INTERNATIONAL STANDARD

ISO 23125

First edition 2010-05-01

Machine tools — Safety — Turning machines

Machines-outils — Sécurité — Machines de tournage

iTeh STANDARD PREVIEW (standards.iteh.ai)

ISO 23125:2010 https://standards.iteh.ai/catalog/standards/sist/2e856d4e-9b20-4e87-8a0e-ca38467734b9/iso-23125-2010



PDF disclaimer

This PDF file may contain embedded typefaces. In accordance with Adobe's licensing policy, this file may be printed or viewed but shall not be edited unless the typefaces which are embedded are licensed to and installed on the computer performing the editing. In downloading this file, parties accept therein the responsibility of not infringing Adobe's licensing policy. The ISO Central Secretariat accepts no liability in this area.

Adobe is a trademark of Adobe Systems Incorporated.

Details of the software products used to create this PDF file can be found in the General Info relative to the file; the PDF-creation parameters were optimized for printing. Every care has been taken to ensure that the file is suitable for use by ISO member bodies. In the unlikely event that a problem relating to it is found, please inform the Central Secretariat at the address given below.

iTeh STANDARD PREVIEW (standards.iteh.ai)

ISO 23125:2010 https://standards.iteh.ai/catalog/standards/sist/2e856d4e-9b20-4e87-8a0eca38467734b9/iso-23125-2010



COPYRIGHT PROTECTED DOCUMENT

© ISO 2010

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

Published in Switzerland

Page

Contents

Forewo	ord	V
Introdu	ıction	vi
1	Scope	1
2	Normative references	2
3	Terms and definitions	5
3.1	General terms	
3.2	Parts of turning machines	
3.3	Modes of operation	
3.4 3.4.1	Size and groups of turning machines defined in this International Standard	
3.5	Mandatory and optional modes of operation for turning machines	0
3.6	Maximum permissible spindle speeds and axes feeds	
4	List of significant hazards	
4.1	Main hazard zones	
4.2	Significant hazards and hazardous situations covered by this International Standard	
5	Safety requirements and/or measures A.R.D. P.R.E.V.E.W.	. 21
5.1	General requirements	21
5.1.1	Required characteristics for guards for all machine groups	21
5.2	Specific requirements resulting from mechanical hazards identified in Clause 4	22
5.2.1	Group 1 machines	22
5.2.2	Groups 2, 3 and 4 machines	23
5.2.3 5.2.4	Group 1 machines Groups 2, 3 and 4 machines Workpiece clamping conditions Modes of machine operation Modes of machine operation	25 27
5.2.5	Optional or additional equipment for turning machines	31
5.3	Specific requirements resulting from electrical hazards	33
5.4	Specific requirements resulting from noise hazards	
5.5	Specific requirements resulting from radiation hazards	
5.6	Specific requirements resulting from material or substance hazards	
5.7 5.8	Specific requirements resulting from neglect of ergonomic principles hazards	35
5.0	Specific requirements resulting from unexpected start-up, over-run or over-speed hazards	37
5.9	Specific requirements resulting from variation in the rotational speed of tools hazards	37 39
5.10	Specific requirements resulting from failure of the power supply hazards	
5.11	Specific requirements resulting from failure of the control circuit hazards	39
5.12	Specific requirements resulting from errors of fitting hazards	
5.13	Specific requirements resulting from ejected fluids or objects hazards	
5.13.1 5.13.2	General requirements	
5.13.2	Guards for large horizontal Group 3 machines (NC turning machines and turning centres)	
5.14	Specific requirements resulting from loss of stability hazards	
5.15	Specific requirements resulting from slips, trips and fall of persons hazards	
5.16	Verification of the safety requirements and/or protective measures	
6	Information for use	46
6.1	Marking	.46
6.2	Instruction for use	
6.2.1	General	
6.2.2	Tooling	
6.2.3 6.2.4	Workpiece clamping Machine functions accessible from the NC panel	
J. Z. T	machine randadia accessible from the 140 parter	3

ISO 23125:2010(E)

