SLOVENSKI STANDARD
SIST EN 13675:2004+A1:2010

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Varnost strojev - Varnostne zahteve za cevarne, valjarne in opremo za pakiranje blaga

Safety of machinery - Safety requirements for tube forming and rolling mills and their finishing line equipment

Sicherheit von Maschinen - Sicherheitsanforderungen an Rohrform- und -walzwerke und Adjustageanlagen

Sécurité des machines - Prescriptions de sécurité pour formeuses et laminoirs à tubes et de lignes de parachèvement

Ta slovenski standard je istoveten z: **EN 13675:2004+A1:2010**

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77.180	Oprema za metalurško industrijo	Equipment for the metallurgical industry

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Safety of machinery - Safety requirements for tube forming and rolling mills and their finishing line equipment

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This European Standard was approved by CEN on 1 April 2004 and includes Amendment 1 approved by CEN on 21 February 2010.

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Contents

Foreword

This document (EN 13675:2004+A1:2010) 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of an identical text or by endorsement, at the latest by October 2010, and conflicting national standards shall be withdrawn at the latest by October 2010.

This document includes Amendment 1, approved by CEN on 2010-02-21.

This document supersedes EN 13675:2004.

The start and finish of text introduced or altered by amendment is indicated in the text by tags A1 A1.

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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.

Annexes A and B are normative. Annexes C and D are informative.

An assessment of the foreseeable risks arising from the use of the plant/machinery was carried out when this standard was drafted by CEN/TC 322/WG 3, comprising experts from the following countries: Denmark, Germany, Italy, Sweden and the United Kingdom.

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, Croatia, 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.

Introduction

〈A1〉 This document is a type-C standard as stated in EN ISO 12100.

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

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.

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

This European Standard assumes that the equipment is operated and maintained by trained personnel. 〈A1〉

1 Scope

This European Standard describes the health and safety requirements of fully automated plant used in the process of tube forming, rolling and finishing (hereafter referred to as "plant"). It describes the foreseeable, significant hazards, hazardous situations, and events arising from plants and from particular machines integrated to form the plant; it does not describe the full health and safety requirements for each particular machine. It indicates preventive measures for avoiding the hazards and reducing the risks. It deals not only with circumstances where the machinery is used as intended, but also includes other conditions foreseen by the manufacturer, such as foreseeable faults, malfunctions or misuse.

This European Standard specifies the requirements to ensure the safety of persons which are to be met during the design, assembly, transport, commissioning, operation, maintenance and decommissioning of the equipment.

This standard assumes that installations are operated and maintained by adequately trained and competent personnel. Manual intervention for setting, adjustment and maintenance is accepted as part of the normal use of these machines.

This standard assumes that the machinery is used with adequate workplace lighting conforming to ▌A1⟩ EN 12464-1 ⟨A1▌ or to local regulations.

This standard applies to:

Automated plant and equipment operated for the production of metal seamless hot and cold finished tubes and welded tubes. A list of machines which could make up different plants is shown in Annex D (informative).

This standard covers:

For seamless hot-finished tubes: from material charging downstream of the heating furnace through the rolling process and up to, but not including any intermediate storage equipment or the downstream finishing lines.

For seamless cold-finished tubes: from material charging through the rolling process to the discharging equipment but not including any storage equipment.

For welded tubes: from coil charging through strip preparation, forming and welding equipment up to, but not including any intermediate storage equipment or the downstream finishing lines.

For the tube finishing line: from tube charging to the discharging equipment to the storage.

The following items are outside the scope of this standard:

—complete risk assessment of single machines which are used to form a plant

—furnaces;

—quenching equipment;

—spiral tube manufacture;

—large diameter tube welding manufacture using three-roll bending machines, U-ing and O-ing press lines and their finishing lines;

—butt welding machinery for the manufacture of endless strips;

—irradiation units (material testing by e. g., ultrasonic and X-ray testing units);

—centrifugal casting machines;

—machine tools used for e. g., threading, chamfering, stamping and marking machines;

—storage equipment.

This standard does not establish any requirements concerning electromagnetic disturbances.

This standard is not applicable to tube rolling and forming mills and finishing line equipment, manufactured before the date of publication of this standard by CEN.

NOTE The words "Tube" and "Pipe" are synonymous in this standard.

