
Test code for machine tools —

Part 10:

**Determination of the measuring
performance of probing systems of
numerically controlled machine tools**

Code d'essai des machines-outils —

*Partie 10: Détermination des performances de mesure des systèmes de
palpage des machines-outils à commande numérique*



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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 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 third edition cancels and replaces the second edition (ISO 230-10:2016), which has been technically revised.

The main changes compared to the previous edition are as follows:

- The document scope has been revised to include specification in [7.2](#), [7.3](#) and [8.2](#);
- a definition for laser light barrier principle is added in [3.2.12](#);
- [Figures 1, 4, 6](#) and [7](#) have been revised;
- Symbols of variables in [Formulae \(3\)](#) and [\(4\)](#) have been changed to be consistent with symbols in [8.2.8.4.1](#);
- a new subclause [7.3](#) on "Determination of the performance of bore gauge systems" has been added.
- a new subclause [8.2](#) on "Non-contacting laser light barrier tool measuring systems" has been added.

A list of all parts in the ISO 230 series can be found on the ISO website.

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.

Introduction

The purpose of ISO 230 (all parts) is to standardize methods of testing the accuracy of machine tools, excluding portable power tools.

This document specifies test procedures to evaluate the measuring performance of contacting and non-contacting probing systems integrated with CNC machine tools. The test procedures are not intended to distinguish between the various causes of errors. They intend to demonstrate the combined influence of the environment, machine tool, probing system and probing software on the measuring performance.

The results of these tests do not reflect on the performance of the machine tool in a metal cutting mode. When the tests are required for acceptance purposes, it is up to the user to choose the tests that are of interest, in agreement with the manufacturer/supplier.

The results of these tests do not reflect on the performance of the machine tool used as a coordinate measuring machine (CMM). Such performance involves traceability issues and it is intended that they be evaluated based on methods of ISO 10360-2 and ISO 10360-5.

Test procedures to measure performance with touch trigger probes are given in [7.1](#) and [8.1](#), scanning probes in [7.2](#), bore gauge systems in [7.3](#), and with non-contacting tool measuring systems applying laser light barrier principle in [8.2](#).

Numerically controlled machine tools can apply probing systems in machining process applications, such as

- identification that the correct workpiece has been loaded before machining,
- location and/or alignment of the workpiece,
- dimensional measurement of the workpiece after machining, but while still on the machine tool,
- measurement of the position and orientation of the machine tool rotary axes,
- measurement and setting of the cutting tool (radius, length and offset of the tool), and
- detection of tool breakage.

Test code for machine tools —

Part 10:

Determination of the measuring performance of probing systems of numerically controlled machine tools

1 Scope

This document specifies test procedures to evaluate the measuring performance of probing systems integrated with a numerically controlled machine tool. Test procedures for touch trigger probing systems and scanning probing systems operating in discrete-point measurement mode are specified in 7.1. Test procedures are specified for scanning probing systems in 7.2, for bore gauge systems in 7.3, for contacting tool measuring systems in 8.1, and for non-contacting tool measuring systems using the laser light barrier principle in 8.2.

The evaluation of the performance of the machine tool, used as a coordinate measuring machine (CMM), is outside the scope of this document. Such performance evaluation involves traceability issues, is strongly influenced by machine tool geometric accuracy and can, in addition to the machine tool probing system tests specified in this document, be evaluated according to ISO 10360-2 and ISO 10360-5.

Descriptions of test procedures in this document are referred to machining centres. However, tests apply in principle to most NC machine tools.

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 230-1:2012, *Test code for machine tools — Part 1: Geometric accuracy of machines operating under no-load or quasi-static conditions*

ISO 230-3:2020, *Test code for machine tools — Part 3: Determination of thermal effects*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

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

- IEC Electropedia: available at <https://www.electropedia.org/>
- ISO Online browsing platform: available at <https://www.iso.org/obp>

NOTE In measuring mode, machine tools are used like CMMs. Therefore, definitions for probing systems performance tests for CMMs apply also to machine tools. However, since not all machine tool users are familiar with the use of CMMs, this document provides definitions specifically with machine tools in mind, making sure that they do not create any conflicts with CMM definitions.