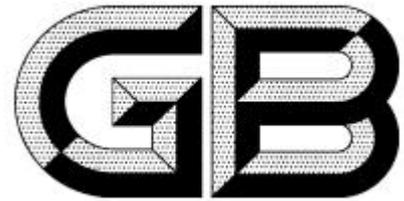


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Metal cutting machines—General specifications for safeguarding

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Foreword

This document is drafted in accordance with the provisions of GB/T 1.1-2020 Directives for Standardization—Part 1: Structure and Drafting Rules of Standardization Documents.

This document supersedes GB 15760-2004 Safety Requirements for Metal-cutting Machine Tools, GB 16454-2008 Safety Requirements for Metal Sawing Machines, GB 18568-2001 Safety Requirements for Machining Centers, GB 22997-2008 Safety of Machine Tools—Small-sized Numerically Controlled Lathes and Turning Centers, GB 22998-2008 Safety of Machine Tools—Large-sized Numerically Controlled Lathes and Turning Centers, GB 24384-2009 Safety Requirements for Cylindrical Grinding Machines, GB 24385-2009 Safety Requirements for Horizontal-spindle Surface Grinding Machines with Rectangular Tables and GB 24386-2009 Safety Requirements for Gear Grinding Machines.

With GB 15760-2004 as the core, this document incorporates the contents of GB 16454-2008, GB 18568-2001, GB 22997-2008, GB 22998-2008, GB 24384-2009, GB 24385-2009 and GB 24386-2009. Compared with GB 15760-2004, in addition to structural adjustments and editorial revisions, the main technical changes are as follows:

- Added the terms and their definitions of injury, safety guards and protective devices, operating modes and remote services; revised the definitions of the terms machine tool safety and protective devices; deleted the term hazardous parts (areas) of machine tools and its definition (see Chapter 3, Chapter 3 of the 2004 edition).
- Added Chapter 4 Machine Tool Classification, Operating Modes and Configurations (see Chapter 4).
- Added the heading Machine Tool Risk Assessment (see 5.1).
- Revised the contents of Machine Tool Hazard Identification (see 5.2, 4.2 of the 2004 edition).
- Revised the contents of Summary of Principal Machine Tool Hazards (see Table 4, Table 1 of the 2004 edition).
- Revised the contents of General Requirements (see 6.1, 5.1 of the 2004 edition).
- Added the provision "Including anchor bolts and motion limits ... The machine tool manufacturer shall specify the requirements for bolts and foundations to be used" (see 6.2.1).
- Added the provision "... Rough surfaces, protrusions and openings ... Openings that may cause entrapment shall be securely enclosed or covered" (see 6.2.2).
- Added the heading General Requirements and the provision "Clamping devices shall be clearly marked with ... the maximum safe rotational speed" (see 6.2.4.1).
- Added the provision "Interlocked protection may be adopted ... to prevent hazards such as finger crushing" (see 6.2.4.2).
- Added the provision "Powered clamping devices shall be monitored ... to prevent gas from blowing towards the operator" (see 6.2.4.3).
- Added the contents of General Requirements for clamping devices (see 6.2.4.4.1).
- Added the provision "When robots are used for loading and unloading ... measures shall be taken to prevent the risk of workpiece ejection" (see 6.2.6).
- Added the requirements for tool magazines and tool changers (see 6.2.7.2 and 6.2.7.3).
- Added the contents of chip removal devices (see 6.2.8).

- Added the contents of work platforms, passageways and openings (see 6.2.9).
- Added the contents of pits (see 6.2.10).
- Added the provision "Live parts in the power circuits and control circuits of electrical equipment ... shall not be accessible" (see 6.3.1).
- Added the contents of electromagnetic interference and electromagnetic radiation (see 6.3.6).
- Revised the heading of Safety of Control Systems (see 6.4.2, 5.4.2 of the 2004 edition).
- Added the provision "For safety-related parts of control systems ... the operation of safety functions (including interlocked protective devices) may be suspended" (see 6.4.2).
- Revised the heading and contents of the table Functions and Required Performance Level PLr of Safety-related Parts of Control Systems (see Table 5, Table 2 of the 2004 edition).
- Added the provision "Excluding stop and emergency stop devices" (see 6.4.3).
- Added the provision of fault alarm reset (see 6.4.4).
- Added the provision "Stop control shall take precedence over start control functions" (see 6.4.5).
- Added the provision "At chip removal devices ... emergency stop devices shall be provided (applicable only to Class 4 machine tools)" (see 6.4.6.2).
- Revised the contents of Mode Selection (see 6.4.7, 5.4.7 of the 2004 edition).
- Added the contents of remote services (see 6.4.10).
- Added the contents of energy isolation and dissipation (see 6.4.12).
- Added the provision "The materials used shall be specified ... in accordance with the requirements of Appendix B" (see 6.5.1.1).
- Added the contents of two-hand control devices and electrosensitive devices (see 6.5.2.3 and 6.5.2.5).
- Revised the heading of Temperature (see 6.7, 5.7 of the 2004 edition).
- Added the provision "During the machine tool design process ... to enable a better assessment of risks" (see 6.8).
- Revised the parameter values of the table Limits of Noise Sound Pressure Level for No-load Running of Machine Tools (see Table 6, Table 3 of the 2004 edition).
- Added the contents of mechanical radiation (see 6.10.2).
- Added the provision "The location of interfaces shall allow ... the machine tool shall not be capable of being started" (see 6.11.2.2).
- Added the provision "The location of interfaces shall allow ... the machine tool shall not be capable of being started" (see 6.11.2.3).
- Revised the contents of Fire and Explosion (see 6.11.3, 5.11.3 of the 2004 edition).
- Revised the contents of Biological and Microbiological Hazards (see 6.11.4, 5.11.4 of the 2004 edition).
- Revised the heading of Assembly (see 6.14, 5.14 of the 2004 edition).
- Added the provision "In case of failure of the cutting cooling system ... it shall be specified in the instructions for use" (see 6.18).

