SLOVENSKI STANDARD
SIST EN 12478:2001

01-junij-2001

Safety of machine tools - Large numerically controlled turning machines and turning centres

Safety of machine tools - Large numerically controlled turning machines and turning centres

Sicherheit von Werkzeugmaschinen - Große numerisch gesteuerte Drehmaschinen und Drehzentren

Sécurité des machines-outils - Tours à commande numérique et centres de tournage de grandes dimensions

Ta slovenski standard je istoveten z: **EN 12478:2000**

ICS:

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25.080.10	Stružnice	Lathes

SIST EN 12478:2001 **en**

EUROPEAN STANDARD
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Sicherheit von Werkzeugmaschinen - Große numerisch gesteuerte Drehmaschinen und Drehzentren

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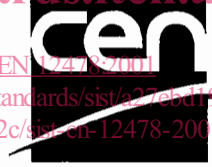

EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

Management Centre: rue de Stassart, 36 B-1050 Brussels

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Foreword

This European Standard has been prepared by Technical Committee CEN/TC 143 "Machine tools – Safety", the secretariat of which is held by SNV.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by May 2001, and conflicting national standards shall be withdrawn at the latest by May 2001.

This European 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).

For relationship with EU Directive(s), see informative Annex ZA, which is an integral part of this standard.

Organisation contribution to the preparation of this European Standard include the European manufacturer Association CECIMO.

The European Standards produced by CEN/TC 143 are particular to machine-tools and complement the relevant A and B standards on the subject of general safety (see introduction of EN 292-1:1991 for a description of A, B and C standards).

Annex A is normative.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

0 Introduction

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

This European Standard is a type C standard as defined in EN 292:1991

The extent to which hazards are covered is indicated in the scope of this standard. In addition turning machines shall comply as appropriate with EN 292:1991 part 1 and 2 for hazards which are not covered by this standard.

The requirement of this European Standard concern designers, manufacturers, suppliers and importers of machines described in the scope.

This standard also includes information to be provided by the manufacturer to the user.

1 Scope

This European Standard specifies the requirements and/or measures to remove the hazards and limit the risks on general purpose numerically controlled large turning machines and turning centres which are designed primarily to work cold metal as defined in 3.1 and 3.2 and herein after referred to as "machines".

This standard covers all significant relevant hazards which are listed in clause 4.

This standard is applies to :

— numerically controlled large vertical turning machines and turning centres which are equipped with work clamping plate exceeding 500 mm outside diameter.

— numerically controlled horizontal spindle turning machines and turning centres with distance between centres exceeding 2 000 mm or which are equipped with work clamping devices exceeding 500 mm outside diameter.

The standard also applies to ancillary devices (e.g. for workpieces, tools and work clamping devices handling devices and chip handling equipment, etc.) which are integral to the machine.

This standard also applies also to machines which are integrated in an automatic production line or turning cell where the hazard and risks arising are comparable to those of machines working separately.

Where additional processes are involved this standard can be taken as a basis (see also annex bibliography)

This standard does apply to NC turning machines with machining facilities under manual control which are dealt with in EN 12840:2000.

This standard applies to machines which are manufactured after the date of issue of this standard.

2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

EN 292-1:1991, *Safety of machinery – Basic concepts, general principles for design – Part 1 : Basic terminology, methodology.*

EN 292-2:1991, *Safety of machinery – Basic concepts, general principles for design – Part 2 : Technical principles and specifications.*

EN 292-2:1991/A1:1995, *Safety of machinery – Basic concepts, general principles for design – Part 2 : Technical principles and specifications.*

EN 294:1992, *Safety of machinery – Safety distances to prevent danger zone being reached by the upper limbs.*

EN 349:1993, *Safety of machinery – Dimensions gaps to avoid crushing of parts of the human body.*

EN 418:1992, *Safety of machinery – Emergency stop equipment – Functional aspects – Principles.*

EN 547-1:1996, *Safety of machinery – Human body measurements – Part-1 : Principles for determining the dimensions for openings for whole body access into machinery.*

EN 547-2:1996, *Safety of machinery – Human body measurements – Part 2 : Principles for determining the dimensions required for access openings.*

EN 574:1996, *Safety of machinery – Two hand control devices – Functional aspects – Principle for design.*

EN 614-1:1995, *Safety of machinery – Ergonomic design principles – Part 1 : Terminology and general principles.*

