TECHNICAL REPORT

ISO/TR 17243-3

First edition
2020-02

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

Part 3: Gear-driven spindles with rolling bearings operating at speeds between 600 r/min and 12 000 r/min

Broches pour machines-outils — Évaluation des vibrations d'une broche pour machine-outil par mesurage sur le corps de broche —

Partie 3: Broches à roulements à entraînement par engrenages opérant à des vitesses entre 600 tr/min et 12 000 tr/min

Reference number
ISO/TR 17243-3:2020(E)

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ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Fax: +41 22 749 09 47
Email: copyright@iso.org
Website: www.iso.org

Published in Switzerland

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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).

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For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 39, *Machine tools*, Subcommittee SC 2, *Test conditions for metal cutting machine tools*.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

A list of all parts in the ISO 17243 series can be found on the ISO website.

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

Part 3: Gear-driven spindles with rolling bearings operating at speeds between 600 r/min and 12 000 r/min

IMPORTANT — The electronic file of this document contains colours which are considered to be useful for the correct understanding of the document. Users should therefore consider printing this document using a colour printer.

1 Scope

This document provides information on how to assess the severity of machine tool spindle vibrations measured on the spindle housing. It gives specific guidance for assessing the severity of vibration measured on the spindle housing at customer sites or at the machine tool manufacturer's test facilities.

Its vibration criteria apply to gear-driven spindles intended for stationary machine tools with nominal operating speeds between 600 r/min and 12 000 r/min.

It is applicable to those spindles of the rolling bearing types only, to spindles assembled on metal cutting machine tools, and for testing, periodic verification, and continuous monitoring.

It does not address:

— geometrical accuracy of axes of rotation (see ISO 230-7);

— unacceptable cutting performance with regards to surface finish and accuracy;

— vibration severity issues of machine tool spindles operating at speeds below 600 r/min or exceeding 12 000 r/min (due to lack of supporting vibration data); or

— frequency domain analyses such as fast Fourier transform (FFT) analyses, envelope analyses or other similar techniques.

Annex A presents an introduction to alternative bearing condition assessment techniques.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 1925, *Mechanical vibration — Balancing — Vocabulary*

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

ISO 2954, *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 2954, ISO 13372 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

3.1
alarm
<spindle condition monitoring> condition where the vibration velocity magnitude [*LTSC* (3.6.1)] indicates increased dynamic load on the bearings and/or vibration acceleration magnitude [*STSC* (3.6.2)] indicates a moderate spindle bearing degradation

3.2
alert
<spindle condition monitoring> condition where a significant change in spindle vibration magnitude [*STSC* (3.6.2) or *LTSC* (3.6.1)], with respect to normal values, has been detected

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 can also incorporate coupling and/or belts in the power train.

3.4
long term
<spindle condition monitoring> time period of longer than six months

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

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

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

3.6
spindle condition
root-mean-square (r.m.s) values for vibration velocity and acceleration of machine tool spindles as defined by specifications

3.6.1
long-term spindle condition
LTSC
parameter indicating the condition of a machine tool spindle in the *long term* (3.4)

3.6.2
short-term spindle condition
STSC
parameter indicating the condition of a machine tool spindle in the *short term* (3.6)

3.7
steady-state operating temperature
<spindle condition monitoring> condition where the machine tool spindle has been running for a sufficient time to reach a stable operating temperature

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