2 Normative references

[A1] 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. [A1]

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

EN 614-1:2006, *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 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 842, *Safety of machinery — Visual danger signals — General requirements, design and testing*

EN 853, *Rubber hoses and hose assemblies — Wire braid reinforced hydraulic type — Specification*

EN 854, *Rubber hoses and hose assemblies — Textile reinforced hydraulic type — Specification*

EN 856, *Rubber hoses and hose assemblies — Rubber-covered spiral wire reinforced hydraulic type — Specification*

EN 857, *Rubber hoses and hose assemblies — Wire braid reinforced compact type for hydraulic applications — Specification*

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 953:1997, *Safety of machinery — Guards — General requirements for the design and construction of fixed and movable guards*

EN 981:1996, *Safety of machinery — System of auditory 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*

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

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

EN 1063, *Glass in building — Security glazing — Testing and classification of resistance against bullet attack*

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

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

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

EN 12198-1, *Safety of machinery — Assessment and reduction of risks arising from radiation emitted by machinery — Part 1: General principles*

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

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*

EN 50171, *Central power supply systems*

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

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

EN 60825-1:2007, *Safety of laser products — Part 1: Equipment classification and requirements (IEC 60825-1:2007)*

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

EN 60529:1991, *Degrees of protection provided by enclosures (IP code) (IEC 60529:1989)*

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

EN ISO 7731:2005, *Ergonomics — Danger signals for public and work areas — Auditory danger signals (ISO 7731:2003)*

EN ISO 9692-2, *Welding and allied processes — Joint preparation — Part 2: Submerged arc welding of steels (ISO 9692-2:1998)*

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

EN ISO 11202, *Acoustics — Noise emitted by machinery and equipment — Measurement of emission sound pressure levels at a work station and at other specified positions — Survey method in situ (ISO 11202:1995)*

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 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 13849-1:2006, *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 13857:2008, *Safety of machinery — Safety distances to prevent hazard zones being reached by upper and lower limbs (ISO 13857:2008)*

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

EN ISO 14122-1, *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, *Safety of machinery — Permanent means of access to machinery — Part 2: Working platforms and walkways (ISO 14122-2:2001)*

EN ISO 14122-3, *Safety of machinery — Permanent means of access to machinery — Part 3: Stairs, stepladders and guard-rails (ISO 14122-3:2001)*

EN ISO 14122-4, *Safety of machinery — Permanent means of access to machines and industrial plants — Part 4: Fixed ladders (ISO 14122-4:2004)*

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* A1

3 Terms and definitions

A1 For the purpose of this document, the terms and definitions given in EN ISO 12100:2003 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. A1

3.1
product/material
metal being in forming or rolling process (e.g., billets, hollow blooms, tubes and pipes)

3.2
pulpit
enclosed room in which the control desk and monitoring facilities for a machine or equipment are located

3.3
control stand
free standing control desk (usually situated adjacent to the machine or equipment)

3.4
mandrels
a) tools to form seamless tubes

b) the centre on which the strips are coiled

3.5
custom-made equipment
equipment made to the customers specification

3.6
large plant/equipment
interconnected equipment (size > 15 m) in which several items of machinery or forming stages are linked by dedicated transport facilities (e. g., roller conveyors, cross-transfer systems). Excluded are overhead cranes, fork lifts, trucks and railway trucks and other vehicles

3.7
cobbling
product/material leaving its intended path

3.8
competent person
person with the knowledge of systems, background, experience and ability to operate and/or maintain the equipment in the way intended

3.9
unauthorized person
person not permitted to enter certain areas, or to perform certain actions in relation with the operation and/or maintenance of the equipment, because not having the required specific knowledge and skill and for not being properly equipped in order to avoid the related hazards

3.10
automated operation
access to a danger zone where automated processes take place shall be prevented, because there are dangerous movements, which cannot be influenced by the operator in a pulpit or at a control stand.

Manual operations such as loading, unloading, maintenance or repairs are forbidden in the dangerous zone of the automatic operation

4 List of significant hazards

An assessment of the hazards and risks arising from the use of machines which form a plant, and falling within the scope of this standard, was carried out when this standard was prepared. This risk identification then formed the basis for determining:

a) potentially hazardous situations having significant risks;

b) the safety requirements and/or measures which shall be incorporated into the machinery/equipment;

c) any special instructions which shall be communicated to the user.

The significant hazards and hazardous situations identified are listed in columns 1 and 2 of clause 5, Table 1.

[A1] Before using this European Standard it is important for the manufacturer to carry out a risk assessment of the machines which form a plant to identify any other relevant hazards (see EN ISO 14121-1). [A1]

5 Safety Requirements and/or measures

5.1 [A1] General design requirements

5.1.1 Introduction

Plant conforming to this European Standard shall comply with the safety requirements and/or measures of Clause 5 and those set out in Clause 7 and Annex A and B. Relevant hazards identified in the risk assessment carried out by the manufacturer but not dealt with in this European Standard shall be reduced by applying the principle of EN ISO 12100-2.

For hazards which are to be reduced by the application of a B standard such as e.g. EN ISO 13857, EN ISO 13850, EN ISO 13732-1 the risk assessment carried out by the manufacturer shall establish the requirements of the B standard which are to be applied. This specific risk assessment shall be part of the general risk assessment of the machine.

