



Handläggande organ

SVENSK MATERIAL- & MEKANSTANDARD, SMS

Fastställd

2000-08-25

Utgåva

1

Sida

1 (1+19)

© Copyright SIS. Reproduction in any form without permission is prohibited.

Test conditions for high accuracy turret and single spindle coordinate drilling and boring machines with table of fixed height with vertical spindle – Testing of the accuracy – Part 1: Single column type machines

The International Standard ISO 3686-1:2000 has the status of a Swedish Standard. This document contains the official English version of ISO 3686-1:2000.

This standard supersedes the Swedish Standard SS-ISO 3686, ed. 1.

Swedish Standards corresponding to documents referred to in this Standard are listed in "Catalogue of Swedish Standards", issued by SIS. The Catalogue lists, with reference number and year of Swedish approval, International and European Standards approved as Swedish Standards as well as other Swedish Standards.

Verktygsmaskiner – Acceptanskontroll av noggranna koordinatbormaskiner med fast bordhöjd och med vertikal spindel eller med revolverhuvud – Noggrannhetskontroll – Del 1: Enpelarmaskiner

Den internationella standarden ISO 3686-1:2000 gäller som svensk standard. Detta dokument innehåller den officiella engelska versionen av ISO 3686-1:2000.

Standarden ersätter SS-ISO 3686, utg. 1.

Motsvarigheten och aktualiteten i svensk standard till de publikationer som omnämns i denna standard framgår av "Katalog över svensk standard", som ges ut av SIS. I katalogen redovisas internationella och europeiska standarder som fastställts som svenska standarder och övriga gällande svenska standarder.

ICS 25.080.20; 25.080.40

Standarder kan beställas hos SIS Förlag AB som även lämnar allmänna upplysningar om svensk och utländsk standard.
Postadress: SIS, Box 6455, 113 82 STOCKHOLM
Telefon: 08 - 610 30 00. Telefax: 08 - 30 77 57
E-post: sis.sales@sis.se. Internet: www.sisforlag.se

Upplysningar om **sakinnehållet** i standarden lämnas av SMS.
Telefon: 08 - 459 56 00. Telefax: 08 - 667 85 42
E-post: info@sms-standard.se

Prisgrupp P

Tryckt i oktober 2000

Contents

Page

Foreword.....	iv
1 Scope	1
2 Normative reference	1
3 Terminology and designation of axes	2
4 Preliminary remarks	3
4.1 Measuring Units	3
4.2 Reference to ISO 230-1	3
4.3 Testing sequence.....	3
4.4 Tests to be performed	3
4.5 Measuring instruments	3
4.6 Minimum tolerance	3
4.7 Machining tests.....	3
5 Geometric tests.....	4
5.1 Linear axes	4
5.2 Table.....	8
5.3 Spindle.....	12
5.4 Multi-spindle turret head.....	15
6 Machining test.....	16
Bibliography	17

ISO 3686-1:2000(E)

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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 3.

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 part of ISO 3686 may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

International Standard ISO 3686-1 was prepared by Technical Committee ISO/TC 39, *Machine tools*, Subcommittee SC 2, *Test conditions for metal cutting machine tools*.

This first edition of ISO 3686-1, together with ISO 3686-2, cancel and replace ISO 3686:1976, of which they constitute a technical revision.

ISO 3686 consists of the following parts, under the general title *Test conditions for high accuracy turret and single spindle coordinate drilling and boring machines with table of fixed height with vertical spindle — Testing of the accuracy*:

- *Part 1: Single column type machines*
- *Part 2: Portal type machines with moving table*

Test conditions for high accuracy turret and single spindle coordinate drilling and boring machines with table of fixed height with vertical spindle — Testing of the accuracy —

Part 1: Single column type machines

1 Scope

This part of ISO 3686 specifies, with reference to ISO 230-1; both geometric tests and machining tests on vertical spindle, single column type coordinate drilling and boring machines. It also specifies the applicable tolerances corresponding to the above-mentioned tests.

It should be noted that, besides drilling and boring operations, it may be possible to carry out light milling operations with these machines. However, this part of ISO 3686 does not deal with jig boring machines or machining centres.

