



SLOVENSKI STANDARD
SIST EN 14070:2004+A1:2009
01-maj-2009

Varnost obdelovalnih strojev - Stroji za prenos in posebne namene

Safety of machine tools - Transfer and special-purpose machines

Sicherheit von Werkzeugmaschinen - Transfer- und Einzweck- oder Sondermaschinen

Sécurité des machines-outils - Machines transfert et machines spéciales

Ta slovenski standard je istoveten z: EN 14070:2003+A1:2009

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ICS:

25.080.01 Stroji na splošno Machine tools in general

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EUROPEAN STANDARD

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Safety of machine tools - Transfer and special-purpose machines

Sécurité des machines-outils - Machines transfert et machines spéciales

Sicherheit von Werkzeugmaschinen - Transfer- und Einzweck- oder Sondermaschinen

This European Standard was approved by CEN on 24 July 2003 and includes Amendment 1 approved by CEN on 29 December 2008.

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This European Standard exists 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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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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Foreword

This document (EN 14070:2003+A1:2009) has been prepared by Technical Committee CEN/TC 143 "Machine tools - Safety", the secretariat of which is held by SNV.

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of an identical text or by endorsement, at the latest by August 2009, and conflicting national standards shall be withdrawn at the latest by December 2009.

This document includes Amendment 1, approved by CEN on 2008-12-29.

This document supersedes EN 14070:2003.

The start and finish of text introduced or altered by amendment is indicated in the text by tags $\boxed{A_1}$ $\boxed{A_1}$.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential safety requirements of the Machinery Directive to determine safety for new transfer and special purpose machines.

$\boxed{A_1}$ For relationship with EC Directive(s), see informative Annexes ZA and ZB, which are integral parts of this document. $\boxed{A_1}$

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

This document includes a Bibliography.

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.

EN 14070:2003+A1:2009 (E)**0 Introduction**

This European Standard is a type C standard as stated in 6.3.2 of EN 1070:1998.

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.

Transfer and special purpose machines present a wide range of hazards due to the variety of processes and configurations with possible obstructions to vision on these machines, in particular, those hazardous events which result from contact with:

- Moving tools especially when being rapidly rotated in spindles;
- Fast moving machine parts;
- Fast moving workpieces;
- Power operated mechanisms for workpiece handling, load or unload.

The figures in annex C (informative) are examples only and are not intended to illustrate the only interpretation of the text.

A list of standards related to EN 14070 is given in the bibliography.

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1 Scope

1.1 This standard specifies the technical safety requirements and protective measures to be adopted by persons undertaking the design, construction and supply (including information which must be provided for installation and dismantling, with arrangements for transport and maintenance) of transfer and special purpose machines (see 3.1). These machines are designed to process only a pre-specified metal or analogous material workpiece, or limited family of similar workpieces by means of a predetermined sequence of machining operations and process parameters.

1.2 This standard takes account of intended use, including reasonably foreseeable misuse, maintenance, cleaning, and setting operations. It specifies access arrangements to machining positions and manual load/unload stations (see 3.4). It presumes access to the machine from all directions. It describes means to reduce risks to operators and other exposed persons.

1.3 This standard also applies to transport devices for workpiece load/unload when they form an integral part of the machine.

1.4 This standard deals with significant hazards relevant to transfer and special purpose machines when they are used as intended and under the conditions foreseen by the manufacturer (see clause 4). The safety requirements and/or protective measures to prevent or minimise those hazards identified in Table 1 and procedures for verification of these requirements or measures are found in clause 5. Safety requirements and/or measures are not specified for: Fire and Explosion

1.5 Where machines employ processes which are covered by other standards (e.g. grinding, turning, forming, EDM, laser processing), the requirements of those standards should be applied (see Bibliography).