- Added the contents of machine tool operating modes (see 6.19).
- Added the provision "Information on machine tool handling ... and lifting mass shall be provided" (see 6.21).
- Added the contents of Verification of Safety Requirements and/or Safety Measures (see 6.22).
- Added the provision "If instructions are provided in more than one language ... shall precede other languages" (see 7.1.5).
- Added the provision "The maximum rotational speed of rotating parts ... identifiable data and information shall be provided" (see 7.1.7).
- Added the provision "The publication date or version of the instruction manual shall be clearly marked" (see 7.2.2).
- Added the content of Verification of Safety Requirements and/or Safety Measures (see Appendix B).

Please note that certain contents of this document may involve patents. The issuing body of this document shall not be liable for identifying any such patents.

This document is proposed and administered by the Ministry of Industry and Information Technology of the People's Republic of China.

The release history of this document and the documents it supersedes is as follows:

- First issued as GB 15760-1995 in 1995, and first revised in 2004.
- This is the second revision, which incorporates the contents of GB 16454-2008 Safety Requirements for Metal Sawing Machines (the release history of GB 16454-2008 is: GB 16454-1996), GB 18568-2001 Safety Requirements for Machining Centers, GB 22997-2008 Safety of Machine Tools—Small-sized Numerically Controlled Lathes and Turning Centers, GB 22998-2008 Safety of Machine Tools—Large-sized Numerically Controlled Lathes and Turning Centers, GB 24384-2009 Safety Requirements for Cylindrical Grinding Machines, GB 24385-2009 Safety Requirements for Horizontal-spindle Surface Grinding Machines with Rectangular Tables and GB 24386-2009 Safety Requirements for Gear Grinding Machines.

Introduction

According to the classification specified in GB/T 15706-2012, this document is a Class C safety standard.

Machine tool safety standards play a vital role in ensuring safe production, property safety, as well as personal safety and health. Therefore, this document is relevant to the following stakeholders associated with machine tool safety:

- Machine tool manufacturers;
- Safety and health authorities (e.g., regulatory authorities, market supervision authorities, accident prevention authorities, etc.).

Other stakeholders affected by the safety level of machine tools include:

- Machine tool operators;
- Machine tool owners;
- Machine tool service personnel;
- Consumers (when machine tools are ordered for consumer use).

In the event of discrepancies between the requirements specified in this document and those in Class A or Class B safety standards, for machine tools designed and manufactured in accordance with this document, the requirements of this document shall take precedence over those specified in other standards.

GB 15760-2004 Safety Requirements for Metal-cutting Machine Tools has been applied since its issuance and implementation in 2004 for conducting national quality supervision and random inspection of domestic and overseas machine tool products, commodity inspection of imported machine tool products, and safety certification. For this reason, this document is revised on the basis of GB 15760 as the core, integrating the common contents of GB 16454-2008 Safety Requirements for Metal Sawing Machines, GB 18568-2001 Safety Requirements for Machining Centers, GB 22997-2008 Safety of Machine Tools—Small-sized Numerically Controlled Lathes and Turning Centers, GB 22998-2008 Safety of Machine Tools—Large-sized Numerically Controlled Lathes and Turning Centers, GB 24384-2009 Safety Requirements for Cylindrical Grinding Machines, GB 24385-2009 Safety Requirements for Horizontal-spindle Surface Grinding Machines with Rectangular Tables and GB 24386-2009 Safety Requirements for Gear Grinding Machines.

