INTERNATIONAL STANDARD ISO 3070/II

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Test conditions for boring and milling machines with horizontal spindle — Testing of the accuracy — Part II : Floor type machines

Conditions d'essai des machines à aléser et à fraiser à broche horizontale — Contrôle de la précision — Partie II : Machines à montant mobile - à taque

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FOREWORD

ISO (the International Organization for Standardization) is a worldwide federation of national standards institutes (ISO member bodies). The work of developing International Standards is carried out through ISO technical committees. Every member body interested in a subject for which a technical committee has been set up 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.

Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council.

International Standard ISO 3070/II was developed by Technical Committee ISO/TC 39, *Machine tools,* and was circulated to the member bodies in March 1977.

It has been approved by the member bodies of the following countries :

Australia	Italy	Sweden
Belgium	Korea, Rep. of	Switzerland
Brazil	Mexico	Turkey
France	Poland	United Kingdom
Germany	Romania	U.S.A.
Hungary	South Africa, Rep. of	Yugoslavia
India	Spain	

No member body expressed disapproval of the document.

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Test conditions for boring and milling machines with horizontal spindle — Testing of the accuracy — Part II : Floor type machines

1 SCOPE AND FIELD OF APPLICATION

This International Standard specifies, with reference to ISO/R 230, both geometrical and practical tests on general purpose and normal accuracy boring and milling machines with horizontal spindle — floor type machines — and the corresponding permissible deviations which apply.

These machines can be provided with spindle heads of different types corresponding in most cases to figures :

4 (spindle head with milling spindle and boring spindle)

5 (spindle head with sliding boring spindle and with facing head)

6 (spindle head with ram or milling arm)

of Part 0 : "General introduction" of ISO 3070.

It must be made clear that this International Standard concerns machines which have both a transverse movement of the column on the bed, a vertical movement of the spindle head, an axial movement of the boring spindle and possibly a feed movement of the radial facing slide in the facing head. They can be provided with a floor supporting workpieces but this device is not taken into consideration in this International Standard.

Some machines also have an intermediate saddle having slideways between bed and column to achieve additional longitudinal feed movement of the column parallel with the spindle axis.

This International Standard deals only with the verification of accuracy of the machine. It does not apply to the testing of the running of the machine (vibrations, abnormal noises, stick-slip motion of components, etc.) or to machine characteristics (such as speeds, feeds, etc.) which should generally be checked before testing accuracy.

2 PRELIMINARY REMARKS

2.1 In this International Standard, deviations and ranges are expressed in millimetres and in inches.

2.2 To apply this International Standard, reference should be made to ISO/R 230, especially for installation of the machine before testing, warming up of spindles or other moving parts, description of measuring methods and recommended accuracy of testing equipment.

2.3 Users of this International Standard are reminded that a movement is said to be longitudinal when it is parallel to the axis of the machine spindle and is said to be transversal when it is in the perpendicular direction.

2.4 The sequence in which the geometrical tests are given is related to the sub-assemblies of the machine and this in no way defines the practical order of testing. In order to make the mounting of instruments or gauging easier, tests may be applied in any order.

2.5 When inspecting a machine, it is not always possible or necessary to carry out all the tests given in this International Standard. It is up to the user to choose, in agreement with the manufacturer, those tests relating to the properties which are of interest to him, but these tests are to be clearly stated when ordering a machine.

2.6 Practical tests should be made with finishing cuts.

2.7 When establishing the tolerance for a measuring range different from that given in this International Standard (see clause 2.311 in ISO/R 230) it should be taken into consideration that the minimum value of tolerance is 0,002 5 mm (0,000 1 in) for both geometrical and practical tests.

