BS ISO 10791-1:2015

BSI Standards Publication

Test conditions for machining centres

Part 1: Geometric tests for machines with horizontal spindle (horizontal Z-axis)

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This British Standard is the UK implementation of ISO 10791-1:2015. It supersedes BS ISO 10791-1:1998 which is withdrawn.

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A list of organizations represented on this committee can be obtained on request to its secretary.

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Test conditions for machining centres —

Part 1: Geometric tests for machines with horizontal spindle (horizontal Z-axis)

Conditions d'essai pour centres d'usinage —

Partie 1: Essais géométriques des machines à broche horizontale (axe Z horizontal)

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Contents

Page

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 on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword - Supplementary information

The committee responsible for this document is ISO/TC 39, *Machine tools*, SC 2, *Test conditions for metal cutting machine tools*.

This second edition cancels and replaces the first edition (ISO 10791-1:1998), which has been technically revised.

ISO 10791 consists of the following parts, under the general title *Test conditions for machining centres*:

— *Part 1: Geometric tests for machines with horizontal spindle (horizontal Z-axis)*

— *Part 2: Geometric tests for machines with vertical spindle or universal heads with vertical primary rotary axis (vertical Z-axis)*

— *Part 3: Geometric tests for machines with integral indexable or continuous universal heads (vertical Z-axis)*

— *Part 4: Accuracy and repeatability of positioning of linear and rotary axes*

— *Part 5: Accuracy and repeatability of positioning of work-holding pallets*

— *Part 6: Accuracy of speeds and interpolations*

— *Part 7: Accuracy of finished test pieces*

— *Part 8: Evaluation of contouring performance in the three coordinate planes*

— *Part 9: Evaluation of the operating times of tool change and pallet change*

— *Part 10: Evaluation of the thermal distortions*

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 program.

The object of ISO 10791 (all parts) is to supply information as wide and comprehensive as possible on tests which can be carried out for comparison, acceptance, maintenance, or any other purpose deemed necessary by user or manufacturer/supplier. ISO 10791 specifies, with reference to the relevant parts of ISO 230, several families of tests for machining centres with horizontal spindle, standing alone or integrated in flexible manufacturing systems.

This part of ISO 10791 also establishes the tolerances for the test results corresponding to general purpose and normal accuracy machining centres.

This part of ISO 10791 is also applicable, totally or partially, to other numerically controlled machines, when their configuration, components, and movements are compatible with the tests described herein.

Accessory spindle heads, forming the object of Annexes A through C in the first edition of this part of ISO 10791, are now covered by the more general ISO 17543-1, as they are not only used on machining centres.

In this edition of ISO 10791-1, the test of the table flatness (formerly G15) has been deleted for several reasons, among which are the following:

— the table surface is not normally used as a reference for the location of the workpiece;

— sometimes, the machine is supplied with some fixtures already mounted on the table;

— sometimes, the machine is provided with a receiver where several pallets can be mounted;

— for tests made during the working life of the machine, the surface might no longer be suitable for accurate measurements, mostly on large machines.

Test conditions for machining centres —

Part 1: Geometric tests for machines with horizontal spindle (horizontal Z-axis)

1 Scope

This part of ISO 10791 specifies, with reference to ISO 230-1, the geometric tests for machining centres (or other numerically controlled machines, where applicable) with horizontal spindle (i.e. horizontal Z-axis).

This part of ISO 10791 applies to machining centres having three numerically controlled linear axes (X-axis up to 5 000 mm length, Y-axis up to 3 200 mm length, and Z-axis up to 2 000 mm length), but refers also to supplementary movements, such as those of rotary, tilting, and swivelling tables. Movements other than those mentioned are considered as special features and the relevant tests are not included in this part of ISO 10791.

This part of ISO 10791 takes into consideration in Annexes A through D four possible types of tables, fixed and rotary, as hereunder described:

— Annex A: horizontal non-rotating tables;

— Annex B: tables rotating around a vertical B'-axis;

— Annex C: tables rotating around a vertical B'-axis and tilting around a horizontal A'-axis;

— Annex D: tables rotating around a horizontal A'-axis and swivelling around a vertical B'-axis.

This part of ISO 10791 does not consider accessory spindle heads, which are covered by ISO 17543-1:—[1)].

This part of ISO 10791 deals only with the verification of geometric accuracy of the machine and does not apply to the testing of the machine operation, which should generally be checked separately. Tests not concerning the pure geometric accuracy of the machine are dealt with in other parts of ISO 10791, as listed in the Foreword.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. 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 230-7:—[1)], *Test code for machine tools — Part 7: Geometric accuracy of axes of rotation*

ISO 841, *Industrial automation systems and integration — Numerical control of machines — Coordinate system and motion nomenclature*

ISO 10791-6:2014, *Test conditions for machining centres — Part 6: Accuracy of speeds and interpolations*

1) To be published.