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Machine tools — Safety — Stationary grinding machines

Machines-outils — Sécurité — Machines à meuler fixes

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO document should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 39, *Machine tools*, Subcommittee SC 10, *Safety,* in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 143, *Machine tools — Safety,* in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This second edition cancels and replaces the first edition (ISO 16089:2015), which has been technically revised.

The main changes are as follows:

— contradictory requirements for the reliability of the control function have been corrected in Table 3;

— requirements for guards in Annex A have been revised: for example, wall thicknesses have been changed for abrasive product guards (Tables A.1 to A.6) and a new Table A.7 has been added, and for enclosures, a new calculation method for wall thicknesses has been introduced;

— Annex F “Noise test code” has been added;

— editorial corrections have been made.

Any feedback or questions on this document should be directed to the user’s national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

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Introduction

This document is a type-C standard as stated in ISO 12100.

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

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

— health and safety bodies (regulators, accident prevention organisations, 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 users/employers (small, medium and large enterprises);

— machine users/employees (e.g. trade unions, organizations for people with special needs);

— service providers, for example, for maintenance (small, medium and large enterprises);

— consumers (in case of machinery intended for use by consumers).

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.

When requirements of this type-C standard are different from those which are stated in type-A or type-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.

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Machine tools — Safety — Stationary grinding machines

1 Scope

This document specifies the requirements and/or measures to eliminate the hazards or reduce the risks in the following groups of stationary grinding machines which are designed primarily to shape metal by grinding:

— Group 1: manually controlled grinding machines without power operated axes and without numerical control;

— Group 2: manually controlled grinding machines with power operated axes and limited numerically controlled capability, if applicable;

— Group 3: numerically controlled grinding machines.

NOTE 1 For detailed information on the groups of grinding machines, see 3.1 and 3.2.

NOTE 2 Requirements in this document are, in general, applicable to all groups of grinding machines. If requirements are applicable to some special group(s) of grinding machines only, then the special group(s) of grinding machine(s) is/are specified.

This document covers the significant hazards listed in Clause 4 and applies to ancillary devices (e.g. for workpieces, tools, workpiece holding devices and handling devices), which are integral to the machine.

This document also applies to machines which are integrated into an automatic production line or grinding cell in as much as the hazards and risks arising are comparable to those of machines working separately.

This document also includes in Clause 7 a minimum list of safety-relevant information which the manufacturer has to provide to the user. See also ISO 12100:2010, Figure 2, which illustrates the interaction of the manufacturer's and user's responsibility for the operational safety.

The user's responsibility to identify specific hazards (e.g. fire and explosion) and reduce the associated risks can be critical (e.g. whether the central extraction system is working correctly).

Where additional metalworking processes (e.g. milling, turning, laser processing) are involved, this document can be taken as a basis for safety requirements. Specific information on hazards arising from other metalworking processes are covered by other International Standards.

This document applies to machines that are manufactured after the date of issue of this document.

This document does not apply to stationary honing, polishing and belt grinding machines. This document does not apply to transportable motor-operated electric tools in accordance with IEC 61029-2-4 and IEC 61029-2-10.

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.

ISO 447, *Machine tools — Direction of operation of controls*

ISO 1083, *Spheroidal graphite cast irons — Classification*

ISO 2553, *Welding and allied processes — Symbolic representation on drawings — Welded joints*

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ISO 3522, *Aluminium and aluminium alloys — Castings — Chemical composition and mechanical properties*

ISO 3574, *Cold-reduced carbon steel sheet of commercial and drawing qualities*

ISO 3746:2010, *Acoustics — Determination of sound power levels and sound energy levels of noise sources using sound pressure — Survey method using an enveloping measurement surface over a reflecting plane*

ISO 3834-1, *Quality requirements for fusion welding of metallic materials — Part 1: Criteria for the selection of the appropriate level of quality requirements*

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

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

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

ISO 4997, *Cold-reduced carbon steel sheet of structural quality*

ISO 5817:2014, *Welding — Fusion-welded joints in steel, nickel, titanium and their alloys (beam welding excluded) — Quality levels for imperfections*

ISO 6316, *Hot-rolled steel strip of structural quality*

ISO 6361-2, *Wrought aluminium and aluminium alloys — Sheets, strips and plates — Part 2: Mechanical properties*

ISO 9355-2, *Ergonomic requirements for the design of displays and control actuators — Part 2: Displays*

ISO 9355-3, *Ergonomic requirements for the design of displays and control actuators — Part 3: Control actuators*

ISO 9444-1, *Continuously hot-rolled stainless steel — Tolerances on dimensions and form — Part 1: Narrow strip and cut lengths*

ISO 9444-2, *Continuously hot-rolled stainless steel — Tolerances on dimensions and form — Part 2: Wide strip and sheet/plate*

ISO 10218-1:2011, *Robots for industrial environments — Safety requirements — Part 1: Robots*

ISO 11161, *Safety of machinery — Integrated manufacturing systems — Basic requirements*

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

ISO 13849-1:2023, *Safety of machinery — Safety-related parts of control systems — Part 1: General principles for design*

ISO 13850, *Safety of machinery — Emergency stop function — Principles for design*

ISO 13856-2, *Safety of machinery — Pressure-sensitive protective devices — Part 2: General principles for design and testing of pressure-sensitive edges and pressure-sensitive bars*

ISO 13857:2019, *Safety of machinery — Safety distances to prevent hazard zones being reached by upper and lower limbs*

ISO 14118:2017, *Safety of machinery — Prevention of unexpected start-up*

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

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

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

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

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

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

ISO 14737, *Carbon and low alloy cast steels for general applications*

ISO 15607, *Specification and qualification of welding procedures for metallic materials — General rules*

IEC 60204-1:2009, *Safety of machinery — Electrical equipment of machines — Part 1: General requirements*

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

IEC 61000-6-2, *Electromagnetic compatibility (EMC) — Part 6-2: Generic standards — Immunity for industrial environments*

IEC 61000-6-4, *Electromagnetic compatibility (EMC) — Part 6-4: Generic standards — Emission standard for industrial environments*

IEC 62061, *Safety of machinery — Functional safety of safety-related electrical, electronic and programmable electronic control systems*

EN 1127-1, *Explosive atmospheres — Explosion prevention and protection — Part 1: Basic concepts and methodology*

3 Terms and definitions, types of grinding machines, and symbols

For the purposes of this document, the terms and definitions given in ISO 12100, ISO 13849-1 and the following apply.

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

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

3.1 Terms and definitions

3.1.1 General terms

3.1.1.1
grinding machine
machine tool intended to machine workpieces by means of rotating grinding tools

Note 1 to entry: The machine can combine different types of grinding methods, for example, external cylindrical grinding and internal cylindrical grinding.

3.1.1.1.1
stationary grinding machine
grinding machine (3.1.1.1) fixed in position during operation

Note 1 to entry: For types and groups of stationary grinding machines, see 3.2.

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