SLOVENSKI STANDARD
SIST EN 12840:2001

01-junij-2001

Safety of machine-tools - Manually controlled turning machines with or without automatic control

Safety of machine tools - Manually controlled turning machines with or without automatic control

Sicherheit von Werkzeugmaschinen - Handgesteuerte Drehmaschinen mit oder ohne Automatiksteuerung

Sécurité des machines-outils - Machines de tournage a commande manuelle avec ou sans commande automatique

Ta slovenski standard je istoveten z: **EN 12840:2001**

ICS:

25.080.10 Stružnice Lathes

SIST EN 12840:2001 **en**

EUROPEAN STANDARD
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English version

Safety of machine-tools - Manually controlled turning machines with or without automatic control

Sécurité des machines-outils - Machines de tournage à commande manuelle avec ou sans commande automatique

Sicherheit von Werkzeugmaschinen - Handgesteuerte Drehmaschinen mit oder ohne Automatiksteuerung

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This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Management Centre has the same status as the official versions.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
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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of an identical text or by endorsement, at the latest by August 2001, and conflicting national standards shall be withdrawn at the latest by August 2001.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.

Organisations contributing to the preparation of this European standard include the European Manufacturer Association CECIMO.

Annex A is normative.

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).

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.

Introduction

This European 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 manually controlled turning machines with or without automatic control shall comply as appropriate with EN 292:1991 part 1 and 2 for hazards which are not covered by this standard.

The requirements 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 manually controlled horizontal or vertical spindle turning machines which may have limited or unlimited automatic control which are intended to work cold metal and here in after referred to as "machines".

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

The standard also applies to ancillary devices (e. g, tools, chuck, workpiece handling devices and swarf handling equipment) which are integral to the machines.

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

This standard does not apply to NC turning machines which are intended for use as automatic production machines where the manual control is only for the principal purpose of setting the machine up for automatic production (see prEN 12415 and prEN 12478).

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

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 machinery – Minimum gaps to avoid crushing of parts of the human body.*

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

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 - Principles for design.*

EN 614-1, *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 : Human interaction with display 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 and construction 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 their components - Hydraulics.*

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

prEN 1005-1:1998, *Safety of machinery – human physical performances – Part 1: Terms and definitions.*

prEN 1005-2:1998, *Safety of machinery – human physical performances – Part 2: Manual handling of machineries and component parts of machinery.*

prEN 1005-3:1998, *Safety of machinery – human physical performances – Part 3: Recommanded forces limits for machinery operation.*

prEN 1005-4:1998, *Safety of machinery – human physical performances – Part 4: Evaluation of working postures in relation to machinery.*

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

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

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

EN 1088:1995,*Safety of machinery - Interlocking devices associated guards - General principles and for design and selection.*

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

EN 1760-2:2001, *Safety of machinery – Pressure sensitive protective devices – Part 2: General principles for the design and testing of pressure sensitive edges and pressure sensitive bars.*

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

EN 12415:2000,*Machine-tools - Safety - Small numerically controlled turning machines and turning centres.*

EN 12478:2000,*Machine-tools - Safety - Large numerically controlled turning machines and turning centres.*

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

EN 60204-1:1997,*Safety of machinery - Electrical equipment of machines - Part 1 : General requirements (IEC 204-1:1992, modified).*

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

EN 60825-1:1994 + A 11 :1996,*Safety of laser products - Part 1 : Equipment 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 essentially 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 over a reflecting plane.*

EN ISO 9614-1:1995,*Acoustics - Determination of sound power level of noise sources using sound intensity - Part 1 : Measurement at discrete points.*

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 in addition to the definitions given in EN 292:1991, EN 418:1992 and EN 1070:1998, the following definitions shall apply :

3.1 turning machine

A 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 in by the rotation of the workpiece and not by the tool.

3.2 manually controlled turning machine

A turning machine where

— The operator can individually activate all the linear slide and tailstock movements.

NOTE They may be cancelled by the operator or by a manually adjustable stop.

— The operator can start and stop spindle rotation.

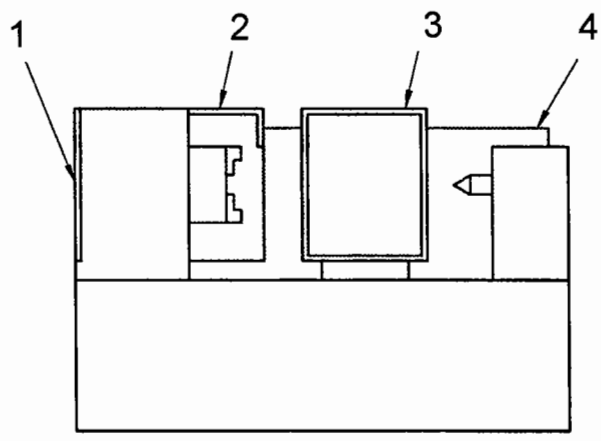
NOTE Variation in speed can be achieved by manual control.

3.3 types of manually controlled turning machines

Three types of manually controlled turning machines are defined as follows :

3.3.1 type 1

These machines can be described as manually controlled centre lathe equipped with interlocked chuck guard, splash guard the control of which is manual, initiating one movement at a time in one direction. The spindle speed (including maximum spindle speed) is selected manually and spindle rotation is initiated manually when the chuck guard is closed. The machine may be equipped with the limited automatic cycling facilities (options) of constant surface speed, axes interpolation and thread cycle cutting. Feed rates are selected manually. Rapid traverse speed limited and is manually controlled by hold to run control. Turret indexing is manually possible only station by station by hold to run control. The machine may be equipped with copying attachments (cam, template, ...).