3 REFERENCES

ISO/R 230, *Machine tool test code.*

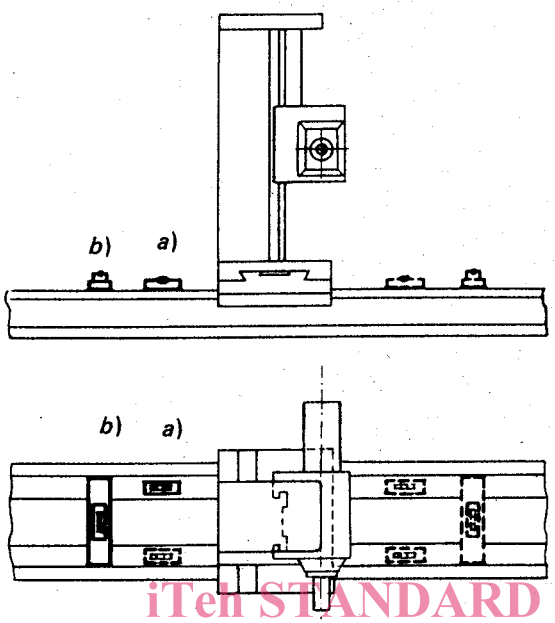
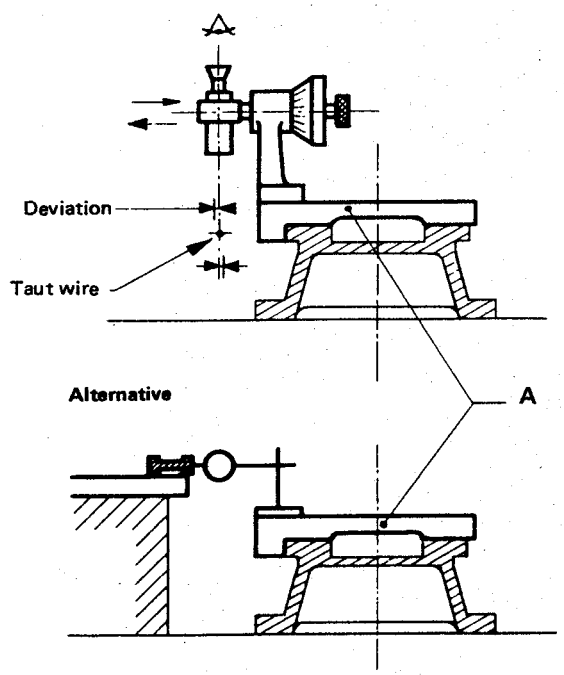
ISO 841, *Numerical control of machines — Axis and motion nomenclature.*

ISO 3070/0, *Test conditions for boring and milling machines with horizontal spindle — Testing of the accuracy — Part 0 : General introduction.*

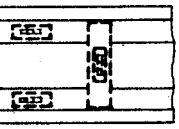
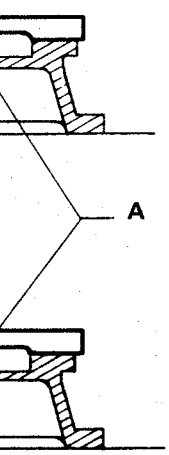
ISO 3070/I, *Test conditions for boring and milling machines with horizontal spindle — Testing of the accuracy — Part I : Table type machines* (and its addendum : *Complementary geometrical tests and practical test to be specified in the case of rotary table machines*).

4 TEST CONDITIONS AND PERMISSIBLE DEVIATIONS

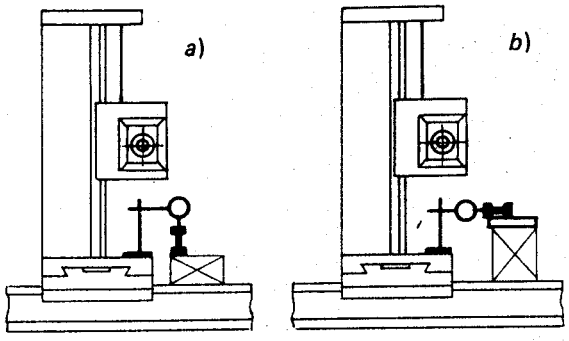
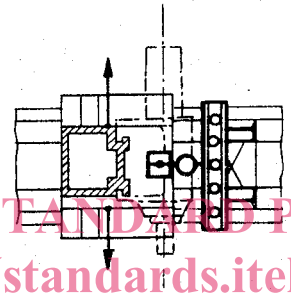
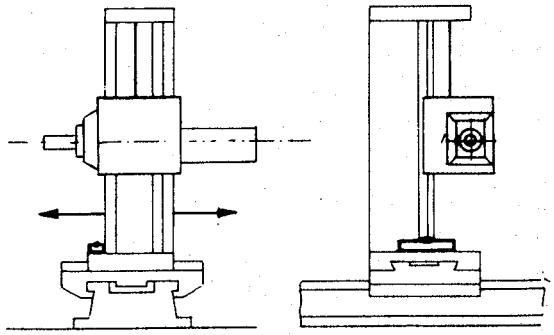
4.1 Geometrical tests

