



BSI Standards Publication

Industrial automation systems and integration — Numerical control systems for machine tools

Part 1: Requirements for numerical control systems

National foreword

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**Industrial automation systems and
integration — Numerical control
systems for machine tools —**

**Part 1:
Requirements for numerical control
systems**

*Systèmes d'automatisation et intégration — Systèmes de commandes
numériques des machines-outils —*

Partie 1: Exigences relatives aux systèmes de commandes numériques





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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).

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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 184, *Automation systems and integration*, Subcommittee SC 1, *Industrial cyber and physical device control*.

A list of all parts in the ISO 23218 series can be found on the ISO website.

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.

Introduction

Numerically controlled machine tools are effective production assets with an operations stock of more than four million units and still increasing.

While mechanical construction sets the base for accuracy and durability, the numerical control system (NC system) enables the leverage the potential of the system.

The NC system comprises a powerful computing hardware, a sophisticated NC-Kernel, and an elaborated connectivity, stretching from internal process parameters to high level manufacturing execution systems (MES) integration and beyond. It supports operation concepts from push buttons to sophisticated touch-panel systems.

Machine tools and their NC systems are used in harsh environments facing operational conditions, such as vibrations, dirt, coolant spray and electromagnetic interference. Purchasers and operators of machine tools require confidence in the appropriate quality, durability and usability in order to ensure the intended use and productivity.

The ISO 23218 series addresses requirements for the NC systems. This document specifically provides requirements for the NC system itself, and ISO 23218-2¹⁾ provides requirements for NC system integration.

Expected users of this document include:

- design engineers working for an NC system company for machine tools, for developing a new and/or improving a current NC system for machine tools;
- design engineers working for a machine tool builder company, for developing and providing new and/or improving current machine tools by procuring an NC system;
- facility planning engineers, for procuring new and/or improving current machine tools with an NC system.

1) Under preparation. Stage at the time of publication: ISO/FDIS 23218-2.

Industrial automation systems and integration — Numerical control systems for machine tools —

Part 1: Requirements for numerical control systems

1 Scope

This document specifies general requirements for the design and manufacturing of numerical control systems (NC systems) for machine tools. It consists of technical and inspection requirements and test methods.

This document is applicable to NC systems used in machine tools (including metal cutting machine tools, metal forming machine tools and woodworking machine tools) and to partial assemblies of machine tools (including cabinets and auxiliary devices) intended to be integrated into machine tools. It is also applicable to other production equipment using NC systems.

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 780, *Packaging — Distribution packaging — Graphical symbols for handling and storage of packages*

ISO 841, *Industrial automation systems and integration — Numerical control of machines — Coordinate system and motion nomenclature*

ISO 2806, *Industrial automation systems — Numerical control of machines — Vocabulary*

ISO 6983-1, *Automation systems and integration — Numerical control of machines — Program format and definitions of address words — Part 1: Data format for positioning, line motion and contouring control systems*

ISO 10303-238, *Industrial automation systems and integration — Product data representation and exchange — Part 238: Application protocol: Model based integrated manufacturing*

ISO 14649 (all parts), *Industrial automation systems and integration — Physical device control — Data model for computerized numerical controllers*

IEC 60068-2-1:2007, *Environmental testing — Part 2-1: Tests — Test A: Cold*

IEC 60068-2-2:2007, *Environmental testing — Part 2-2: Tests — Test B Dry heat*

IEC 60068-2-6:2007, *Environmental testing — Part 2-6: Tests — Test Fc: Vibration (sinusoidal)*

IEC 60068-2-14:2009, *Environmental testing — Part 2-14: Tests — Test N: Change of temperature*

IEC 60068-2-27:2008, *Environmental testing — Part 2-27: Tests — Test Ea and guidance: Shock*

IEC 60068-2-31:2008, *Environmental testing — Part 2-31: Tests — Test Ec: Rough handling shocks, primarily for equipment-type specimens*

IEC 60068-2-78:2012, *Environmental testing — Part 2-78: Tests — Test Cab: Damp heat, steady state*

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

IEC 61000-4-2:2008, *Electromagnetic compatibility (EMC) — Part 4-2: Testing and measurement techniques — Electrostatic discharge immunity test*

IEC 61000-4-3:2020, *Electromagnetic compatibility (EMC) — Part 4-3: Testing and measurement techniques — Radiated, radio-frequency, electromagnetic field immunity test*

IEC 61000-4-4:2012, *Electromagnetic compatibility (EMC) — Part 4-4: Testing and measurement techniques — Electrical fast transient/burst immunity test*

IEC 61000-4-5:2014, *Electromagnetic compatibility (EMC) — Part 4-5: Testing and measurement techniques — Surge immunity test*

IEC 61000-4-6:2013, *Electromagnetic compatibility (EMC) — Part 4-6: Testing and measurement techniques — Immunity to conducted disturbances, induced by radio-frequency fields*

IEC 61000-4-8:2009, *Electromagnetic compatibility (EMC) — Part 4-8: Testing and measurement techniques — Power frequency magnetic field immunity test*

IEC 61000-4-11:2020, *Electromagnetic compatibility (EMC) — Part 4-11: Testing and measurement techniques — Voltage dips, short interruptions and voltage variations immunity tests*

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

IEC 61800-3:2017, *Adjustable speed electrical power drive systems — Part 3: EMC requirements and specific test methods*

IEC 82079-1, *Preparation of instructions for use — Structuring, content and presentation — Part 1: General principles and detailed requirements*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 2806 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 numerical control system

NC system

system that realizes the automatic control of a process by the use of numerical data introduced while the operation is in progress

Note 1 to entry: Driving devices are not included in NC systems.

3.2 port

access to a device or network of the *numerical control (NC) system* (3.1) where electromagnetic energy or signals may be supplied or received or where the device or network variables may be observed or measured

Note 1 to entry: The port generally refers to the boundary on the external interface of the numerical control (NC) system, and interface generally refers to the boundary of each unit in NC system.

[SOURCE: IEC 60050-131:2002, 131-12-60, modified]