1.6 This standard applies to machines which are manufactured after publication of this standard by CEN.

2 Normative references

This European Standard incorporates by dated or undated reference provisions from other publications. These normative references are cited at the appropriate places in the text, and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

EN 292-1:1991, *Safety of machinery - Basic concepts, general principles for design – Part 1: Basic terminology, methodology.*

EN 292-2:1991, *Safety of machinery - Basic concepts, general principles for design – Part 2: Technical principles and specifications.*

EN 292-2:1991/A1:1995, *Safety of machinery - Basic concepts, general principles for design – Part 2: Technical principles and specifications; Amendment A1.*

EN 294:1992, *Safety of machinery – Safety distances to prevent danger zones being reached by the upper limbs.*

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 626-1, *Safety of machinery – Reduction of risks to health from hazardous substances emitted by machinery – Part 1 - Principles and specifications for machinery manufacturers.*

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

EN 894-1, *Safety of machinery - Ergonomic 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 894-3:2000, *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 954-1, *Safety of machinery - Safety-related parts of control systems – Part I: General principles for design.*

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, *Safety of machinery – The positioning of protective equipment in respect of approach speeds of parts of the human body.*

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EN 1005-1, *Safety of machinery – Human physical performance – Part 1: Terms and definitions.*

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

EN 1005-3, *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 1050:1996, *Safety of machinery - Principles for risk assessment.*

EN 1070:1998, *Safety of machinery – Terminology.*

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

EN 1760–1, *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 1837, *Safety of machinery – Integral lighting of machines.*

EN ISO 3744, *Acoustics – Determination of sound power levels of noise sources using sound pressure – Engineering method in an essentially free field over a reflecting plane (ISO 3744:1994).*

EN ISO 3746:1995, *Acoustics – Determination of sound power levels of noise sources using sound pressure – Survey method using an enveloping measurement surface over a reflecting plane (ISO 3746:1995).*

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

EN ISO 7250, *Basic human body measurements for technological design (ISO 7250:1996).*

EN ISO 9614-1, *Acoustics – Determination of sound power levels of noise sources using sound intensity – Part 1: Measurement at discrete points (ISO 9614-1:1993).*

EN ISO 11202:1995, *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 11204:1995, *Acoustics - Noise emitted by machinery and equipment - Measurement of emission sound pressure levels at a work station and at other specified positions - Method requiring environmental corrections (ISO 11204:1995).*

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 11688-2, *Acoustics – Recommended practice for the design of low-noise machinery and equipment – Part 2: Introduction to the physics of low-noise design (ISO/TR 11688-2:1998).*

EN 60204-1:1997, *Safety of machinery - Electrical equipment of machines – Part 1: General requirements (IEC 60204-1:1997).*

EN 60825-1:1994/A1, *Safety of laser products – Part 1: Equipment classification, requirements and user's guide; Amendment A1 (IEC 60825-1:1993/A1:1997) / Note: Endorsement notice*

EN 61000-6-2, *Electromagnetic compatibility (EMC) – Part 6-2: Generic standards - Immunity for industrial environments (IEC 61000-6-2:1999, modified).*

EN 61000-6-4, *Electromagnetic compatibility (EMC) – Part 6-4: Generic standards - Emission standard for industrial environments (IEC 61000-6-4:1997, modified)*.

EN 61310-3, *Safety of machinery – Indication, marking and actuation – Part 3: Requirements for the location and operation of actuators (IEC 61310-3:1999)*.

EN 61496-1, *Safety of machinery – Electro-sensitive protective equipment – Part 1 - General requirements and tests (IEC 61496-1:1997)*.

IEC 61496-2, *Safety of machinery – Electro-sensitive protective equipment – Part 2 – Particular requirements for equipment using active opto-electronic protective devices*.

3 Terms and definitions

For the purposes of this European Standard, the terms and definitions given in EN 1070 apply. Additional terms and definitions specifically needed for this document are added below.

3.1

transfer and special purpose machines

machine designed to process only a pre-specified workpiece or family of workpieces, by means of a pre-determined sequence of machining operations and process parameters (see Figures C.1 and C.2)

NOTE These machines can include one or more of the following elements:

- station(s) incorporating unit(s) (see 3.4 and 3.5 below);
- transport system(s) for the workpiece;
- clamping devices;
- metal working fluid system(s);
- swarf/chip removal system(s);
- measurement and test systems.

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3.2

work zone

space within which the machine mechanisms are located and the process(es) are performed

3.3

machine working cycle

period of time between the start of process on one workpiece and the start of process on the next workpiece after a transfer

NOTE This is determined by the longest individual station time.

3.4

station

term applied to the fixed positions within a machine at which workpieces are located during the processing portion of the machine working cycle

NOTE Stations are normally identified by sequential numbering e.g.:

- Station 1 – Load station
- Station 2 – Machining station
- Station 3 – Gauging station
- Station 4 – Idle station
- Station XX – Unload station

The term station also covers the fixtures, units, heads and other mechanisms associated with the process performed at a particular station (see Figures C.3, C.4 and C.5).