Where the means of reducing the risk is by the physical arrangement or positioning of the installed machines, the manufacturer shall include in the Information for use a reference to these specific reduction means.

Where the means of reducing the risk is by a safe system of working the plant, the manufacturer shall include in the information for use details of the system and of the elements of information required by the operating personnel. This shall include arrangements to run a machine for essential operating reasons or in special mode with safety devices suspended or temporarily modified.

This clause specifies and explains the preventative measures given in Table 1 and it also describes additional safety features, procedures and techniques which shall be considered by the designer and the manufacturer of the equipment. [A1]

5.1.2 [A1] Site inspection

The manufacturer shall undertake sufficient site inspection to establish all requirements of the plant design for:

a) accessibility;

b) maintenance and clearance gaps for cleaning;

c) movement of machinery and material;

d) safe operation;

e) health and safety at the workplace;

f) prevention of emissions hazardous to health at the workplace.

5.1.3 Structural assembly

The manufacturer shall undertake and record design calculations to show that the structural assembly, e.g. steel sections, auxiliaries, lifting points and fixtures, which form part of the equipment are adequate for safety functions under intended use.

5.1.4 Safety layout

The manufacturer shall prepare a safety layout document of the plant. The aim of the safety layout is to give information (normally by means of one or more drawings) about the physical position of safety related elements like, e.g.:

a) isolators according to EN 60204-1;

b) emergency stop buttons, according to the requirements of EN ISO 13850;

c) escape routes (if necessary, e.g. for large plants);

d) other safety-related safety marking, according to the requirements of EN ISO 7731, EN 842;

e) segregating devices (guards, fences, trip devices etc.) intended to prevent access to danger areas of the plant according to the requirements of EN ISO 13857, EN 953, EN ISO 14122-2;

f) doors and other points of access to the plant (where required with related locking and/or interlocking devices);

g) warning devices and safety signs (warning signs for, e.g. forbidden access, X-rays);

h) fire precautions.

The safety layout shall be included into the manufacturer's instructions for use.

5.1.5 Safety devices

Safety devices shall be accessible for inspection and maintenance, and protected against damage under foreseeable conditions. In particular, they shall be sufficiently robust to operate reliably.

5.1.6 Hydraulic, pneumatic, cooling and lubrication systems

Hydraulic, pneumatic, cooling and lubrication systems shall be designed to reduce risks from toxic effects, fire, explosion, vibration and noise. Hazards associated with pressure, temperature, ignition sources, and proximity to adjacent personnel shall be taken into account. In no case shall the system be designed to safety requirements lower than those described in EN 982 or EN 983 and take account of Table 1.

5.1.7 Fluid systems carrying or containing fluids

Manufacturers of plant using fluid systems carrying or containing fluids which are likely to solidify and/or have high or low viscosity and impair safety, shall provide protection against temperatures giving rise to these effects. Data shall be provided in the information for use.

5.1.8 Guard-rails

Guard-rails are to be considered as means to deter or impede access to hazardous areas, i.e. a physical obstacle which only reduces the probability of access (but not totally prevents it), offering an obstruction to free access (see 3.27 of EN ISO 12100-1:2003).

Therefore, guard-rails are not permitted as the sole measure of safeguarding hazardous areas in case of significant risks (e.g. from moving machinery or processed material).

Guard-rails shall be used for cases where the hazards of slips, trips and falls are involved.

Guard-rails can be used as a measure to prevent unintentional access of unauthorised persons to zones where residual risks exist. At zones, where risks due to potentially danger movements of equipment exist, operation of manual modes shall be made by means of hold-to-run devices from control stands with full overview of the driving elements.

The evaluation of the degree of risk associated to a specific hazardous situation shall be performed during individual risk assessment by the manufacturer in compliance with EN ISO 14121-1. However, guard-rails, are not to be considered as sufficient measures of safeguarding to address hazardous situations included in Table 1, where only significant hazards are dealt with.

Guard-rails shall conform to EN ISO 14122-3.

In addition, the manufacturer shall give information in the instructions for use (see Clause 7) about the foreseen restrictions for access to the areas surrounded by the guard-rails and about the nature of the existing residual risks.

5.1.9 Material to be discharged to drains

The manufacturer shall give information on the material to be discharged to drains. This information shall include connection means to waste discharge points and floor drains which form part of the equipment. The information shall be included in the information for use.

5.1.10 Personal protective equipment

The manufacturer shall give information in the information for use (see Clause 7) on the required attributes of any personal protective equipment (PPE, see column 3 of Table 1) needed to safeguard personnel from any residual risks remaining after applying the safety requirements.

