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Test conditions for numerically controlled broaching machines — Testing of accuracy — Vertical surface type broaching machines

Conditions d'essai des machines à brocher à commande numérique — Contrôle de l'exactitude — Machines verticales à brocher

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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).

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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*.

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 series can be found on the ISO website.

NOTE In addition to the terms used in official ISO languages (English, French, Russian), this document gives the equivalent terms in the Italian and Persian languages. These are published under the responsibility of the national member bodies for Italy (UNI) and Iran (ISIRI). However, only the terms given in the official languages can be considered as ISO terms.

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Introduction

Most numerically controlled broaching machines are classified into two categories characterized by their particular configuration:

1) vertical surface type machines;

2) horizontal surface type machines.

The main application of numerically controlled surface type broaching machines is for generating slots and grooves in turbine disks.

The object of this document is to supply information as wide and comprehensive as possible on tests on numerically controlled broaching machines which can be carried out for comparison, acceptance, maintenance or any other purposes.

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Test conditions for numerically controlled broaching machines — Testing of accuracy — Vertical surface type broaching machines

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 specifies, with reference to ISO 230-1, the geometric tests on numerically controlled (NC) broaching machines of normal accuracy, with vertical axis acting for cutting operation. The accuracy of rotary axes, if available, is checked with reference to ISO 230-7.

This document also specifies, with reference to ISO 230-2, the positioning tests on vertical surface type broaching machines for both linear and rotary axes.

This document proposes test pieces containing broached slots and grooves with reference to ISO 230-1, cutting tests under finishing conditions. It also specifies the characteristics and dimensions of the test pieces themselves. This document is intended to supply minimum requirements for assessing the cutting accuracy of the machine.

This document also establishes the tolerances for the test results corresponding to general purpose and normal accuracy vertical surface type broaching machines equipped with numerical control.

This document explains different concepts or configurations and common features of NC vertical surface type broaching machines which are normally used in the manufacturing of turbine disks. It also provides a terminology and designation of controlled axes with reference to ISO 841.

This document deals only with the verification of the accuracy of the broaching machine. It does not apply to the operational testing of the machine (e.g. vibration, abnormal noise, stick-slip motion of components), nor to machine characteristics (e.g. speeds, feeds) as such checks are generally carried out before testing the accuracy.

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 230-2:2014, *Test code for machine tools — Part 2: Determination of accuracy and repeatability of positioning of numerically controlled axes*

ISO 230-7:2015, *Test code for machine tools — Part 7: Geometric accuracy of axes of rotation*

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3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 230-1, ISO 230-2, ISO 230-7 and the following apply.

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

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

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

3.1
surface broaching operation
machining process in which a *broach* (3.2) is pushed over an external surface to remove material by linear cutting

Note 1 to entry: Principal cutting motion is a relative translation of broach against the non-rotating workpieces and where the cutting energy is brought by the broach or workpiece motion.

3.2
broach
cutting tool that has multiple transverse cutting edges each with progressively increased size

3.3
broaching machine
machine tool in which broaching operation is executed

3.4
vertical broaching machine
broaching machine (3.3) whose main cutting axis (Z-axis) is vertical

3.5
vertical surface type broaching machine
vertical broaching machine (3.4) in which its *broach* (3.2) is pushed or pulled over an external surface of the workpiece to remove material

4 Terminology and designation of axes

See Figure 1 and Figure 2.

A common configuration of NC vertical surface type broaching machines with A-axis is shown in Figure 2. The nomenclature for the structural components of the broaching machine are shown in Figure 1.

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