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3.5
unit

single axis or multi-axis module located at a station to carry the tooling, device or mechanism which performs the process on the workpiece (see Figure C.6)

3.6
workpiece load/unload device

mechanism that delivers workpieces to, or removes them from, the machine

4 List of significant hazards

4.1 The list of hazards contained in Table 1 is the result of a hazard identification and risk assessment carried out as described by EN 1050, for transfer and special purpose machines covered by the scope of this standard. The safety requirements and/or protective measures and information for use contained in clauses 5 and 7 are based on the risk assessment and deal with the identified hazards by either eliminating them or reducing the effects of the risks they generate.

4.2 The risk assessment assumes foreseeable access from all directions, as well as unexpected start-up. Risks to both the operators and other persons who can have access to the hazard zones are identified, taking into account hazards which can occur under various conditions (e.g. commissioning, set-up, production, maintenance, repair, decommissioning) during the life of the machine. The assessment includes an analysis of the effect of failure in the control system.

4.3 In addition, the user of this standard (i.e. the designer, manufacturer or supplier) shall validate that the risk assessment is complete for the machine under consideration with particular attention to:

- the intended use of the machine including maintenance, setting and cleaning, and its reasonably foreseeable misuse;
- the identification of the significant hazards associated with the machine.

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the significant hazards associated with the machine.
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Table 1 — List of significant hazards and major sources of these hazards associated with transfer and special purpose machines

| a | Description | Example(s) of related hazardous situation(s) | Associated activity | Related danger zone | Clause 5 Reference (Table 2) |
|-----|-----------------------------------|--|--|------------------------------|------------------------------|
| 1. | Mechanical hazards due to: | | | | |
| 1.1 | Crushing | workpiece clamping | loading/reorienting/unloading | between clamps and workpiece | 1.2 |
| | | transfer mechanism | maintenance | within pits | 1.5 |
| | | movement of workpiece handling devices, transfer mechanism or unit heads | operating cycle of machine, process control, manual tool change, maintenance | at machine | 1.1, 1.2 |
| 1.2 | Shearing | movement of axes, workpiece handling devices or transfer mechanism | operating cycle of machine, manual tool change, maintenance | at machine | 1.1 to 1.1.5, 1.2, 1.3, 1.4 |
| 1.3 | Cutting or severing | spindle or tool running or cutting | spindle running | at spindle or tool | 1.1 to 1.1.5 |
| 1.4 | Entanglement | rotating tools | spindle running | at spindle or tool | 1.1 to 1.1.5 |

| a | Description | Example(s) of related hazardous situation(s) | Associated activity | Related danger zone | Clause 5 Reference (Table 2) |
|-----|---|---|---|---|------------------------------|
| | | removal of swarf/chips | power-operated swarf/chip removal | swarf/chip collection and discharge zones | 1.3 |
| 1.5 | Drawing-in or trapping | movement of workpiece handling, transfer mechanism or unit head | power-operated motion of workpiece or tool in spindle | envelope of movement of workpiece or at unit head | 1.1 to 1.1.5, 1.2, 1.3, 1.4 |
| | | rotating power transmission mechanisms | maintenance | in or around machine | 1.4 |
| 1.6 | Impact | moving/rotating tool | spindle running | at spindle or tool | 1.1 to 1.1.6.4 |
| | | workpiece transfer | power-operated workpiece transfer | envelope of motion of workpiece and workpiece transfer mechanisms | 1.2 |
| 1.7 | Stabbing or puncture | moving tool (especially eccentric tools) | process control | at tool in spindle | 1.1 to 1.1.6.4 |
| | | handling tools | during manual tool change or replenishing tool magazine | at sharp cutter faces | (see clause 7) |
| | | handling swarf/chips | during loading/unloading and cleaning | at workpiece, table, and swarf /chip collecting and discharge zones | (see clause 7) |
| 1.9 | High pressure fluid ejection | Pipes or hoses carrying high pressure fluids | machine operating, maintenance | at or near machine | 13, 17 |
| 2 | Electrical hazards due to: | | | | |
| 2.1 | Contact of persons with live parts (direct contact) | contact with live parts or connections | during commissioning, maintenance, trouble shooting | electrical cabinet, terminal boxes, control panels at machine | |
| 2.2 | Contact of persons with parts which have become live under faulty conditions (indirect contact) | contact with live parts or connections | during operation, inspection and maintenance of machine | at machine or faulty part | |
| 3 | Thermal hazards resulting in: | | | | |
| 3.1 | Burns or scalds by a possible contact of persons | ejection of swarf | during cutting | at or near machine | 1.1.1, 1.1.2, 17 |