EN 894-1:1997, *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, *Safety of machinery – Ergonomics requirements for the design of displays and control actuators – Part 2 : Displays.*

EN 894-3:2000, *Safety of machinery – Ergonomics requirements for the design of displays and control actuators – Part 3 : Control actuators.*

EN 953:1997, *Safety of machinery – Guards –General requirements for the design of fixed and moveable guards.*

EN 954-1:1996, *Safety of machinery – Safety related parts of control systems – Part 1 : General principles for design.*

EN 982:1996, *Safety of machinery – Safety requirements for fluid power systems and components – Hydraulics.*

EN 983:1996, *Safety of machinery – Safety requirements for fluid power systems and components – Pneumatics.*

EN 1037:1995, *Safety of machinery – Prevention of unexpected start up.*

EN 1050:1996, *Safety of machinery – Principles of risk assessment.*

EN 1070:1998, *Safety of machinery – Terminology.*

EN 1088:1995, *Safety of machinery – Interlocking devices associated with guards – Principles for design and selection.*

EN 1550:1997, *Safety of machinery – Safety requirements for the design and construction of work holding chucks.*

prEN 1760-3, *Safety of machinery – Pressure sensitive protective devices – Part 3 : Pressure sensitive bumpers and pressure sensitive plates.*

EN 1837:1999, *Safety of machinery – Integral lighting of machines.*

EN ISO 14122-1:1996, *Safety of machinery – Permanent means of access to machines and industrial plants – Part 1 : Choice of a fixed means of access between tow levels.*

EN ISO 14122-3:1996, *Safety of machinery – Permanent means of access to machines and industrial plants – Part 3 : Stairways, stepladders and guard-rails.*

prEN ISO 14122-4:1999, *Safety of machinery – Permanent means of access to machines and industrial plants – Part 4 : Fixed ladders.*

EN 12626:1997, *Safety of machinery – Laser processing machines – Safety requirements.*

EN 12840:2000, *Safety of machine tools – Manually operated turning machines.*

ENV 26385:1990, *Ergonomic principles of the design of work systems.*

EN 60204-1:1992, *Electrical equipment of industrial machines – Part 1 : general requirement.*

EN 60529:1991, *Degrees of protection provided by enclosures (IP code).*

EN 60825-1:1994 + A11:1996, *Safety of laser products – Equipment – Part 1 : Classification, requirements and user's guide (IEC 60825-1:1993).*

EN ISO 3744:1995, *Acoustics – Determination of sound power level of noise sources using sound pressure – Engineering method in an essential free field over a reflecting plane.*

EN ISO 3746:1995, *Acoustics – Determination of sound power level of noise sources using sound pressure – Survey method using an enveloping measurement surface aver a reflecting plane.*

EN ISO 9614-1:1995, *Acoustics – Determination of sound power levels of noise sources using sound intensity - Part 1 : Measurement at discreet point.*

EN ISO 11202:1995, *Acoustics – Noise emitted by machinery and equipment – Measurement method of emission sound pressure levels at the workstation and at other specified positions – Survey method in situ.*

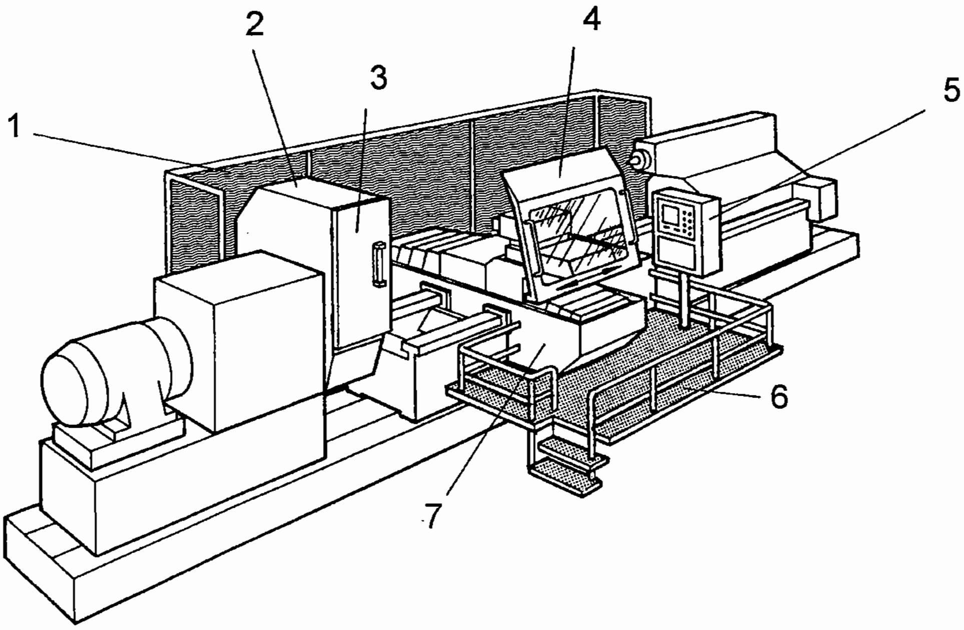
EN ISO 11204:1995, *Acoustics – Noise emitted by machinery and equipment – Method requiring environmental corrections.*

