TECHNICAL REPORT

ISO/TR 17243-1

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Machine tool spindles — Evaluation of machine tool spindle vibrations by measurements on spindle housing —

Part 1:
Spindles with rolling element bearings and integral drives operating at speeds between 600 min^{-1} and 30 000 min^{-1}

Broches pour machines-outils — Évaluation des vibrations d'une broche pour machine-outil par mesurages sur le logement de la broche —

Partie 1: Broches à roulements à billes et moteurs intégrés opérant à des vitesses comprises entre 600 min^{-1} et 30 000 min^{-1}

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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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT), see the following URL: Foreword — Supplementary information.

The committee responsible for this document is ISO/TC 39, *Machine tools*, Subcommittee SC 2, *Test conditions for metal cutting machine tools*.

ISO/TR 17243 consists of the following parts, under the general title *Machine tool spindles — Evaluation of machine tool spindle vibrations by measurements on spindle housing*:

— *Part 1: Spindles with rolling element bearings and integral drives operating at speeds between 600 min^{-1} and 30 000 min^{-1}*

— *Part 2: Direct driven spindles and belt driven spindles with rolling element bearings operating at speeds between 600 min^{-1} and 30 000 min^{-1}*

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Introduction

This part of ISO/TR 17243 provides specific guidance for assessing the severity of vibration measured on the spindle housing at customer site or at the machine tool manufacturer test facilities.

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Machine tool spindles — Evaluation of machine tool spindle vibrations by measurements on spindle housing —

Part 1: Spindles with rolling element bearings and integral drives operating at speeds between 600 min^{-1} and 30 000 min^{-1}

1 Scope

This part of ISO/TR 17243 provides information on how to assess the severity of machine tool spindle vibrations measured on the spindle housing. The vibration criteria provided in this part of ISO/TR 17243 apply to spindles with integral drive intended for stationary machine tools with nominal operating speeds between 600 min^{-1} and 30 000 min^{-1}. This part of ISO/TR 17243 only applies to spindles with rolling element bearing types.

This part of ISO/TR 17243 applies to spindles assembled on metal cutting machine tools.

This part of ISO/TR 17243 is applicable for testing, periodic verification, and continuous monitoring.

Spindles with bearing types other than rolling element bearings are excluded from this part of ISO/TR 17243.

This part of ISO/TR 17243 does not address geometrical accuracy of axes of rotation (see ISO 230-7).

This part of ISO/TR 17243 does not address unacceptable cutting performance with regards to surface finish and accuracy.

This part of ISO/TR 17243 does not address vibration severity issues of machine tool spindles operating at speeds below 600 min^{-1} or exceeding 30 000 min^{-1} due to lack of supporting vibration data and limitations in many vibration measurement instruments. Also, due to lack of data, machine tool spindles with bearing types other than rolling element bearings are excluded from this part of ISO/TR 17243.

This part of ISO/TR 17243 does not address frequency domain analyses such as fast fourier transform (FFT) analyses, envelope analyses, or other similar techniques.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 1925, *Mechanical vibration — Balancing — Vocabulary*

ISO 1940-1, *Mechanical vibration — Balance quality requirements for rotors in a constant (rigid) state — Part 1: Specification and verification of balance tolerances*

ISO 2041, *Mechanical vibration, shock and condition monitoring — Vocabulary*

ISO 2954:2012, *Mechanical vibration of rotating and reciprocating machinery — Requirements for instruments for measuring vibration severity*

ISO 13372, *Condition monitoring and diagnostics of machines — Vocabulary*

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3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 1925, ISO 2041, ISO 13372, ISO 2954, and the following apply.

NOTE A concept limited to a special meaning in a particular context is indicated by designating the subject field in angle brackets (<, >) before the definition. For example, in the context of spindle condition monitoring for the term entry for alert, see 3.11.

3.1
belt driven spindle
spindle where the power transmission is achieved by a belt between the drive motor and the spindle

3.2
direct driven spindle
machine tool spindle in a motor-coupling-spindle configuration with no belts, gears, or other power transmitting elements in the power train

3.3
gear driven spindle
machine tool spindle with one or more power transmitting gear units in the power train

Note 1 to entry: Gear driven spindles may also incorporate coupling and/or belts in the power train.

3.4
spindle with integral drive
spindle unit where the rotor of the drive motor is the rotor of the spindle

3.5
short term
<spindle condition monitoring> time period of six months or shorter

Note 1 to entry: Time periods may differ for specific spindle types and/or operational conditions.

3.6
long term
<spindle condition monitoring> time period of longer than six months

Note 1 to entry: Time period may differ for specific spindle types and/or operational conditions.

3.7
machine condition monitoring
detection, collection, and interpretation of information and data that indicate the spindle condition of a machine tool spindle

3.8
spindle condition
root-mean-square (RMS) values for vibration velocity and acceleration of machine tool spindles as defined by specifications

3.9
short term spindle condition
STSC
parameter indicating the short term spindle condition of a machine tool spindle

3.10
long term spindle condition
LTSC
parameter indicating the long term spindle condition of a machine tool spindle

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