This document specifies the basic safety protection technical requirements and measures to be adopted against the principal hazards present in metal-cutting machine tools as well as their auxiliary equipment and accessories. To facilitate implementation, corresponding verification methods are also provided. This document will play an important role in preventing unsafe machine tool products from entering the market.

Metal cutting machines—General specifications for safeguarding

1 Scope

This document specifies the basic safety protection technical requirements, measures and verification methods to be adopted against the principal hazards present in metal-cutting machine tools.

This document applies to the design, manufacture and inspection of all metal-cutting machine tools as well as their auxiliary equipment and accessories.

Note: Where no confusion arises, "metal-cutting machine tools" mentioned in this document are hereinafter referred to as "machine tools".

2 Normative References

The contents of the following documents are incorporated as indispensable provisions of this document through normative reference in the text. For dated referenced documents, only the edition corresponding to the stated date applies to this document; for undated referenced documents, the latest edition (including all amendments) applies to this document.

GB/T 191 Packaging—Pictorial Markings for Handling of Packages

GB/T 1251 (all parts) Ergonomics

GB/T 2893 (all parts) Graphical Symbols—Safety Colours and Safety Signs

GB/T 3167 Metal-cutting Machine Tools—Graphical Symbols for Operational Indications

GB/T 3168 Numerically Controlled Machine Tools—Graphical Symbols for Operational Indications

GB/T 5226.1-2019 Electro technical Safety of Machinery—Electrical Equipment of Machines—Part 1: General Requirements

GB/T 6576 Machine Tool Lubrication Systems

GB/T 7247.1 Safety of Laser Products—Part 1: Equipment Classification and Requirements

GB/T 7247.4 Safety of Laser Products—Part 4: Laser Protective Screens

GB/T 7247.5 Safety of Laser Products—Part 5: Producer's Checklist Conforming to GB/T 7247.1

GB/T 7247.14 Safety of Laser Products—Part 14: User's Guide

GB/T 7932-2017 Pneumatic Fluid Power—General Rules and Safety Requirements for Systems and Their Components

GB/T 8196-2018 Safety of Machinery—Guards—General Requirements for the Design and Construction of Fixed and Movable Guards

GB/T 9969 General Principles for Instructions of Industrial Products

- GB 11291.2 Robots and Robotic Devices—Safety Requirements for Industrial Robots—Part 2: Robot Systems and Integration
- GB/T 12265 Safety of Machinery—Minimum Gaps to Prevent Crushing of Parts of the Human Body
- GB/T 13379 Principles of Visual Ergonomics—Lighting for Indoor Work Places
- GB/T 14775 Manipulators—General Ergonomic Requirements
- GB/T 14776 Ergonomics—Workstation Dimensions—Design Principles and Their Application
- GB/T 15241.2 Ergonomic Principles Related to Mental Workload—Part 2: Design Principles
- GB/T 15706-2012 Safety of Machinery—Basic Concepts, General Principles for Design—Risk Assessment and Risk Reduction
- GB/T 16251 Ergonomic Principles for the Design of Work Systems
- GB/T 16754 Safety of Machinery—Emergency Stop—Principles for Design
- GB/T 16855.1-2018 Safety of Machinery—Safety-related Parts of Control Systems—Part 1: General Principles for Design
- GB/T 16855.2 Safety of Machinery—Safety-related Parts of Control Systems—Part 2: Validation
- GB/T 16856 Safety of Machinery—Risk Assessment—Implementation Guidelines and Examples of Methods
- GB/T 17161 Machine Tools—Operating Directions of Control Devices
- GB/T 17421.5 General Principles of Machine Tool Testing—Part 5: Determination of Noise Emission
- GB/T 17454 (all parts) Safety of Machinery—Pressure-sensitive Protective Devices
- GB/T 17888 (all parts) Safety of Machinery—Fixed Means of Access to Machinery
- GB/T 17799.2 Electromagnetic Compatibility (EMC)—Generic Standards—Part 2: Immunity Requirements for Industrial Environments
- GB 17799.4 Electromagnetic Compatibility (EMC)—Generic Standards—Part 4: Emission Requirements for Industrial Environments
- GB/T 18153 Safety of Machinery—Safety Data for Determining Thermal Surface Temperature Limits for the Touchable Surfaces
- GB/T 18209.2 Electro technical Safety of Machinery—Indicating, Marking and Actuation—Part 2: Requirements for Marking
- GB/T 18209.3-2010 Electro technical Safety of Machinery—Indicating, Marking and Actuation—Part 3: Requirements for the Location and Operation of Actuators
- GB/T 18569 (all parts) Safety of Machinery—Reduction of Risks to Health Resulting from Hazardous Substances Emitted by Machinery
- GB/T 18717 (all parts) Ergonomic Design for the Safety of Machinery
- GB/T 18831 Safety of Machinery—Interlocking Devices Associated with Guards—Principles for Design and Selection
- GB/T 19436.1 Electro technical Safety of Machinery—Electrosensitive Protective Equipment—Part 1: General Requirements and Tests