6.2.5 Re	estart		49
6.2.6 No	oise		49
6.2.7 An	ncillary hand	dling devices	50
6.2.8 Re	esidual risks	s to be addressed by the machinery user	50
		structions for the turning machine	
		ruction for the machine	
Annex A (normative) I	mpact test method for guards on turning machines	52
Annex B (informative)	Test equipment for impact test and examples of materials	57
Annex C (informative)	Calculation of direct impact energy	60
Annex D (informative)	Example of check list for safety functions	62
Annex E (i	informative)	Examples of exhaust and extinguishing systems	64
Annex F (i	informative)	Example of the determination of performance level for interlocked guard	68
Bibliograp	ohv		73

iTeh STANDARD PREVIEW (standards.iteh.ai)

ISO 23125:2010 https://standards.iteh.ai/catalog/standards/sist/2e856d4e-9b20-4e87-8a0e-ca38467734b9/iso-23125-2010

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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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.

ISO 23125 was prepared by Technical Committee ISO/TC 39, *Machine tools*, Subcommittee SC 10, *Safety*, in collaboration with Technical Committee CEN/TC 143, *Machine tools* — *Safety*.

This first edition cancels and replaces:

EN 12415:2000+A1:2002, Safety of machine tools — Small numerically controlled turning machines and turning centres

ISO 23125:2010

EN 12478:2000, Safety of machine tools large numerically controlled turning machines and turning centres ca3846773469/iso-23125-2010

EN 12840:2001, Safety of machine-tools — Manually controlled turning machines with or without automatic control

EN 13788:2001, Machine tools — Safety — Multi-spindle automatic turning machines

which have been technically revised.

The International Standards produced by ISO/TC 39/SC 10 in collaboration with CEN/TC 143 are particular to machine tools and complement the relevant A and B standards on the subject of general safety (see Introduction to ISO 12100-1 for a description of type-A, -B and -C standards).

This International Standard has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s).

© ISO 2010 – All rights reserved

Introduction

This International Standard has been prepared to be a Harmonized Standard to provide one means of conforming to the Essential Safety Requirements of the Machinery Directive of the European Union and associated EFTA regulations.

This International Standard is a type-C standard as defined in ISO 12100-1.

The machinery concerned and the extent to which hazards, hazardous situations and events are covered is indicated in the Scope of this International Standard. In addition, turning machines shall comply as appropriate with ISO 12100-1 and ISO 12100-2 for hazards which are not covered by this International Standard.

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 over the provisions of the other International Standards for machines that have been designed and built in accordance with the provisions of this type-C standard.

This International Standard replaces the "safety categories" defined in EN 954-1¹⁾ as resistance to faults and their subsequent behaviour in the fault condition, by introducing the "performance level" defined in ISO 13849-1:2006 in terms of probability of dangerous failure per hour.

The requirements of this International Standard concern designers, manufacturers, suppliers and importers of machines described in the Scope. (standards.iteh.ai)

This International Standard also includes a list of informative items to be provided by the manufacturer to the user.

https://standards.iteh.ai/catalog/standards/sist/2e856d4e-9b20-4e87-8a0e-

The requirements for a new mode of operation, Mode 3-2 manual intervention machining mode" will be discussed in the future.

¹⁾ The application of EN 954-1:1996 in harmonized standards has been prolonged until 2011-12-31. After that date, "performance levels" are to be applied.

Machine tools — Safety — Turning machines

1 Scope

This International Standard specifies the requirements and/or measures to eliminate the hazards or reduce the risks in the following groups of turning machines and turning centres, which are designed primarily to shape metal by cutting.

- Group 1: Manually controlled turning machines without numerical control.
- **Group 2**: Manually controlled turning machines with limited numerically controlled capability.
- Group 3: Numerically controlled turning machines and turning centres.
- Group 4: Single- or multi-spindle automatic turning machines.

NOTE 1 For detailed information on the machine groups, see the definitions in 3.4 and mandatory and optional modes of operation in 3.5.

NOTE 2 Requirements in this International Standard are, in general, applicable to all groups of turning machines. If requirements are applicable to some special group(s) of turning machine(s) is/are specified.

NOTE 3 Hazards arising from other metalworking processes (e.g. grinding and laser processing) are covered by other International Standards (see Bibliography): 38467734b9/iso-23125-2010

This International Standard covers the significant hazards listed in Clause 4 and applies to ancillary devices (e.g. for workpieces, tools and work clamping devices, handling devices and chip handling equipment), which are integral to the machine.