EN ISO 11688-1:1998, *Acoustics – Recommended practice for the design of low noise machinery and equipment – Part 1 : Planning.*

3 Terms and definitions

For the purposes of this standard and in addition to the terms and definitions given in EN 292:1991 and EN 418:1992 and EN 1070:1998, the following terms and definitions apply :

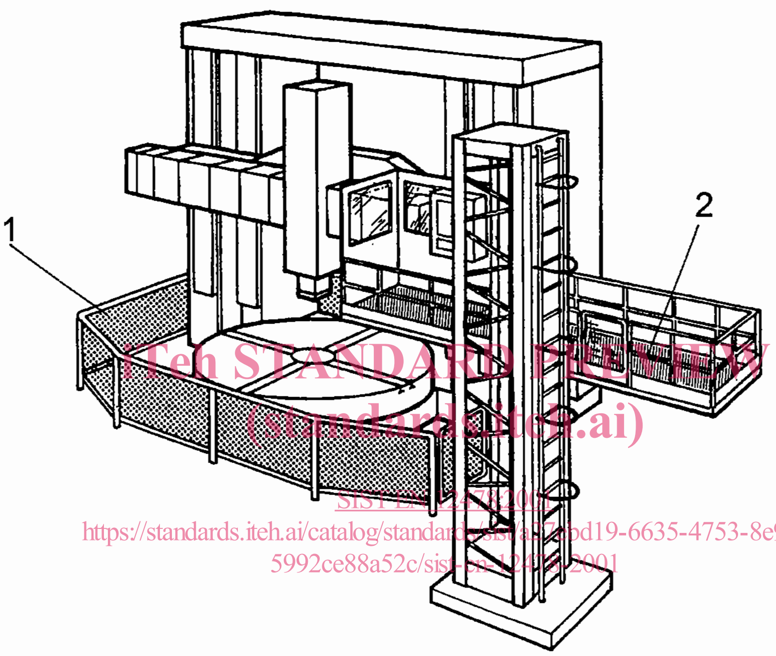
3.1
numerically controlled turning machine
Machine tool in which the principal movement is the rotation of the workpiece against the stationary cutting tool(s) and where cutting energy is brought by the workpiece and not by the tool. This machine is controlled by a numerical control (NC) providing automatic function according to 3.3.1



Key

1 rear guard
2 chuck guard
3 access door
4 front guard
5 control panel
6 platform
7 saddle

Figure 1 a — Large horizontal turning machine



Key

1 perimeter fence
2 platform

Figure 1b — Large vertical turning machine with operating platform

Figure 1 — Example of large turning machines

3.2
turning centre
A NC turning machine equipped with power driven tool(s) and the capacity to orientate the work holding spindle around its axis. This machine may have additional features such as automatic tool changing from a magazine

3.3
machine modes of operation
NOTE Definitions of modes of NC are given below :

mode of NC

A mode of operation of the NC or data entry device in which entries are interpreted as functions to be executed.

a) manual mode of NC

Non automatic mode of NC of a machine where the operator controls it without the use of pre-programmed numeric data for example by push button or joystick control.

b) manual data input mode

They entry of programme data by hand at the NC.

c) single block mode

The mode of NC in which, at the initiation of the operator only one block of control data only is executed.

d) automatic mode

The mode of NC in which the machine operates in accordance with the programme data until stopped by the program or the operator.