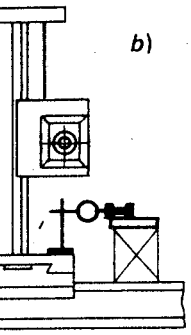
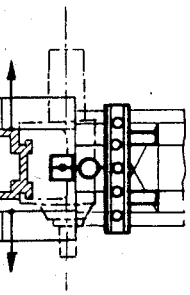
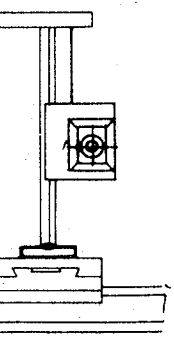
No.	Diagram	Object	
G 1		**A – BED** Verification of levelling of slideways : *a*) Checking of bed lengthwise : – straightness of slideways in the vertical plane;	*a*)
		b) Checking of bed crosswise : – slideways should be in the same plane.	*b*)
G 2		Checking of straightness of the slideways in a horizontal plane.	

and h

	Object	Permissible deviation	
		mm	in
 	**A – BED** Verification of levelling of slideways : *a*) Checking of bed lengthwise : – straightness of slideways in the vertical plane;	*a*) 0,02 up to 1000 For each 1000 mm (40 in) increase in length add to the preceding tolerance : 0,01 Local tolerance : 0,006 over any measuring length of 300 Maximum permissible deviation : 0,05 up to 10000 0,08 above 10000	*a*) 0.0008 up to 40 0.0004 0.00025 over any measuring length of 12 0.002 up to 400 0.0032 above 400
	b) Checking of bed crosswise : – slideways should be in the same plane.	*b*) Variation of level : 0,02/1000	0.0008/40
	Checking of straightness of the slideways in a horizontal plane.	0,02 up to 1000 For each 1000 mm (40 in) increase in length add to the preceding tolerance : 0,005 Local tolerance : 0,006 over any measuring length of 300 Maximum permissible deviation : 0,05 up to 10000 0,08 above 10000	0.0008 up to 40 0.0002 0.00025 over any measuring length of 12 0.002 up to 400 0.0032 above 400