This part of ISO 3686 deals only with the verification of the accuracy of the machine. It does not apply to the testing of the machine operation (vibrations, abnormal noises, the stick-slip motion of components, etc.), nor the machine characteristics (such as speeds, feeds, etc.), which should generally be carried out before testing the accuracy.

This part of ISO 3686 provides the terminology used for the principle components of the machine and indicates the designation of the axes in accordance with ISO 841.

2 Normative reference

The following normative document contains provisions which, through reference in this text, constitute provisions of this part of ISO 3686. For dated references subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this part of ISO 3686 are encouraged to investigate the possibility of applying the most recent edition of the normative document indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

ISO 230-1:1996 *Test code for machine tools — Part 1: Geometric accuracy of machines operating under no-load or finishing conditions.*

ISO 3686-1:2000(E)

3 Terminology and designation of axes

See Figure 1 and Table 1

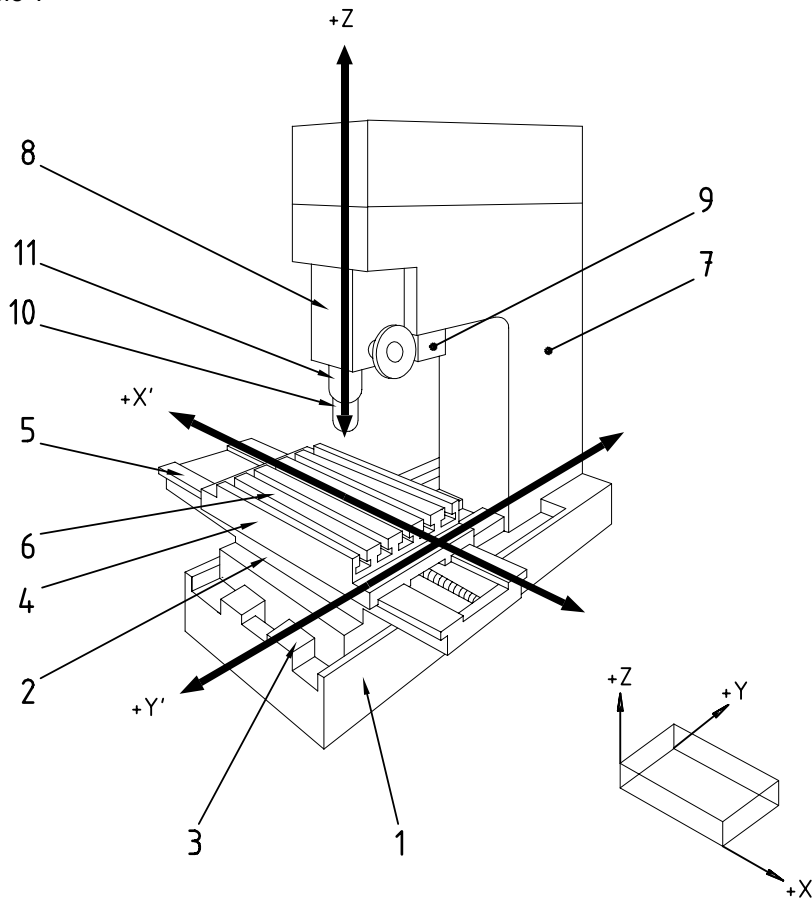


Figure 1

Table 1

Ref.	English	French	German
1	Bed	Banc	Bett
2	Transverse saddle	Chariot transversal	Querschleiten
3	Slideways for saddle	Glissières de chariot transversal	Querschleiten-Führungsbahnen
4	Table	Table	Tisch
5	Slideways for table	Glissières de table	Tisch-Führungsbahnen
6	Table surface	Surface de fixation	Aufspannfläche
7	Column	Montant	Ständer
8	Spindle head	Poupée porte-broche	Spindelstock
9	Slide for the spindle head	Guidage de poupée porte-broche	Spindelstockführung
10	Spindle	Broche	Spindel
11	Quill	Fourreau porte-broche	Spindelpinole

NOTE In addition to terms used in two of the three official ISO languages (English and French), this table gives the equivalent term in German; these are published under the responsibility of the member body for Germany (DIN). However, only the terms given in the official languages can be considered as ISO terms.