This International Standard also applies to machines which are integrated into an automatic production line or turning cell inasmuch as the hazards and risks arising are comparable to those of machines working separately.

This International Standard also includes a minimum list of safety-relevant information which the manufacturer has to provide to the user. See also ISO 12100-1:2003, Figure 1, which illustrates the interaction of 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 processes (e.g. milling, grinding, etc.) are involved, this International Standard can be taken as a basis for safety requirements; for specific information see the Bibliography.

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

© ISO 2010 – All rights reserved

2 Normative references

The following referenced documents are indispensable for the application 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 230-5:2000, Test code for machine tools — Part 5: Determination of the noise emission

ISO 447:1984, Machine tools — Direction of operation of controls

ISO 702-1:2009, Machine tools — Connecting dimensions of spindle noses and work holding chucks — Part 1: Conical connection

ISO 841:2001, Industrial automation systems and integration — Numerical control of machines — Coordinate system and motion nomenclature

ISO 3744:—²⁾, Acoustics — Determination of sound power level of noise sources using sound pressure — Engineering method in an essentially free field over a reflecting plane

ISO 3746:—³⁾, Acoustics — Determination of sound power levels of noise sources using sound pressure — Survey method using an enveloping measurement surface over a reflecting plane

ISO 4413:—⁴), Hydraulic fluid power — General rules and safety requirements for systems and their components

ISO 4414:—⁵⁾, Pneumatic fluid power — General rules and safety requirements for systems and their components (standards.iteh.ai)

ISO 4871:1996, Acoustics — Declaration and verification of noise emission values of machinery and equipment ISO 23125:2010

https://standards.iteh.ai/catalog/standards/sist/2e856d4e-9b20-4e87-8a0e-

ISO 6385:2004, Ergonomic principles in the design of work systems 2010

ISO 8525:2008, Airborne noise emitted by machine tools — Operating conditions for metal-cutting machines

ISO 9241(all parts), Ergonomics of human-system interaction

ISO 10218-2:—⁶⁾, Robots and robotic devices — Safety requirements — Part 2: Industrial robot system and integration

ISO 11202:—⁷⁾, Acoustics — Noise emitted by machinery and equipment — Measurement of emission sound pressure levels at a work station and at other specified positions applying approximate environmental corrections

ISO 11204:—⁸⁾, Acoustics — Noise emitted by machinery and equipment — Measurement of emission sound pressure levels at a work station and at other specified positions applying accurate environmental corrections

7) To be published. (Revision of ISO 11202:1995)

2

²⁾ To be published. (Revision of ISO 3744:1994)

³⁾ To be published. (Revision of ISO 3746:1995)

⁴⁾ To be published. (Revision of ISO 4413:1998)

⁵⁾ To be published. (Revision of ISO 4414:1998)

⁶⁾ To be published.

⁸⁾ To be published. (Revision of ISO 11204:1995)

ISO/TR 11688-1:1995, Acoustics — Recommended practice for the design of low-noise machinery and equipment — Part 1: Planning

ISO 12100-1:2003, Safety of machinery — Basic concepts, general principles for design — Part 1: Basic terminology, methodology

ISO 12100-2:2003, Safety of machinery — Basic concepts, general principles for design — Part 2: Technical principles

ISO 13849-1:2006, Safety of machinery — Safety-related parts of control systems — Part 1: General principles for design

ISO 13849-2:2003, Safety of machinery — Safety-related parts of control systems — Part 2: Validation

ISO 13850:2006, Safety of machinery — Emergency stop — Principles for design

ISO 13851:2002, Safety of machinery — Two-hand control devices — Functional aspects and design principles

ISO 13854:1996, Safety of machinery — Minimum gaps to avoid crushing of parts of the human body

ISO 13855:—⁹⁾, Safety of machinery — Positioning of protective equipment with respect to the approach speeds of parts of the human body

ISO 13856-2:2005, Safety of machinery — Pressure-sensitive protective devices — Part 2: General principles for the design and testing of pressure-sensitive edges and pressure-sensitive bars