- GB/T 19436.2 Electro technical Safety of Machinery—Electrosensitive Protective Equipment—Part 2: Specific Requirements for Equipment Using Active Opto-electronic Protective Devices (AOPDs)
- GB 19436.3 Electro technical Safety of Machinery—Electrosensitive Protective Equipment—Part 3: Specific Requirements for Equipment Using Active Opto-electronic Diffuse Reflective Protective Devices (AOPD-DR)
- GB/T 19436.4 Electro technical Safety of Machinery—Electrosensitive Protective Equipment—Part 4: Specific Requirements for Equipment Using Vision-based Protective Devices (VBPD)
- GB/T 19670-2023 Safety of Machinery—Prevention of Unexpected Start-up
- GB/T 19671 Safety of Machinery—Two-hand Control Devices—Principles for Design and Selection
- GB/T 23572 Metal-cutting Machine Tools—General Specifications for Hydraulic Systems
- GB/T 23573 Metal-cutting Machine Tools—Method for Measurement of Dust Concentration
- GB/T 23574 Metal-cutting Machine Tools—Method for Measurement of Oil Mist Concentration
- GB/T 23819 Safety of Machinery—Fire Prevention and Protection
- GB/T 23821-2022 Safety of Machinery—Safety Distances to Prevent Hazardous Zones from Being Reached by Upper and Lower Limbs
- GB/T 26118.1 Safety of Machinery—Assessment and Reduction of Risks Arising from Machine Radiation—Part 1: General Principles
- GB/T 26118.2 Safety of Machinery—Assessment and Reduction of Risks Arising from Machine Radiation—Part 2: Measurement Procedures for Radiation Emissions
- GB/T 26118.3 Safety of Machinery—Assessment and Reduction of Risks Arising from Machine Radiation—Part 3: Reduction of Radiation by Attenuation or Shielding
- GB/T 28780 Safety of Machinery—Integrated Lighting Systems for Machines
- GB/T 32812 Metalworking Fluids—Limit Requirements and Determination Methods for Hazardous Substances
- GB/T 36954 Safety of Machinery—Application of Ergonomic Principles in Risk Assessment and Risk Reduction
- GB/T 40806 Airborne Noise Emitted by Machine Tools—Operating Conditions for Metal-cutting Machine Tools
- JB/T 5062 Information Display Devices—General Ergonomic Requirements
- JB/T 8356 Machine Tool Packaging—Technical Requirements

3 Terms and Definitions

The terms and definitions specified in GB/T 15706-2012 and the following ones apply to this document.

3.1 machine tool safety

The state in which a machine tool, when used under the intended operating conditions specified in the instruction manual (or within the specified service life), performs its functions and does not cause injury or health hazards to personnel or damage to equipment during transportation, installation, adjustment, maintenance, dismantling and disposal.

Note: Intended use refers to the rational use of the machine tool in accordance with the information provided by the manufacturer. Intended use shall be consistent with the instructions in the manual, and foreseeable misuse shall also be properly taken into account.

3.2 harm

Physical injury or health hazard to the human body.

[Source: GB/T 15706-2012, 3.5]

3.3 machine tool hazard

A condition where a machine tool, whether stationary or in operation, may cause injury to personnel or damage to equipment.

3.4 risk

A combination of the probability of harm occurring and the severity of that harm.

[Source: GB/T 15706-2012, 3.12]

3.5 machining area

The area on a machine tool through which the cutting tool travels during the machining of a workpiece.

3.6 working area

An area that may be involved in the work process.

Note: It includes the positions required for the moving parts of the machine tool, the positions required for loading and unloading workpieces, as well as the positions required for operating, adjusting and maintaining the machine tool.

3.7 safeguard

A guard or a protective device.

[Source: GB/T 15706-2012, 3.26]

3.8 guard

A physical barrier designed as an integral part of a machine to provide protection.

Note 1: A guard may be:

— Used independently. For movable guards, it is only effective when in the closed position; for fixed guards, it is only effective when firmly fixed in place.

— Used in combination with interlocking devices with or without protective locking. In such cases, the guard provides protection regardless of its position.

Note 2: Depending on its structure, a guard may be referred to as an enclosure, shield, cover, screen, door or enclosed guard.

Note 3: Terms for types of guards are defined in 3.27.1–3.27.6 of GB/T 15706-2012. Types of guards and their requirements can also be found in 6.3.3.2 of GB/T 15706-2012 and GB/T 8196.

[Source: GB/T 15706-2012, 3.27]

3.9 protective device

A type of safeguard other than a guard.