Nederlandse norm

NEN-ISO 3070-1

(en)

Machine tools - Test conditions for testing the accuracy of boring and milling machines with horizontal spindle - Part 1: Machines with fixed column and movable table (ISO 3070-1:2007,IDT)

Vervangt NEN-ISO 3070-2:1997-08;
NEN-ISO 3070-0:1997,deels

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- ISO 3070-1:2007,IDT

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INTERNATIONAL STANDARD

ISO 3070-1

Third edition
2007-12-15

Machine tools — Test conditions for testing the accuracy of boring and milling machines with horizontal spindle —

Part 1: Machines with fixed column and movable table

Machines-outils — Conditions d'essai pour le contrôle de l'exactitude des machines à aléser et à fraiser à broche horizontale —

Partie 1: Machines à montant fixe et à table mobile

Reference number
ISO 3070-1:2007(E)

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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.

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The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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.

ISO 3070-1 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 ISO 3070-0:1982 and ISO 3070-2:1997, of which it constitutes a technical revision.

ISO 3070 consists of the following parts, under the general title *Machine tools — Test conditions for testing the accuracy of boring and milling machines with horizontal spindle*:

— *Part 1: Machines with fixed column and movable table*

— *Part 2: Machines with movable column and fixed table*

— *Part 3: Machines with movable column and movable table*

Introduction

It is generally accepted that horizontal spindle boring and milling machines fall into three categories characterized by their particular configuration:

a) machines with fixed column and movable table;

b) machines with movable column and fixed table;

c) machines with movable column and movable table.

In the past, all these types of machines and associated terminology were described in ISO 3070-0:1982. The relevant accuracy tests were described in ISO 3070-2:1997, ISO 3070-3:1997, and ISO 3070-4:1998 respectively. However, ISO/TC 39/SC 2 decided to integrate the descriptions and the terminology of these machines into appropriate parts of ISO 3070 describing the accuracy tests and to renumber the parts of this series accordingly.

INTERNATIONAL STANDARD **ISO 3070-1:2007(E)**

Machine tools — Test conditions for testing the accuracy of boring and milling machines with horizontal spindle —

Part 1: Machines with fixed column and movable table

1 Scope

This part of ISO 3070 specifies, with reference to ISO 230-1, ISO 230-2 and ISO 230-7, geometric tests, machining tests, spindle tests and tests for checking the accuracy and repeatability of positioning by numerical control of general purpose, normal accuracy, horizontal spindle boring and milling machines having a fixed column and movable table. This part of ISO 3070 also specifies the applicable tolerances corresponding to these tests.

This type of machine can be provided with spindle heads of different types, such as those with sliding boring spindle and milling spindle, sliding boring spindle and facing head, or ram or milling ram.

This part of ISO 3070 concerns machines having both longitudinal (Z-axis) and transverse (X-axis) movement of the table, a vertical movement of the spindle head (Y axis), movement of the boring spindle or ram (W axis) and, possibly, a feed movement of radial facing slide in the facing head (U axis), and that may include a rotary or indexing table.

NOTE In other parts of ISO 3070 spindle ram movement is designated as the Z axis.

This part of ISO 3070 deals only with the verification of the accuracy of the 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 referenced documents are indispensable for the application 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 230-1:1996, *Test code for machine tools — Part 1: Geometric accuracy of machines operating under no-load or finishing conditions*

ISO 230-2:2006, *Test code for machine tools — Part 2: Determination of accuracy and repeatability of positioning numerically controlled axes*

ISO 230-7:2006, *Test code for machine tools — Part 7: Geometric accuracy of axes of rotation*

ISO 1101:2004, *Geometrical Product Specifications (GPS) — Geometrical tolerancing — Tolerances of form, orientation, location and run-out*

3 Terminology and designation of axes

3.1 General

A boring and milling machine is a machine tool in which the principal cutting motion is the rotation of the cutting tool against the non-rotating workpiece and where the cutting energy is brought by the cutting tool rotation.

The cutting movement is generated by the rotation of the spindle(s) and, possibly, of the facing head.