ISO 13856-3:2006, Safety of machinery — Pressure-sensitive protective devices — Part 3: General principles for the design and testing of pressure-sensitive bumpers, plates, wires and similar devices

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

ca38467734b9/iso-23125-2010

ISO 14118:2000, Safety of machinery — Prevention of unexpected start-up

ISO 14119:1998, Safety of machinery — Interlocking devices associated with guards — Principles for design and selection

ISO 14120:2002, Safety of machinery — Guards — General requirements for the design and construction of fixed and movable guards

ISO 14121-1:2007, Safety of machinery — Risk assessment — Part 1: Principles

ISO 14122-1:2001, Safety of machinery — Permanent means of access to machinery — Part 1: Choice of fixed means of access between two levels

ISO 14122-2:2001, Safety of machinery — Permanent means of access to machinery — Part 2: Working platforms and walkways

ISO 14122-3:2001, Safety of machinery — Permanent means of access to machinery — Part 3: Stairs, stepladders and guard-rails

ISO 14122-4:2004, Safety of machinery — Permanent means of access to machinery — Part 4: Fixed ladders

ISO 14159:2002, Safety of machinery — Hygiene requirements for the design of machinery

10

⁹⁾ To be published.

ISO 23125:2010(E)

ISO 16156:2004, Machine-tools safety — Safety requirements for the design and construction of work holding chucks

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

IEC 60825-1:2007, Safety of laser products — Part 1: Equipment classification and requirements

IEC 61000-6-2:2005, Electromagnetic compatibility (EMC) — Part 6-2: Generic standards — Immunity for industrial environments

IEC 61000-6-4:2006, Electromagnetic compatibility (EMC) — Part 6-4: Generic standards — Emission standard for industrial environments

IEC 62061:2005, Safety of machinery — Functional safety of safety-related electrical, electronic and programmable electronic control systems

IEC 61800-5-2:2007, Adjustable speed electrical power drive systems — Part 5-2: Safety requirements — Functional

EN 547-1:1996+A1:2008, Safety of machinery — Human body measurements — Part 1: Principles for determining the dimensions required for openings for whole body access into machinery

EN 547-2:1996+A1:2008, Safety of machinery — Human body measurements — Part 2: Principles for determining the dimensions required for access openings

EN 614-1:2006+A1:2009, Safety of machinery — Ergonomic design principles — Part 1: Terminology and general principles (Standards.iteh.ai)

EN 614-2:2000+A1:2008, Safety of machinery — Ergonomic design principles — Part 2: Interactions between the design of machinery and work tasks

https://standards.iteh.ai/catalog/standards/sist/2e856d4e-9b20-4e87-8a0e-EN 894-1:1997+A1:2008, Safety of machinery Ergonomics requirements for the design of displays and control actuators — Part 1: General principles for human interactions with displays and control actuators

EN 894-2:1997+A1:2008, Safety of machinery — Ergonomics requirements for the design of displays and control actuators — Part 2: Displays

EN 894-3:2000+A1:2008, Safety of machinery — Ergonomics requirements for the design of displays and control actuators — Part 3: Control actuators

EN 982:1996+A1:2008, Safety of machinery — Safety requirements for fluid power systems and their components — Hydraulics

EN 983:1996+A1:2008, Safety of machinery — Safety requirements for fluid power systems and their components — Pneumatics

EN 1005-1:2001+A1:2008, Safety of machinery — Human physical performance — Part 1: Terms and definitions

EN 1005-2:2003+A1:2008, Safety of machinery — Human physical performance — Part 2: Manual handling of machinery and component parts of machinery

EN 1005-3:2002+A1:2008, Safety of machinery — Human physical performance — Part 3: Recommended force limits for machinery operation

EN 1005-4:2005+A1:2008, Safety of machinery — Human physical performance — Part 4: Evaluation of working postures and movements in relation to machinery

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

Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 12100-1:2003, and ISO 13849-1:2006 and the following apply.