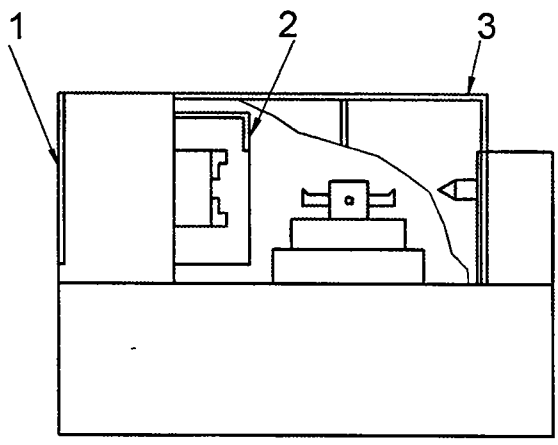
1. Rear spindle guard
2. Chuck guard (open)
3. Splash guard
4. Rear guard

Figure 1 — Type 1 "Manually operated turning machine

Manually controlled turning machines which may have limited automatic cycling facilities (options).

3.3.2 type 2

These machines can be described as manual by controlled centre lathes with extended automatic cycling facilities (e.g. area clearance routine or part program or automatic spindle rotation control). They are equipped with a chuck guard and a partial enclosure/saddle guard (depending on the distance between centres) and rapid traverse speed is limited. These machines do not have automatic workpiece or tool change (e.g. turret indexing) and automatic bar feed.



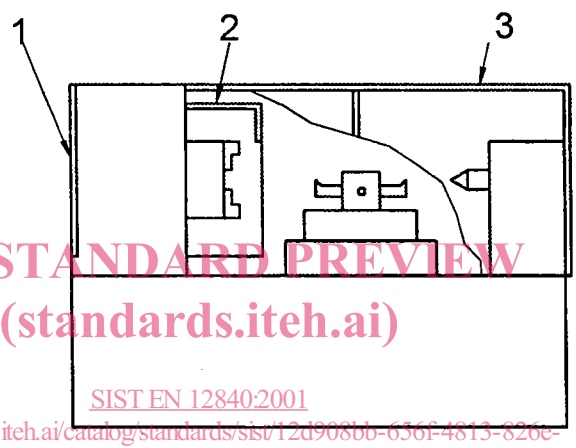
1. Rear spindle guard
2. Chuck guard (open)
3. Partial enclosure

Figure 2 — Type 2 "Manually operated turning machine"

Manually controlled turning machines which have extended automatic cycling facilities.

3.3.3 type 3

These machines can be described as NC turning machines with manual control.



1. Rear spindle guard
2. Chuck guard (open)
3. Enclosure

Figure 3 — Type 3 "Manually operated turning machine"

Manually controlled turning machines which have full NC control facilities.

3.4 manual control

Where each movement is individually controlled by the operator.

3.5 limited automatic cycling facilities (options)

Where one or a combination of the following options are available

3.5.1 constant surface speed

Variation in the rotational speed of the spindle as an automatic function to perform constant speed cutting in relation to diameter.

3.5.2 axes interpolation

Slide movements performing a complex cutting path arising from the combined movements of more than one axis.

3.5.3 cutting cycle

Axes movements to perform cutting path and return path in sequence.

NOTE Cutting cycle may operate with automatic tool withdrawal.

3.6 extended automatic cycling facilities

Extended automatic cycling facilities may include e.g. the following partial programs :

- clearance routines
- part program
- automatic spindle rotation control

NOTE Extended automatic cycling facilities do not include :

- automatic workpiece/tool change
- automatic bar feed

3.7 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(s) 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 reprogrammed numeric data for example by push button or joystick control.

b) automatic mode of NC : The mode of NC of a manually controlled machine with extended automatic cycling facilities or full NC control facilities in which the machine operates in accordance with the programme data until stopped by the program or the operator.

3.7.1 manual mode of operation

The non sequential operation of the machine under manual control by the operator.

3.7.2 machining mode of operation

The operation of the machine under automatic programmed sequential operation.

3.7.3 setting mode of operation

Mode in which the operator performs adjustments for the subsequent machining process

NOTE This mode comprise e. g. program sequence check measurements of tool and/or work/piece position (e.g. by touching the work/piece with measurement probe or with the tool).

3.8 operational stop

A controlled stop function with power left available to the machine actuators in which further hazardous machine movements is inhibited.

3.9 double action control device

A control device that needs two different actions to start a machine movement e.g. a lever with two displacements in different directions in order to prevent an unintended start up.

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 hazard elimination and risk reduction may be found in EN 292-1 and EN 292-2:1991.

The designers 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 automatic operation, manual operation, and/or operations requiring intervention by the operator and other personnel (e.g. setting, cleaning maintenance and repair) have to be considered. An analysis of failure of machine components including failure in the control system(s) is part of the risk assessment. Guidance on this subject is given in EN 954-1:1996.

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

— ejection of tools, chucks jaws, workpiece or parts of them including swarf chips (see 17 in table 1) ;

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

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

The main danger zones are :

— working areas with moving spindle(s), workpiece holding device (e.g. chuck), slide(s), turret(s), workpiece(s), copying unit(s), steady rests, tailstock, swarf, chip handling equipment (if integrated) ;

— workpiece loading/unloading devices including bar feeders for horizontal spindle machines (if applicable) ;

— rear of the spindle ;

— change gears ;

— lead screw.