3.2 Types of movement

The feed movements are as follows:

a) longitudinal, transverse and possibly rotary movements of the table;

b) vertical movement of the spindle head;

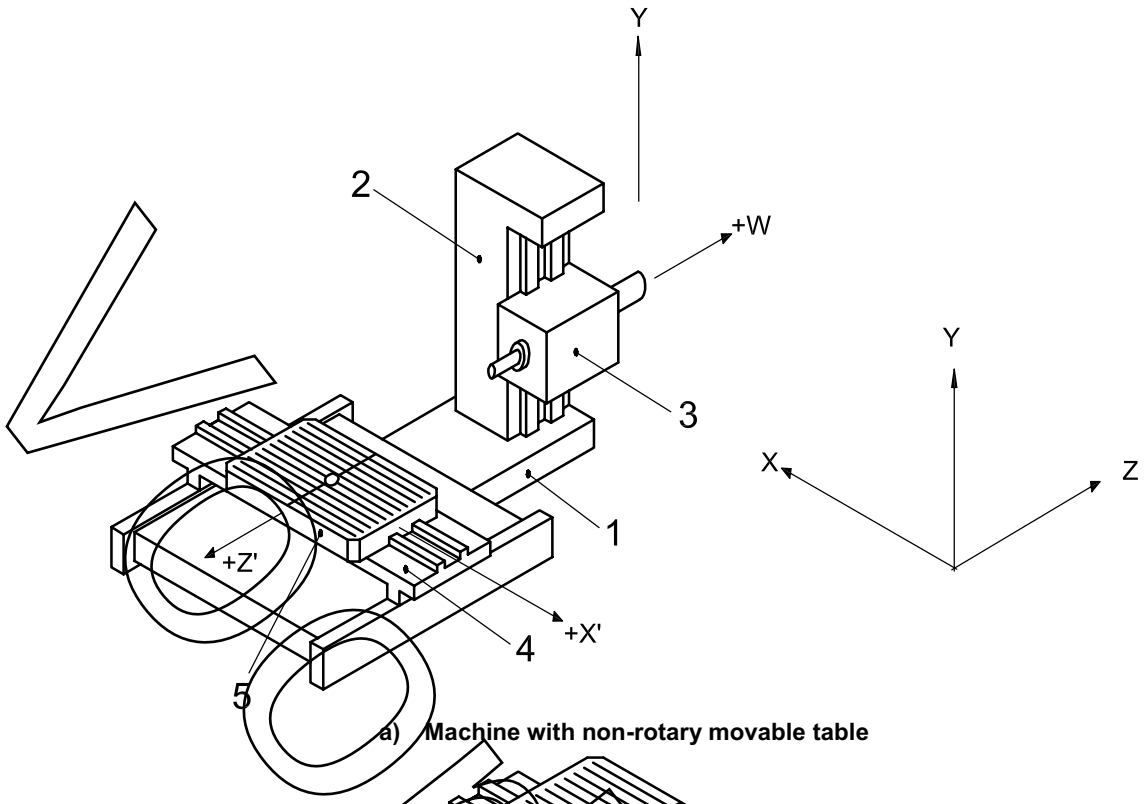
c) axial movement of the spindle;

d) possible movement of radial facing slide in the facing head.

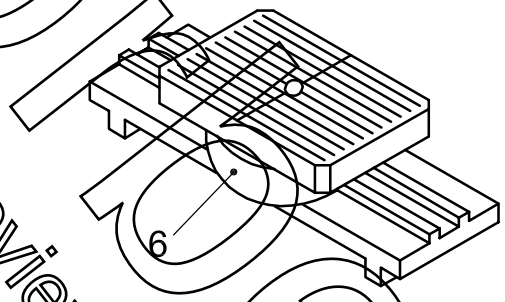
Table 1 provides the nomenclature for various structural components of machines shown in Figure 1. Figure 1 shows two possible configurations of boring and milling machines with fixed column and movable table: one with a non-rotary movable table and the other with an integral rotary table.

Table 1 — Nomenclature (see Figure 1)

Figure 1 ref.	English	French	German
1	bed	banc	Maschinenbett
2	column	montant du chariot porte-broche	Maschinenständer
3	spindle head	chariot porte-broche	Spindelstock
4	table saddle	traînard	Bettschlitten
5	table	table	Aufspanntisch
6	rotary table	table pivotante	Drehtisch



a) Machine with non-rotary movable table



b) Machine slide with integral rotary table

NOTE 1 ISO 841 nomenclature was not used here in respect of the W axis in order to ensure consistency in this part of ISO 3070 for machines with and without W axis.

