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Test conditions for machining centres —

Part 10: Evaluation of thermal distortions

Conditions d'essai des centres d'usinage —

Partie 10: Évaluation des déformations thermiques

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Contents

Page

Foreword ..... **iv**
Introduction ..... **v**
1 Scope **1**
2 Normative references **1**
3 Terms and definitions **1**
4 Preliminary remarks **1**
4.1 Measuring units 1
4.2 Reference to ISO 230-3 2
4.3 Measuring instruments 2
4.4 Testing sequence 2
4.5 Tests to be performed 2
4.6 Diagrams 2
4.7 Tolerances 2
4.8 Software compensation 2
5 Thermal tests **3**
Annex A (informative) **Machining tests to evaluate thermal distortions** **14**
Bibliography **44**

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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 second edition cancels and replaces the first edition (ISO 10791-10:2007), which has been technically revised.

The main changes are as follows:

— thermal test T4 has been added;

— Annex A has been added.

A list of all parts in the ISO 10791 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.

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Introduction

A machining centre is a numerically controlled machine tool capable of performing multiple machining operations, including milling, boring, drilling and tapping, as well as automatic tool changing from a magazine or similar storage unit in accordance with a machining programme. Most machining centres have facilities for automatically changing the direction in which the workpieces are presented to the tool.

The purpose of this document is to provide information on tests and checks which can be carried out for comparison, acceptance, maintenance or any other purpose.

Annex A presents three machining tests to evaluate thermal distortions of machining centres.

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Test conditions for machining centres —

Part 10:
Evaluation of thermal distortions

1 Scope

This document specifies, tests for the evaluation of thermal distortions of the machine tool structure and positioning system, for machining centres with vertical spindle, with numerically controlled linear axes of lengths up to 5 000 mm for the X-axis and up to 2 000 mm for the Y- and Z-axis. It also applies to machining centres with horizontal spindle with numerically controlled linear axes of lengths up to 5 000 mm for the X-axis, 3 200 mm for the Y-axis and 2 000 mm for the Z-axis.

This document specifies four tests:

— environmental temperature variation error;

— thermal distortion caused by a rotating spindle;

— thermal distortion caused by moving linear axes;

— thermal distortion caused by rotary motion of components.

This document is intended to be used with ISO 230-3.

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 terms and definitions given in ISO 230-1:2012 and ISO 230-3:2020 apply.

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

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

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

4 Preliminary remarks

4.1 Measuring units

In this document, all linear dimensions and deviations are expressed in millimetres. All angular dimensions are expressed in degrees. Angular deviations are, in principle, expressed in ratios; however,

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