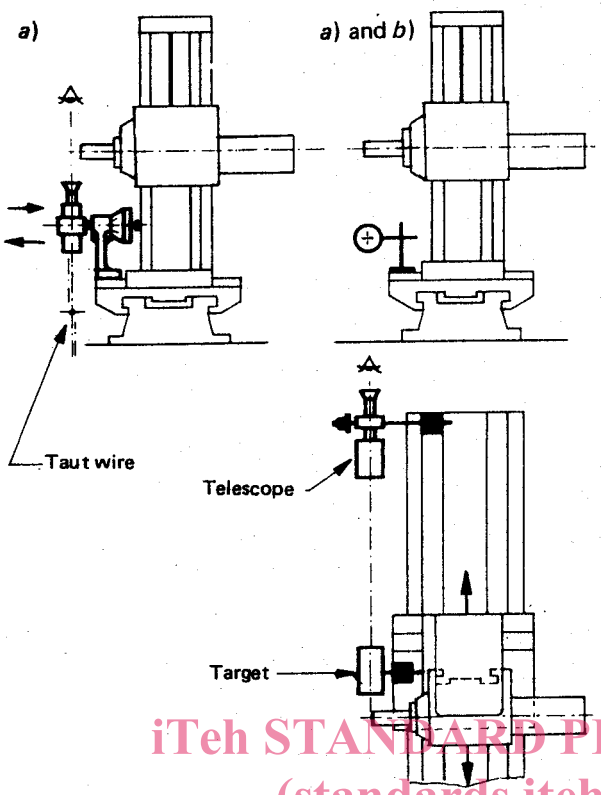
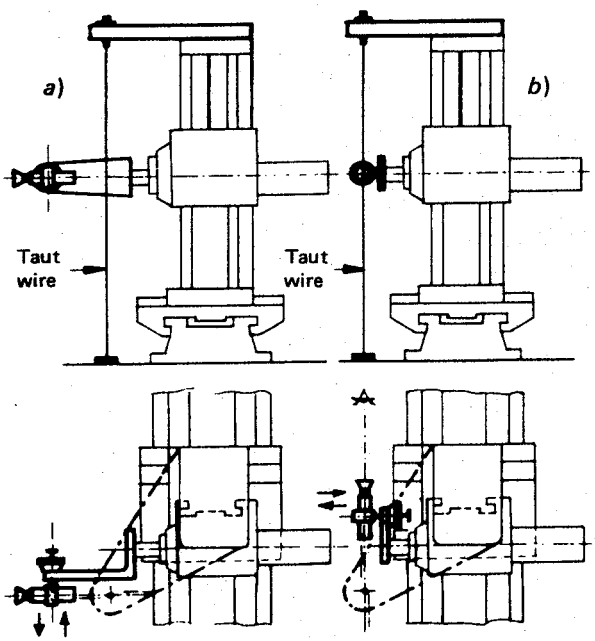
Permissible deviation			Measuring instruments	Observations and references to the test code ISO/R 230
mm		in		
0,02 to 1000	*a)*	0.0008 up to 40	Precision level, optical or other methods	*a)* Clauses 3.11, 3.21 and 5.212.21 or 5.212.22 – Measurements shall be made at a number of positions equally spaced along the length of the bed. – The column shall be placed in the middle of its traverse on the table saddle with the table saddle placed in the middle of the bed.
1000 mm (40 in) increase in length add to the lerance :				
0,01		0.0004		
Local tolerance :				
0,006		0.00025		
over any measuring length of				
300		12		
Maximum permissible deviation :				
0,05 to 10000		0.002 up to 400		
0,08 ve 10000		0.0032 above 400		
Variation of level :			Precision level and support	*b)* Clause 5.412.7 A level shall be placed transversely and measurements taken at a number of positions equally spaced along the length of the bed. The variation of level at any position shall not exceed the permissible deviation.
02/1000		0.0008/40		
0,02 to 1000		0.0008 up to 40	Microscope and taut wire or other optical methods	Clauses 5.212.3 or 5.212.22 or 5.232.1 The microscope or the dial gauge shall be fixed on a support A of a suitable form such that it can slide in the slideways and shall sight or touch, in the horizontal plane, the taut wire or a straightedge laid parallel to the slideways. The taut wire or the straightedge shall be placed on a fixed part, independent of or integral with the machine and as near as possible to the slideways to be checked.
00 mm (40 in) increase in length add to the preceding				
0,005		0.0002		
Local tolerance :				
0,006		0.00025		
over any measuring length of				
300		12		
Maximum permissible deviation :			Dial gauge, straightedge and supports	
0,05 to 10000		0.002 up to 400		
0,08 ve 10000		0.0032 above 400		

