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**Milling cutters for high speed machining —  
Safety requirements**

*Fraises pour usinage à grande vitesse — Prescriptions de sécurité*

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Tel. + 41 22 749 01 11  
Fax + 41 22 749 09 47  
E-mail [copyright@iso.ch](mailto:copyright@iso.ch)  
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## Foreword

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International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 3.

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 International Standard may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 15641 was prepared by the European Committee for Standardization (CEN) in collaboration with ISO Technical Committee TC 29, *Small tools*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

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Throughout the text of this standard, read "(standards.iteh.ai)" to mean "...this International Standard...".

Annexes A and B of this International Standard are for information only.

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## Foreword

The text of EN ISO 15641:2001 has been prepared by Technical Committee CEN/TC 143 "Machine tools – Safety", the secretariat of which is held by SNV, in collaboration with Technical Committee ISO/TC 29 "Small tools".

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of an identical text or by endorsement, at the latest by March 2002, and conflicting national standards shall be withdrawn at the latest by March 2002.

The annexes A and B are informative.

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 standard is intended to assist designers, manufacturers and suppliers of milling cutters to satisfy their obligations in respect of high speed machining applications. It defines requirements for design, confirmation testing and information for use that manufacturers and suppliers are to provide.

The prime objective is to ensure that milling cutters, employed for high speed machining, will be able to safely withstand the quadratic increase in centrifugal force resulting from their application at increased rotational speed.

It is based upon a collaborative German research project established to investigate the suitability of milling cutters for use in high speed machining operations.

This standard deals only with the tool and is not sufficient alone to ensure the safety. The safety of machinery is dealt with by other specific safety standards.

This standard takes account of cutting conditions only by requiring the manufacturer to provide application information.

Informative annex A provides guidance for reduction of hazards by design and informative annex B explains the scope limits.

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### 1 Scope

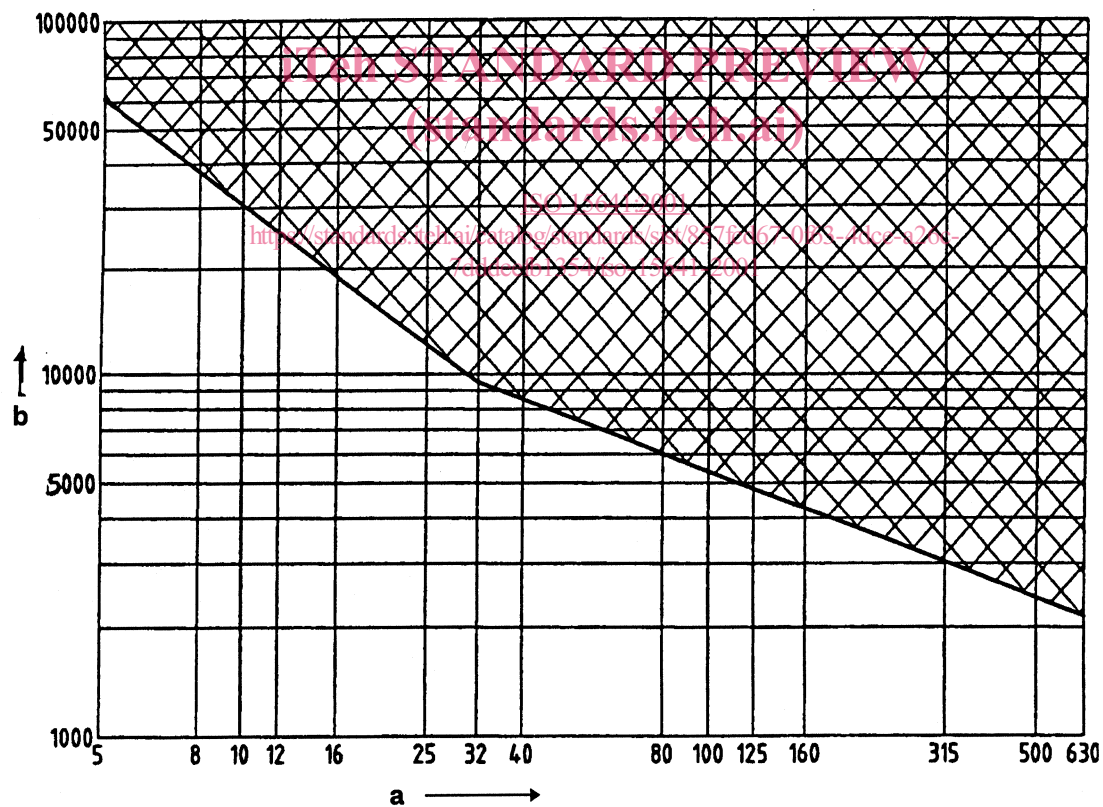
This standard deals with the principle hazards arising from use of milling cutters, e.g. milling cutters according to ISO 3855, used for high speed machining (chip removal machining at increased peripheral speeds) on metal working machine tools and prescribes safety requirements.


It specifies design methods, centrifugal force test procedures, operational limits and the provision of information that will lead to minimisation or elimination of these hazards.

The standard is applicable to milling cutters which are intended for operation at speeds in accordance with figures 1 and 2.

These figures respectively define the rotational speed limits and peripheral speed limits for specific cutter diameters.