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| a | Description | Example(s) of related hazardous situation(s) | Associated activity | Related danger zone | Clause 5 Reference (Table 2) |
|-----|--|--|--|---------------------|------------------------------|
| | | handling of hot work material | during unloading | at unload position | 7.2.f |
| | | contact with hot tooling | during tool change, process control, maintenance | at unit heads | 7.2.f |
| 4 | Hazards generated by noise resulting in: | | | | |
| 4.1 | Hearing loss (deafness), other physiological disorders (e.g. loss of balance, loss of awareness) | motion of power transmission elements, cutting processes and fluid power systems | during operating cycle of machine | near machine | 4 |
| 4.2 | Interference with speech communication, acoustical signals | air blast used for cleaning of tool or fixture/pallet locations | during operating cycle of machine | near machine | 4 |
| 6 | Hazards generated by radiation | | | | |
| 6.5 | Lasers | direct or reflected visual exposure to laser radiation | maintenance of laser positional feedback system | within machine | 6.5 |
| 7 | Hazards generated by materials and substances (and their constituent elements) processed or used by the machinery | | | | |
| 7.1 | Hazards from contact with or inhalation of harmful fluids, gases, mists, fumes, and dusts | conditions near machine caused by ejection of particles of work material, fluid droplets or mist from metal working fluids | during operating cycle of the machine | at or near machine | 7.1 |
| 7.2 | Fire or explosion | flammable work material, flammable (low flash point) metal working fluids | during operating cycle of the machine | at or near machine | 7.2 |
| 7.3 | Biological or micro-biological (viral or bacterial) hazards | contact with hydraulic or metal working fluid as liquid or mist containing detritus and bacteria | during operation, process control, and maintenance | at or near machine | 7.3 |

| a | Description | Example(s) of related hazardous situation(s) | Associated activity | Related danger zone | Clause 5 Reference (Table 2) |
|------|--|--|---|---|------------------------------|
| 8 | Hazards generated by neglecting ergonomic principles in machinery design as, e.g. hazards from: | | | | |
| 8.1 | Unhealthy postures or excessive effort (repetitive strain) | lifting and reaching while handling workpiece, tooling or machine parts | during loading/unloading, process control, and maintenance | at load/unload and tool mounting positions, maintenance action points | 8.1 |
| 8.2 | Inadequate consideration of hand-arm or foot-leg anatomy | inappropriate location of controls | during loading/unloading, process control, and maintenance | at load/unload and tool mounting positions, maintenance action points | 8.2 |
| 8.4 | Inadequate local lighting | judgement and accuracy of manual actions impaired during handling or positioning of workpiece or tooling | during loading /unloading, process control, handling of tooling | at load/unload, tool mounting positions | 8.4 |
| 8.6 | Human errors, human behaviour | reasonably foreseeable misuse, inadvertent operation of controls, incorrect work material or cutter handling/setting | during loading/unloading, process control, tool handling | at load/unload, tool mounting positions | 8.6 |
| 8.7 | Inadequate design, location or identification of manual controls | inadvertent operation of controls | during operating cycle of machine, setting, maintenance | at or near machine | 8.7 |
| 8.8 | Inadequate design or location of visual display units | misinterpretation of displayed information | during operating cycle of machine, setting, maintenance | at or near machine | 8.8 |
| 10 | Unexpected start-up, unexpected overrun/ over speed (or any similar malfunction) from: | | | | |
| 10.1 | Failure/disorder of the control system | mechanical hazards associated with selected machine movement | during setting, cleaning | at machine | 10.1 |
| 10.2 | Restoration of energy supply after an interruption | unexpected movements of machine | during setting, cleaning or maintenance | at or near machine | 10.2 |
| 10.3 | External influences on the electrical equipment | unpredictable behaviour of electronic controls due to electromagnetic interference | during setting or operating cycle of the machine | at or near machine | 10.3 |