NOTE 2 For components 1 to 6, see Table 1.

Figure 1 — Machines with movable table with and without integral rotary table

4 Definition of the machining operations carried out on these machines

4.1 Boring operations

Boring is a machining operation for generating holes of various sizes and geometries in which the principal cutting motion is the rotation of a single-point cutting tool against the non-rotating workpiece and where the cutting energy is brought by the cutting tool rotation.

Boring the diameter of cylindrical, conical, blind or through holes to the required size is achieved by using a boring bar to locate the cutting edge of the boring tool in a well-defined position with respect to the axis average line of the boring spindle.

In the case of coaxial bores situated on opposite faces of the same workpiece, the operation may be carried out using a boring bar, supported between the machine boring spindle and the steady stock located on the other side of the table. Alternatively, if the machine has a rotary table, such an operation can be carried out by rotating the table 180° to bore the opposite side of the workpiece with the same boring tool located on the

boring bar that is mounted on the boring spindle without any steady support (reverse boring). Although more economical, this alternative method requires closer tolerances for table angular positioning as well as for the axis of rotation errors.

4.2 Milling operations

Milling is a machining operation to generate non-axisymmetrical (non-rotational) surfaces of various geometries in which the principal cutting motion is the rotation of a cutting tool with multiple cutting edges against the non-rotating workpiece, and where the cutting energy is brought by the cutting tool rotation.

Milling operations mostly involve face milling or end milling. The tools are mounted either in the boring spindle taper (see Figure 2) or, as for face milling cutters, on the milling spindle nose.

5 Special remarks concerning particular elements

5.1 Spindle heads

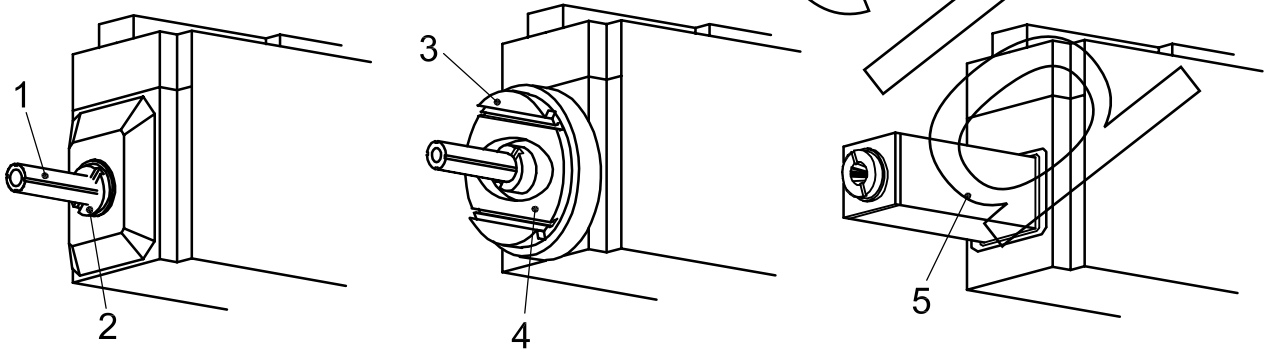
Reference should be made to Figure 2 for examples of the various types of head. Related nomenclature is given in Table 2.

Facing heads generally have a radial facing slide and are either integral or removable; the latter is considered an accessory.

It should be noted that the integral facing head may not always be mounted onto the milling spindle and may have its own bearing independent from the main spindle bearings.

Table 2 — Nomenclature (see Figure 2)

Figure 2 ref.	English	French	German
1	boring spindle	broche à aléser	Bohrspindel
2	milling spindle	broche à fraiser	Frässpindel
3	facing head	plateau à surfacer	Planscheibe
4	spindle head with facing head	tête de broche avec plateau à surfacer	Spindelstock mit Planscheibe
5	ram	coulisseau	Traghülse



a) Spindle head for boring and milling **b) Spindle head with facing head** **c) Spindle head with ram**

NOTE For elements 1 to 5, see Table 2.

Figure 2 — Types of spindle head

Bestelformulier

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