3.1 General terms

3.1.1

turning machine

machine tool in which the principal movement is the rotation of the workpiece against the stationary cutting

3.1.2

manual control

mode of operation where each movement of the machine is individually initiated and controlled by the operator

3.1.3

manually controlled turning machine

turning machine (3.1.1) for which process steps for the machining are controlled or started by an operator without support by an NC-machining program

3.1.4

numerical control

NC

computerized numerical control STANDARD PREVIEW

CNC

automatic control of a process performed by a device that makes use of numerical data introduced while the operation is in progress

NOTE Adapted from ISO/IEC 2806:1994, definition123/2010

https://standards.iteh.ai/catalog/standards/sist/2e856d4e-9b20-4e87-8a0e-

3.1.5 ca38467734b9/iso-23125-2010

numerically controlled turning machine

NC turning machine

turning machine that operates under numerical control (3.1.4) or computerized numerical control (CNC)

3.1.6

turning centre

numerically controlled turning machine (3.1.5) equipped with power-driven tools and the capability to orientate the work holding spindle around its axis

A turning centre can also include, but is not limited to, functions such as gauging, burnishing, threading, boring, milling, grinding and drilling.

NOTE 2 If grinding processes are involved, see EN 13218 for additional safety measures.

3.1.7

work zone

space where metal cutting is to take place

3.1.8

performance level

discrete level used to specify the ability of safety-related parts of control systems to perform a safety function under foreseeable conditions

[ISO 13849-1:2006, definition 3.1.23]

3.1.9

mean time to dangerous failure

MTTF_d

expectation of the mean time to dangerous failure

[ISO 13849-1:2006, definition 3.1.25]

3.2 Parts of turning machines

3.2.1

vision panel

window provided in a guard through which the operator can view the **work zone** (3.1.7) or other areas of the machine

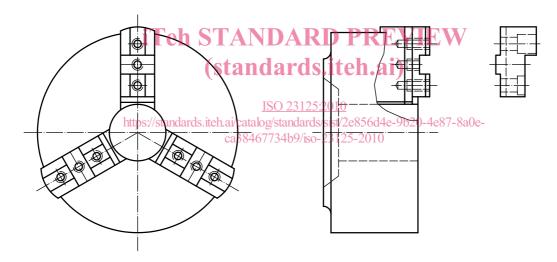
3.2.2

chuck

clamping device in which workpieces are clamped with the aid of either manual energy or pneumatic, hydraulic or electric energy

See Figure 1.

NOTE Adapted from ISO 16156:2004, definition 3.1.



NOTE The chuck with 3 jaws is an example only, a chuck can have 2, 3, 4 or 6 jaws.

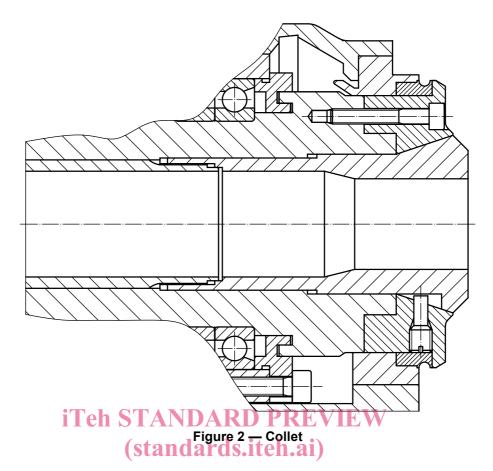
Figure 1 — Chuck

3.2.3

collet

device designed to hold the bar into the turning spindle, e.g. by pressure bar or draw bar

See Figure 2.



3.2.4

electronic handwheel

manually operated control device which initiates and maintains an axis movement by pulse generation input to the **numerical control** (3.1.4) during its totation 4,69/iso-23125-2010

3.3 Modes of operation

3.3.1

Mode 0: manual mode

operation of the machine by the operator without NC functions or non-automatic mode of the machine axes, where the operator has control over the machining process without the use of pre-programmed operations

NOTE The axes movement can be controlled by the use of push buttons, electronic handwheels or joysticks.

3.3.2

Mode 1: automatic mode

automatic, programmed, sequential operation of the machine with the facility for manual or automatic loading/unloading of workpiece and tools, until stopped by program or operator

3.3.3

Mode 2: setting mode

mode of operation in which adjustments for the subsequent machining process are performed by the operator

NOTE Checking of tool or workpiece position (e.g. by touching the workpiece with a probe or tool) are procedures of the setting mode (see 5.2.4.4).

