
**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*



This document is a preview generated by ERS



COPYRIGHT PROTECTED DOCUMENT

© ISO 2020

All rights reserved. Unless otherwise specified, or required in the context of its implementation, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

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

Contents

Page

Foreword	v
1 Scope	1
2 Normative references	1
3 Terms and definitions	2
4 Preliminary operations	3
4.1 General	3
4.2 Process load	3
4.3 Spindle speed	3
4.4 Thermal conditions	3
4.5 Spindle position and orientation	4
4.6 Gear selection	4
4.7 Tool or workpiece balancing	4
4.7.1 General	4
4.7.2 Spindle vibration measurements with a tool/workpiece mounted in the spindle	4
4.7.3 Spindle vibration measurements without tool/workpiece	4
4.8 Spindle chuck	4
4.9 Spindle cooling	4
4.10 Drawbar	4
4.11 Background vibration	5
4.12 Idle operation	5
5 Measurement and operational procedures	5
5.1 Measuring instruments	5
5.2 Measurement locations/directions	5
5.2.1 General	5
5.2.2 Naming convention for measurement locations	7
5.3 Sensor mounting procedures	7
6 Evaluation parameters	8
6.1 Vibration velocity parameter	8
6.1.1 General	8
6.1.2 Resonance exclusion criteria	8
6.2 Vibration acceleration parameter	9
7 Spindle classification	10
7.1 General	10
7.2 Classification according to maximum spindle speed	10
7.3 Classification according to bearing type	10
8 Evaluation	10
8.1 General	10
8.1.1 Overview	10
8.1.2 Measurement uncertainty	11
8.2 Criterion I: vibration magnitude	11
8.2.1 General	11
8.2.2 Evaluation zones	11
8.2.3 Exemplary evaluation zone boundaries	11
8.3 Criterion II: change in vibration magnitude	11
8.4 General zone boundaries	12
8.5 Examples of evaluation zone boundary values	13
8.6 Operational limits	13
8.6.1 General	13
8.6.2 Setting of alerts	13
8.6.3 Setting of alarms	13
8.6.4 Setting of the threshold for shutdown	14

Annex A (informative) Introduction to alternative bearing condition assessment techniques	15
Bibliography	17

This document is a preview generated by EVS

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 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.

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*