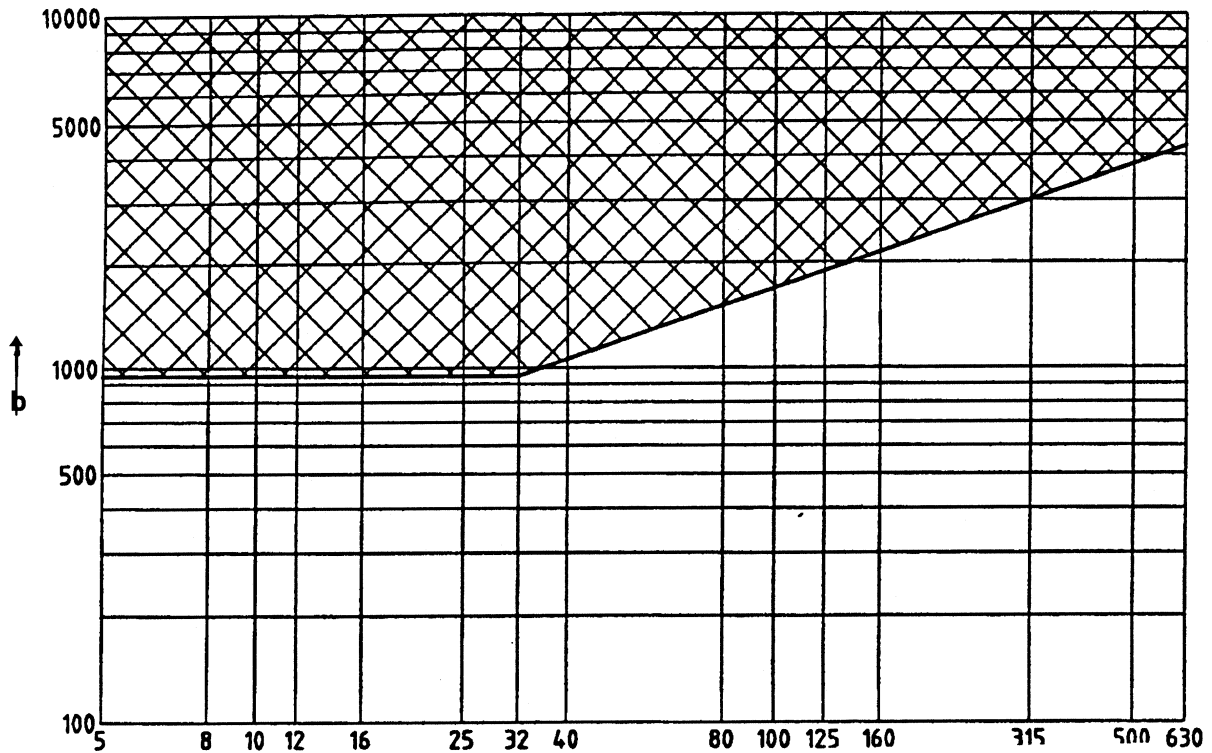
NOTE A detailed explanation is provided in annex B.



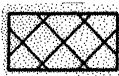
 Scope of standard

- a Maximum diameter of tool  $D$  in mm
- b Rotational speed  $n$  in min<sup>-1</sup>

Figure 1 - Rotational speed  $n$  vs maximum diameter of tool  $D$



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Scope of standard

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a Maximum diameter of tool  $D$  in mm

b Velocity at  $D$  (speed  $v_D$  at maximum diameter of tool  $D$ ) in  $\frac{m}{min}$

Figure 2 - Velocity at  $D$  (speed  $v_D$ ) vs maximum diameter of tool  $D$

## 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 1070

Safety of machinery – Terminology

ISO 1940-1:1986

Mechanical vibration – Balance quality requirements of rigid rotors – Part 1: Determination of permissible residual unbalance

ISO 3002-1

Basic quantities in cutting and grinding – Part 1: Geometry of the active part of cutting tools – General terms, reference systems, tool and working angles, chip breakers

ISO 3855

Milling cutters – Nomenclature



### 3 Terms and definitions

For the purposes of this standard the terms and definitions given in EN 1070, ISO 3002-1 and the following apply:

#### 3.1 Tool classification terms

##### 3.1.1

##### **solid or one-piece cutter**

milling cutter which has no detachable parts. Its body and cutting part or parts are one piece.

##### 3.1.2

##### **composite cutter**

milling cutter in which the cutting part or parts (e.g. tips) are attached to the body by material bonding (e.g. by brazing).

##### 3.1.3

##### **complex cutter**

milling cutter in which one or more parts (e.g. indexable inserts, cartridges, clamping elements) are attached to the body by mechanical fastening (e.g. key bolt, screw bolt or clamp bolt fixing which operate by friction lock or form lock principles).

#### 3.2 Types of fixing

##### 3.2.1

##### **bonding**

securing of cutter parts with material bonding such as brazing, welding or gluing.

##### 3.2.2

##### **separable**

securing of cutter parts by detachable fastening(s). Examples are friction lock and form lock fixings, or a combination of these, which can be mounted and detached repeatedly.

##### 3.2.3

##### **friction lock**

means of securing cutter parts where friction force prevents the movement of parts in use.

##### 3.2.4

##### **form lock**

means of securing cutter parts where the shape and arrangement of parts prevents their movement in use.

#### 3.3 Terms for the designation of geometric parameters

##### 3.3.1

##### **maximum diameter of tool $D$**

maximum diameter of the circle created by cutter rotation. See  $D$  in figures 3, 4 and 5.

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