4 Preliminary remarks

4.1 Measuring Units

In this part of ISO 3686, all linear dimensions, deviations and corresponding tolerances are expressed in millimetres; angular dimensions are expressed in degrees, and angular deviations and the corresponding tolerances are expressed primarily in ratios, but in some cases microradians or arcseconds may be used for clarification purposes. The equivalence of the following expressions should be kept in mind:

$$0,010/1\ 000 = 10\ \mu\text{rad} \approx 2''$$

4.2 Reference to ISO 230-1

To apply this part of ISO 3686, reference shall be made to ISO 230-1, especially for the installation of the machine before testing, warming up of the spindle and other moving components, description of measuring methods and recommended accuracy of testing equipment.

In the "Observations" block of the tests described in clauses 5 and 6, the instructions are followed by a reference to the corresponding clause in ISO 230-1, in cases where the test concerned is in compliance with the specifications of ISO 230-1.

4.3 Testing sequence

The sequence in which the tests are presented in this part of ISO 3686 in no way defines the practical order of testing. In order to make the mounting of instruments or gauging easier, tests may be performed in any order.

4.4 Tests to be performed

When testing a machine, it is not always necessary nor possible to carry out all the tests described in this part of ISO 3686. When the tests are required for acceptance purposes, it is up to the user to choose, in agreement with the supplier/manufacturer, those tests relating to the components and/or the properties of the machine which are of interest. These tests are to be clearly stated when ordering a machine.

It should be noted that, for turret head-drilling machines, all the geometric tests that concern the rotation of the spindle, i.e., tests G9, G10, G11 and G12, should be carried out on all spindles.

4.5 Measuring instruments

The measuring instruments indicated in the tests described in clauses 5 and 6 are examples only. Other instruments measuring the same quantities and having at least the same accuracy may be used. Dial gauges shall have a resolution of 0,001 mm.

4.6 Minimum tolerance

When the tolerance for a geometric test is established for a measuring length different from that given in this part of ISO 3686 (see 2.311 of ISO 230-1:1996), it shall be taken into consideration that the minimum value of tolerance is 0,005 mm.

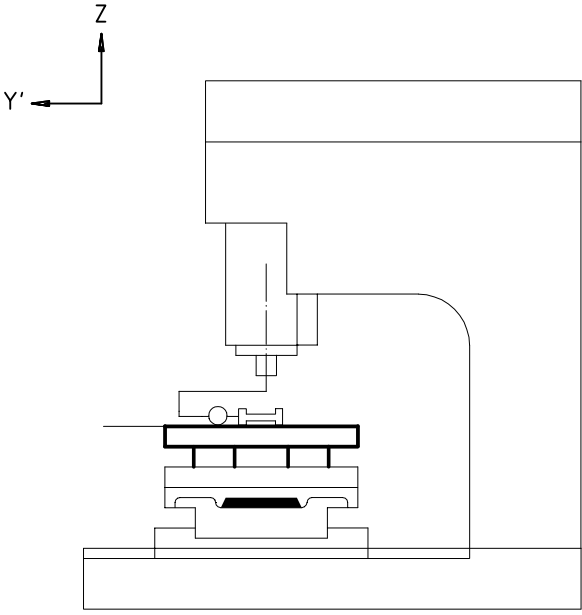
4.7 Machining tests

Machining tests shall be made with finishing cuts only, not with roughing cuts which are liable to generate appreciable cutting forces.

ISO 3686-1:2000(E)

5 Geometric tests

5.1 Linear axes

<p>Object</p>	<p>G1</p>
<p>Checking of straightness of the X-axis motion in the horizontal XY-plane (EYX).</p>	
<p>Diagram</p> 	
<p>Tolerance</p> <p>0,015 for any measuring length of up to 1 000</p>	<p>Measured deviation</p>
<p>Measuring instruments</p> <p>Straightedge and dial gauge or microscope and taut wire or optical methods</p>	
<p>Observations and references to ISO 230-1:1996 5.211, 5.23, 5.231.2 and 5.232.1</p> <p>For all machine configurations, either the straightedge, the taut wire or the straightness reflector shall be placed on the table. If the spindle can be locked, either the dial gauge, the microscope or the interferometer may be mounted on it; if the spindle cannot be locked, the instrument shall be placed on the spindle head of the machine.</p> <p>The measuring line should pass as close to the centre of the table as possible.</p>	