3.3.1
machining mode
The automatic, programmed, sequential operation of the machine with the facility for manual or automatic loading/unloading of workpiece

3.3.2
machine setting mode
Mode in which the operator performs adjustments for the subsequent machining process.

The programming, testing and manual (under power) non sequential operation of the machine.

NOTE This mode comprises e. g. program sequence check, measurement of tool and/or workpiece position (e. g. by touching the workpiece with a measurement probe or with the tool).

3.4
operator's position
Position(s) where the operator stands to operate the machine, e.g. close to the main control panel

3.5
operational stop
A controlled stop function with power left available to machine actuators and which further hazardous machine movement is inhibited

3.6
programmable functions
Functions that the user can have access to at the electronic equipment for program modifications

3.7
acceleration monitoring
System designed to allow limiting acceleration/deceleration

3.8
vision panel
A window provided in a guard through which the operator can view the workzone or other areas of the machine

4 List of significant hazards

The significant hazards associated with the machine(s) have been identified (see table 1) in accordance with the procedures described in 5 of EN 292-1:1991 and EN 1050:1996.

The safety requirements and/or measures to eliminate these hazards or reduce their associated risks are laid down in clause 5 of this standard.

NOTE For machines which present additional hazards or do not conform to this standard, guidance on risk assessment can be found in EN 1050:1996 and on measures to be taken for hazards elimination may be found in EN 292-1:1991 and EN 292-2:1991.

The designer attention is focused on hazards which can occur during the life of the machine to both operator and other persons who have access to the danger zone(s) for conditions of intended use including reasonably foreseeable misuse of the machine (see 3.12 in EN 292-1:1991). The hazards for both machining operation or operations requiring intervention by the operator or other personnel (e.g. setting, cleaning, maintenance and repair). An analysis of the failure of machine components including failure in the control system(s) is part of the risk assessment guidance on this subject is given EN 954-1:1996.

The significant hazards covered by this standard are listed in table 1. Particular attention is given to the hazards dealing with :

— ejection of tools, clamping devices or workpieces or parts of them including chips (see 17 in table 1) ;

— entanglement on or drawing into moving parts of the machine, particularly clamps work holding devices, tools, and the workpiece (see 1.4 and 1.5 in table 1) ;

— cutting and crushing between moving and fixed parts of the machine (see 1.1 and 1.3 in table 1) ;

— slip trip and fall (see 19 in table 1).

Main danger zones are :

— working areas with moving spindles(s), work clamping components e.g. work clamping devices, slide(s), turret(s), tool(s), workpiece(s), chip handling equipment (if integrated), etc. ;

— workpiece loading/unloading devices including bar feeders for horizontal spindle machines ;

— external tool magazines and tool changers ;

— chip discharge zone.

Table 1 — List of hazards

EN 1050 Ref. N°	Hazards	Annex A of EN 292-2:1991/ A1:1995	EN 292 Part 1: 1991	EN 292 Part 2: 1991	Hazardous situation	Relevant type B standard	Relevant clause in this standard
Hazards, hazardous situations and hazardous events							
1	**Mechanical hazards** due to : — machine parts or workpiece, e.g. : a) shape ; b) relative location ; c) mass and stability (potential energy of elements which may move under the effect of gravity) ; d) mass and velocity (kinetic energy of elements in controlled or uncontrolled motion) ; e) inadequacy of mechanical strength. — accumulation of energy inside the machinery, e.g. : f) elastic elements (springs) ; g) liquids and gases under pressure ; h) the effect of vacuum.	1.3 1.5.3, 1.6.3	4.2 4.2	3.1, 3.2, 4 3.8, 6.2.2			
1.1	Crushing hazard	1.3	4.2.1		Between fixed and moving part including work clamping (chuck or tailstock) and tool magazine.	EN 294, EN 349, EN 574, EN 953, EN 1088	5.1.3, 5.1.7, 5.2.1.1, 5.2.1.3, 5.2.1.4
1.2	Shearing hazard				Between fixed and moving part including tool magazine.	EN 294, EN 349, EN 574, EN 953, EN 1088	5.1.7, 5.2.1.3, 5.2.1.4, 5.2.1.5, 5.2.4,
1.3	Cutting or severing hazard				During tool motion, by chip.	EN 294, EN 953	5.1.3, 5.1.7, 5.2.1.3, 5.2.4

(to be continued)