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Machine tools — Short-term capability evaluation of machining processes on metal-cutting machine tools

*Machines-outils — Évaluation de la capacité des procédés d'usinage
des machines-outils travaillant par enlèvement de métal*



Reference number
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CONTENTS

Foreword	iv
Introduction	v
1 Scope	1
2 Normative references	1
3 Terms and definitions	1
4 Symbols	4
4.1 Uppercase letters.....	4
4.2 Lowercase letters.....	5
4.3 Greek letters.....	5
5 Preliminary remarks	6
6 Procedure for short-term capability evaluation	7
6.1 General	7
6.2 Agreements.....	8
6.3 Warm-up procedure	10
6.4 Adjustment.....	10
6.5 Production.....	11
6.6 Measurement	11
6.7 Computation and analysis	12
6.7.1 General	12
6.7.2 Trend correction.....	14
6.7.3 Outlier management.....	15
6.7.4 Stability of the process.....	15
6.7.5 Calculation of indices	16
7 Factors influencing short-term capability evaluation	17
7.1 General	17
7.2 Thermal influences.....	18
7.3 Influences due to measuring uncertainty.....	19
7.4 Influences arising from statistical analysis.....	19
7.4.1 Confidence level and sample size	19
7.4.2 Type of distribution	19
Annex A (informative) Additional information related to statistical evaluations	21
Annex B (informative) Agreement forms	29
Annex C (informative) Evaluation forms	33
Annex D (informative) Examples of capability agreements and analysis	37
Bibliography	45

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).

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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*.

This second edition cancels and replaces the first edition (ISO 26303:2012), which has been technically revised. The main changes compared with the previous edition are as follows:

- additional explanations have been added in 6.6 "Measurement" and for Formula (23);
- the indices of variables in Formulae (3) and (18) have been corrected;
- agreement forms 2 to 4 of Annex B, analysis form 2 of Annex C, agreement forms 3 and 4 of Annex D and analysis forms 1 and 2 of Annex D have been corrected;
- the references in Figure 2 have been revised;
- Figure A.1 has been improved;
- the status of Annexes B and C has been changed to informative;
- the formulae in analysis form 4 of Annex C and in analysis form 4 of Annex D have been corrected;
- the Bibliography has been updated.

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.

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Introduction

The evaluation of the short-term capability of the machining process is a different approach in machine tool assessment compared with machine tool performance testing methods, which are covered by a number of International Standards, e.g. ISO 230 (all parts) and other machine tool type specific standards. The main differences are machining a sample batch of test pieces and definition of the relevant influencing factors as well as the statistical conditioning and analysis of the workpiece quality related data obtained during such tests.

This document is the result of a project guided closely by an international working group, and summarized in order to make the information available to as many interested parties as possible.

Especially for large batch production, short-term process capability estimates, as well as capacity measures, are very often applied in addition to testing of machine tool performances. In fact, machine tool users increasingly employ statistical process control (SPC) techniques in their activities and frequently ask the machine suppliers/manufacturers to become system suppliers as well, giving them responsibilities for the machining process too.

Statistical methods in process management are covered by ISO 22514 (all parts).

For the purposes of machine tool acceptance based on the test of its capability in machining a specified workpiece, both requirements and methods stated by individual users differ widely, due to the absence of a recognized International Standard. Long-winded discussions and adaptation processes during the acceptance tests are, therefore, often necessary, delaying delivery to the customer and causing great time- and cost-related expenditure. This document provides a unified procedure for the acceptance test of a machine tool based on its short-term process capability. It introduces:

- the short-term capability of a given process, which employs the machine tool under test, the machining process, tooling and clamping applied, as well as the workpiece properties;
- the estimate of relevant machine capability indexes.

This document adapts to and conforms to the specifications established in ISO 22514 (all parts). However, the term “process performance index” specified in ISO 3534-2:2006 and used in ISO 22514-3:2020 corresponds for normal distribution to the term “short-term capability” in this document. The term “short-term capability” has been widely used in the machine tool industry for many years; therefore, ISO/TC 39/SC 2 decided to maintain this term.

Combined with the statistical evaluation, many influencing factors significantly restrict the fraction of tolerance interval covered by machine tool variations. As a consequence, the machine capability indices are specified in conjunction with the test conditions and the required tolerance limits.