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Machine tools — Safety — Sawing machines for cold metal

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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 documents 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).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on 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 the following URL: www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 39, *Machine tools*, Subcommittee SC 10, *Safety*.

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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 abovementioned 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, e. g. 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 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 — Sawing machines for cold metal

1 Scope

This document deals with all significant hazards, hazardous situations and events to sawing machines as defined in Clause 3, whose primary intended use is for sawing cold metal (ferrous and non-ferrous), or material partly of cold metal and under conditions of misuse which are reasonably foreseeable by the manufacturer (see Clause 4).

This document is applicable to (metal) sawing machines which are manufactured after the date of publication of this document.

When additional processing (i.e. milling, boring, marking, finishing operation, etc.) is considered, this document can serve as a basis for safety requirements. For more detailed information, refer to the bibliography.

This document deals with noise hazards but does not provide a full noise test code. It is intended to draft such a code in the next revision of this document.

This document does not include requirements and safety measures for fire and explosion hazards. It is intended to deal with them in the next revision of this document.

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 683-1, *Heat-treatable steels, alloy steels and free-cutting steels — Part 1: Non-alloy steels for quenching and tempering·*

ISO 3744, *Acoustics — Determination of sound power levels and sound energy levels of noise sources using sound pressure — Engineering methods for an essentially free field over a reflecting plane*

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

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

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

ISO 9355-1, *Ergonomic requirements for the design of displays and control actuators — Part 1: Human interactions with displays and control actuators*

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 9614-1, *Acoustics — Determination of sound power levels of noise sources using sound intensity — Part 1: Measurement at discrete points*

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*

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ISO 11204:2010, *Acoustics — Noise emitted by machinery and equipment — Determination of emission sound pressure levels at a work station and at other specified positions applying accurate environmental corrections*

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

ISO 13849-1:2015, *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 13854, *Safety of machinery — Minimum gaps to avoid crushing of parts of the human body*

ISO 13855:2010, *Safety of machinery — Positioning of safeguards with respect to the approach speeds of parts of the human body*

ISO 13856-1, *Safety of machinery — Pressure-sensitive protective devices — Part 1: General principles for design and testing of pressure-sensitive mats and pressure-sensitive floors*

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

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

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

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/TR 11688-1, *Acoustics — Recommended practice for the design of low-noise machinery and equipment — Part 1: Planning*

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

EN 1037:1995+A1:2008, *Safety of machinery — Prevention of unexpected start-up*

EN 1837:1999+A1:2009, *Safety of machinery — Integral lighting of machines*

3 Terms and definitions

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 terminological databases for use in standardization at the following addresses:

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

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

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3.1
sawing machine
machine tool that is used for cutting material and cutting into length using a *sawing tool* (3.9)

3.1.1
band-sawing machine
sawing machine (3.1) that is mainly used for cutting material and cutting into length using a *sawing tool* (3.9) which is designed as an flexible endless saw band

Note 1 to entry: Examples are given in Clause 5 and Figures 1 to 8.

3.1.2
circular sawing machine
sawing machine (3.1) for cutting bar and profile material to length with a *sawing tool* (3.9) which is designed as a circular saw blade

Note 1 to entry: Examples are given in Clause 5, Figures 9 to 16 and Annex C.

3.1.3
hack-sawing machine
sawing machine (3.1) for cutting bar and profile material to length with a *sawing tool* (3.9) which is clamped between the ends of a downwardly open bow

Note 1 to entry: Examples are given in Clause 5 and Figure 17.

3.1.4
automatic sawing machine
sawing machine (3.1) in which the power-operated elements perform continuous or repeat cycles

Note 1 to entry: The first cycle initiated by a control system starts from the operator until either an automatically determined condition is achieved, or a stop signal is given by the operator.

Note 2 to entry: A typical cycle can be feeding of *work material* (3.13), clamping of work material, feeding of *sawing tool* (3.9) through work material, sawing tool retraction, unclamping of *workpiece* (3.14), unloading of workpiece and unclamping of work material. Repeat the above cycle until a stop signal is actuated.

3.2
back jaw feed
power-operated *work material* (3.13) feeding device having a carriage-mounted vice which grips the work material at any point along its length and traverses it to the sawing position

3.3
load/unload position
zone of the machine where provision exists for manual loading onto, or unloading *work material*(s) (3.13) from the machine

Note 1 to entry: Frequent, but not continuous access, is required of operators during normal operation of the machine.

3.4
manual sawing process
operation of the machine under manual control, all process steps in the machining sequence being started or manually controlled by the operator

3.5
metalworking fluid
fluid to cool and lubricate the sawing process

EXAMPLE Oil, oil mist, alcohol, mixture of oil and water.

3.6 Metalworking fluid systems

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3.6.1
recirculating system
metalworking fluid system with collection and pumped recirculation of the fluid

3.6.2
minimum quantity system
system where a small volume of the fluid is supplied to the *sawing tool* (3.9)

Note 1 to entry: No circulation of the fluid is required due to the small consumption.

3.7
push feed
power-operated *work material* (3.13) feeding device pushing on the tail end of the work material to advance it to a position or length stop which determines the required *workpiece* (3.14) length

3.8
roller feed
power-operated *work material* (3.13) feeding device in which the work material is fed by rollers

Note 1 to entry: The roller feed can incorporate lateral guide rollers and an additional length measuring system.

3.9
sawing tool
tool for sawing operation, consisting of tough blade or band with a hard toothed edge used with a circular–, band–, and hack–sawing machine

3.10
semi-automatic machine
single-cycle machine
sawing machine (3.1) in which the power-operated elements perform a single cycle initiated by the operator

Note 1 to entry: A typical cycle can be clamp *workpiece* (3.14), feed *sawing tool* (3.9) to workpiece, begin sawing process, retract sawing tool and unclamp workpiece.

3.11 Types of sawing processes

3.11.1
contour cutting
pushing *work material* (3.13) either by hand or under power through the *sawing tool* (3.9), following a path which is not parallel to the plane of the sawing tool

Note 1 to entry: Contour cutting uses a vertical *band-sawing machine* (3.1.1), fixed sawing frame and contour cutting type.

3.11.2
mitre-sawing
process in which *work material* (3.13) is cut out of square to the longitudinal axis

3.12
work zone
<sawing machines> maximum range determined by the *sawing tool* (3.9) and the clamping device

3.13
work material
material which is fed into the machine and intended to be machined by a *sawing tool* (3.9)

3.14
workpiece
object which has been machined by a *sawing tool* (3.9)

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