5.1.11 Safety signs and warning devices

Safety signs and warning devices according to EN 61310-1 and to EN 61310-2 shall be used.

Graphical symbols shall be in accordance with ISO 3864-1 and/or ISO 7000.

Danger signals shall be in accordance with EN ISO 7731 and/or EN 842 and/or EN 981.

Warning signs about non-ionising radiation for persons with implanted medical devices shall be fixed where applicable.

The manufacturer shall not rely upon warning devices alone to reduce hazards in case of significant risks.

5.1.12 Access

5.1.12.1 Access to operating points

a) Access to control desks, pulpits, underground areas, inspection and service floors shall be realized in accordance with EN ISO 14122-1, EN ISO 14122-2, EN ISO 14122-3 and EN ISO 14122-4 and protected against heat radiation according EN 12198-1 and designed to withstand moving material, tools and jets of high pressure fluids or gases.

b) Surfaces for walking or standing shall be selected so that risks of slips, trips and falls caused by scale, oil, emulsion and/or lubricant are avoided or reduced.

c) Physical barriers shall be provided and warning signs shall be installed so that they are visible from outside the danger zone.

5.1.12.2 Access to danger zones

a) Plants shall be safeguarded in such a way that hazardous situations arising from access of persons to danger zones shall be prevented.

b) In particular, access to the danger zones where automatic process take place shall be in general prevented, because of the presence of dangerous movements and/or conditions of the involved equipment.

c) The manufacturer shall define the areas where access inside danger zones is required for inspection. Additional safety precautions as defined in 5.1.12.3 are required.

d) Operators may enter the danger area for operating or maintenance purposes. Safety measures and intervention procedures as defined in 5.1.12.3 shall be applied.

e) Physical barriers (e.g. guards, see 5.1.15) shall be in general provided to safeguard the danger zones; also safety devices (e.g. trip devices), alone or in combination with guards can be used to achieve the required level of safety (see 5.3.3 of EN ISO 12100-2:2003).

f) The relevant category for control devices covering safety functions in relation with access of persons to danger zones during operation or maintenance, shall be selected according to 5.1.14 and Annex A.

g) The manufacturer shall specify in the information for use the conditions (including details about safe systems of working, as well as adoption of precautions like PPE, use of handling tools etc.) under which access to the danger zones of the plant be permitted (see 7.4, 7.5 and Annex C).

5.1.12.3 Access for inspection purposes under operational conditions

Appropriate safety measures and/or intervention procedures shall be applied to allow authorized personnel access to danger zones under operational conditions, e.g. it might be necessary to enter the danger zone at mill stands or drives for inspection. For these specific actions safety measures shall be considered, in particular:

a) conditions for access: at least operation at reduced speed and other measures like indication to the main pulpit, switching to manual control mode, switching off the X-ray measuring device;

b) conditions for staying/working at/in danger zones such as operation of manual modes by means of hold-to-run control with full overview of the danger zone, operation at reduced speed;

c) conditions for re-start: access doors shall be closed (taking care that no person is inside the danger zone) and reset-button has been pushed (or similar action).

Normal operation speed shall only be achievable if interlocking guards are in protective position.

The manufacturer shall specify in the information for use the safety measures provided and the conditions under which access to the danger zones shall be permitted, including details about safe systems of working, as well as adoption of precautions like PPE, use of handling tools etc.

5.1.13 Electrical equipment

Electrical equipment shall conform to EN 60204-1. In particular the manufacturer shall construct and install all electrical equipment so that it is capable of withstanding all hazards, including those form heat, vibration, wet conditions, identified in the risk assessment required at the design stage and taking into account the requirement set out in Annex A.

5.1.14 Safety control system

Safety controls shall be selected in accordance with the severity of the risk as described in EN ISO 13849-1. The operation of each safety control shall be considered in combination with other elements of the safety control system and be shown not to reduce the safety level of any other element of the system.

For the hazards listed in Table 1 where a control system is involved a risk assessment has to be carried out according to EN ISO 13849-1.

5.1.15 Guards

A guard used to prevent access to a danger zone shall be selected as appropriate for the degree of access (e.g. frequency) to be permitted, that is e.g. an enclosing guard or distance guard, fixed or movable with interlock. This selection shall be made in conformity with Clause 6 of EN 953:1997. The guards identified in 5.2, Table 1 have been selected by this procedure.

Guard shall conform to Clause 5 of EN 953:1997 considering EN ISO 13857.

5.1.16 Surface temperatures and heat radiation

Surfaces which are accessible and could be touched shall have temperatures not exceeding the burn threshold for contact time and material specified in EN ISO 13732-1. Where these limits can not be kept, additional technical measures shall be applied, e.g. isolation, distance guard. These measures shall be supplemented by warning instructions and wearing of PPE, if necessary.