator

Note 1 to entry: If there is no operator intervention, the repetition of the sequences takes place as long as the running conditions are met.

3.25

operating mode(s)

state of the control system allowing to operate the hot flat rolling mill under defined conditions

Note 1 to entry: Such modes are, e.g. production, safe stop, enabling, adjustment, inspection.

Note 2 to entry: The safety level of the operating mode(s) is defined as result of the risk assessment.

3.25.1

special modes

3.25.1.1

enabling mode

operation of machine functions by using an enabling device (as per 3.23)

3.25.1.2

inching (jog) mode

operation of machine functions using a hold-to-run control device (as per 3.24)

3.25.2**safe stop mode**

movement of the involved equipment is prevented through the control system

Note 1 to entry: The required safety level of the safe intervention stop is defined as result of the risk assessment.

Note 2 to entry: Safe intervention stop is not sufficient as a safety measure to perform repair work because isolation of the equipment from the relevant energy sources is not realized.

Note 3 to entry: Residual risks, e.g. by stored energy must have been secured by other means.

Note 4 to entry: Safe stop mode may also include switching off additional devices, e.g. X-ray.

3.25.3**normal production mode**

machine is ready to produce or producing as intended

Note 1 to entry: Production, material handling and activities supporting these processes are covered.

Note 2 to entry: Maintenance according to 3.10 is not covered.

3.26**reduced speed**

speed, reduced to minimize the hazardous potential without safety monitoring of speed

Note 1 to entry: In case of failure, an increase in speed may occur.

Note 2 to entry: Applies to linear or rotational speed.

Note 3 to entry: Speed reduced without an enabling device means that the movement is so slow that the operator can move away from this dangerous movement in time. Based on a risk assessment, an enabling device may therefore be required in some cases, even at a reduced speed (e.g. in narrow spaces).

Note 4 to entry: Examples of reduced speeds include speeds of less than 10 mm/s for presses, less than 250 mm/s for robots, less than 250 mm/s for all non-shearing movements and less than 33 mm/s for shearing or crushing movements.

3.27**safely-limited speed, SLS**

exceeding of a predefined speed limit is safety-related prevented according to EN 61800-5-2:2017, 4.2.3.4

Note 1 to entry: Linear or rotational speed.