3.3.4

service mode

mode for service and maintenance tasks, such as axis calibration by laser, ballbar testing and spindle error analysis

NOTE In service mode, the machining of a workpiece is not allowed (see 5.2.4.5).

© ISO 2010 – All rights reserved

3.4 Size and groups of turning machines defined in this International Standard

3.4.1 General

With regard to the relevant hazards, the turning machines are subdivided into four different groups. Group 1, Group 2 and Group 3 turning machines can then be sub-divided into "small" or "large" sizes. See the overview in Table 1.

Table 1 — Overview of sizes and groups of turning machines

Group No.	Group name	Subclause in which group is defined	Subdivision in sizes	Subclause in which size is defined
Group 1	Manually controlled turning machines without numerical control	3.4.1.3	Small	3.4.1.1
Group i		3.4.1.3	Large	3.4.1.2
Group 2	Manually controlled turning machines with limited numerically controlled capability	3.4.1.4	Small	3.4.1.1
Group 2		3.4.1.4	Large	3.4.1.2
Group 3	Numerically controlled turning machines and turning centres	3.4.1.5	Small	3.4.1.1
Group 3		3.4.1.5	Large	3.4.1.2
Group 4	Single- or multi-spindle automatic turning machines iTeh STAND	ARĎ PRE	No subdivisión	_

(standards.iteh.ai)

3.4.1.1

small turning machine

ISO 23125:2010

turning machine within the following dimensional limits: iandards/sist/2e856d4e-9b20-4e87-8a0e-

ca38467734b9/iso-23125-2010

- horizontal spindle turning machines and turning centres with distance between centres (BC) up to and including 2 000 mm and which are designed to accept workpiece clamping devices of up to and including 500 mm outside diameter;
- vertical turning machines, inverted spindle turning machines including pick-up machines and turning centres, which are designed to accept workpiece clamping devices of up to and including 500 mm outside diameter

3.4.1.2

large turning machine

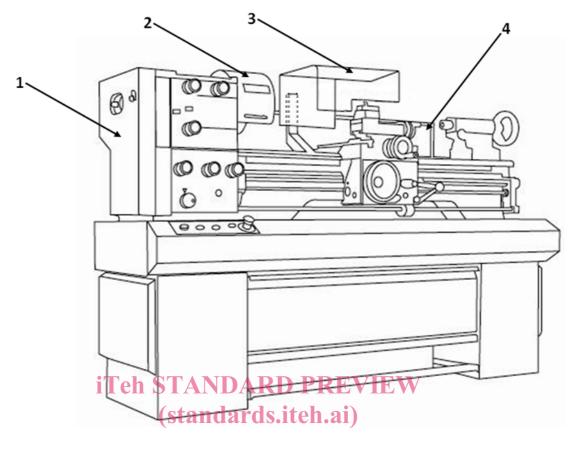
turning machine which exceeds the following dimensional limits:

- horizontal spindle turning machines and turning centres with distance between centres exceeding 2 000 mm or which are designed to accept work clamping devices exceeding 500 mm outside diameter;
- vertical turning machines, inverted spindle turning machines, including pick-up machines, and turning centres which are designed to accept work clamping devices exceeding 500 mm outside diameter

3.4.1.3

Group 1: manually controlled turning machine without numerical control

turning machine, where all movements are initiated and controlled by the operator, one at a time



Key

- rear spindle end guard 3 front chip/splash guard (saddle mounted)
- 1 rear spinule etilu gualu https://standards.iteh.ai/catalog/standards/sist/2ex56d4 2 chuck guard 4 rear chip/splash guard ca3846 / 734b9/iso-23123-2010

Figure 3 — Group 1: Example of a manually controlled, horizontal spindle turning machine

This group of turning machines may be equipped with the following features:

- mechanical facilities for mechanical feed or thread cutting;
- electronic facilities for constant surface speed (CSS);
- copying attachments (cam, template, etc.);
- but shall have no limited or full numeric control system (NC).

For mandatory and optional modes of operation for this group of turning machines, see Table 2.

3.4.1.4

Group 2: manually controlled turning machine with limited numerically controlled capability

turning machine that can be operated as a Group 1 machine by the use of electronic handwheels or as a machine with limited NC control by operating controls on NC panel