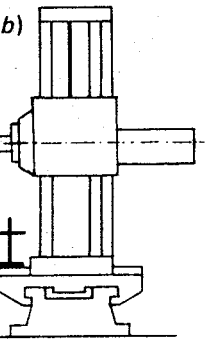
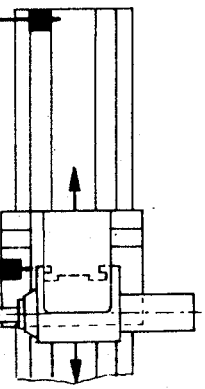
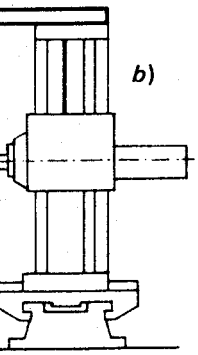
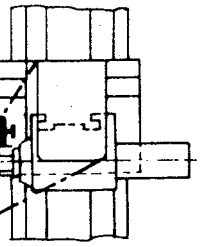
No.	Diagram	Object
G 3	 	**B – COLUMN SADDLE** (In the case of columns provided with a saddle for movement of the column parallel to the spindle axis) Checking of the slideways between saddle and column : – straightness of movement of the column on the saddle. 1) **Longitudinal verification** (along the W axis) : *a*) in a vertical plane; *b*) in a horizontal plane.
		2) **Transverse verification** (along the X axis) : – slideways should be in the same plane.

	Object	Permissible deviation	
		mm	in
	B – COLUMN SADDLE		
	(In the case of columns provided with a saddle for movement of the column parallel to the spindle axis)		
	Checking of the slideways between saddle and column :		
	– straightness of movement of the column on the saddle.		
 b)	1) **Longitudinal verification** (along the W axis) :		
	a) in a vertical plane;	For *a*) and *b*)	
	b) in a horizontal plane.	0,02 up to 1000 0,03 above 1000	0.0008 up to 40 0.0012 above 40
		Local tolerance :	
		0,006 over any measuring length of 300	0.00025 over any measuring length of 12
	2) **Transverse verification** (along the X axis) :	Variation of level :	
	– slideways should be in the same plane.	0,02/1000	0.0008/40

5bis

Permissible deviation		Measuring instruments	Observations and references to the test code ISO/R 230
mm	in		
For *a*) and *b*)		Dial gauge, straightedge and supports or optical methods	Clauses 5.232.1 or 5.212.22 The dial gauge shall be fixed on the column base such that it can slide against the functional part of a straightedge laid parallel to the saddle slideways. For checking *b*), the straightedge is laid horizontally and flat and for checking *a*), the straightedge is laid vertically on edge. The straightedge shall be placed on a fixed part, independent of or integral with the machine and as near as possible to the slideways to be checked.
0,02	0.0008		
to 1000	up to 40		
0,03	0.0012		
ove 1000	above 40		
Local tolerance :			
0,006	0.00025		
over any measuring length of			
300	12		
Variation of level :		Precision level	Clause 5.412.7 A level shall be placed transversely on the column base and measurements taken at a number of positions equally spaced along the length of the column. The variation of level measured at any position shall not exceed the permissible deviation.
02/1000	0.0008/40		

No.	Diagram	Object	
G 4		**C – COLUMN** Checking of straightness of the movement of the column lengthwise on the bed : *a*) in the horizontal plane; *b*) in the vertical plane.	For ea precedi
G 5		Checking of straightness of the vertical movement of the spindle head on the column : *a*) in the vertical plane coaxial with the spindle axis; *b*) in a vertical plane perpendicular to the spindle axis.	For eac toleranc f

	Object	Permissible deviation	
		mm	in
 	**C – COLUMN** Checking of straightness of the movement of the column lengthwise on the bed : *a*) in the horizontal plane; *b*) in the vertical plane.	For *a*) and *b*) 0,04 / up to 1000 For each 1000 mm (40 in) increase in length, add to the preceding tolerance : 0,005 Maximum permissible deviation : 0,12	0.0016 / up to 40 0.0002 0.005
 	Checking of straightness of the vertical movement of the spindle head on the column : *a*) in the vertical plane coaxial with the spindle axis; *b*) in a vertical plane perpendicular to the spindle axis.	For *a*) and *b*) 0,02 / up to 1000 For each 1000 mm (40 in) increase in length add to the preceding tolerance : 0,01 for machines having travel ⩽ 4000 mm (160 in) and : 0,02 for machines having travel > 4000 mm (160 in)	0.0008 / up to 40 0.0004 0.0008