
INTERNATIONAL STANDARD 3070 / 1

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION · МЕЖДУНАРОДНАЯ ОРГАНИЗАЦИЯ ПО СТАНДАРТИЗАЦИИ · ORGANISATION INTERNATIONALE DE NORMALISATION

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

Conditions d'essais des machines à aléser et à fraiser, à broche horizontale — Contrôle de la précision — Partie I : Machines à montant fixe

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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 3070/1 (which includes Addendum 1) was drawn up by Technical Committee ISO/TC 39, *Machine tools*, and circulated to the Member Bodies in May 1973 (Addendum 1 was circulated in November 1973).

It has been approved by the Member Bodies of the following countries:

Austria	Italy	Thailand
Belgium	Japan	Turkey
Bulgaria	Mexico	United Kingdom
Czechoslovakia	New Zealand	U.S.A.
France	Romania	U.S.S.R.
Germany	South Africa, Rep. of	Yugoslavia
Hungary	Spain	
India	Switzerland	

The Member Body of the following country expressed disapproval of the document on technical grounds:

Sweden

Addendum 1 to ISO/DIS 3070/1 has been approved by the Member Bodies of the following countries:

Australia	Hungary	Sweden
Austria	India	Thailand
Belgium	Italy	Turkey
Bulgaria	Japan	United Kingdom
Czechoslovakia	New Zealand	U.S.A.
Egypt, Arab Rep. of	Romania	U.S.S.R.
France	South Africa, Rep. of	Yugoslavia
Germany	Spain	

The Member Body of the following country expressed disapproval of the document on technical grounds:

Switzerland

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

1 SCOPE AND FIELD OF APPLICATION

This International Standard describes, with reference to ISO/R 230, geometrical tests on general purpose and normal accuracy boring and milling machines, horizontal spindle, table type, defined in ISO 3070/0, and the corresponding deviations which apply.

In addition it should be noted that this International Standard concerns machines which have both longitudinal and transverse movement of the table, and may include a rotary or indexing table. It will also have a vertical movement of the spindle head, and possibly a facing head.

It 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.

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NOTE — Rotary table machines will be covered by an addendum.¹⁾

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 and other moving parts, description of measuring methods and recommended accuracy of testing equipment.

2.3 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.

2.4 When inspecting a machine, it is not always 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.

2.5 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).

3 REFERENCES

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

ISO/R 1101, *Tolerances of form and of position — Part 1 : Generalities, symbols, indications on drawings*.

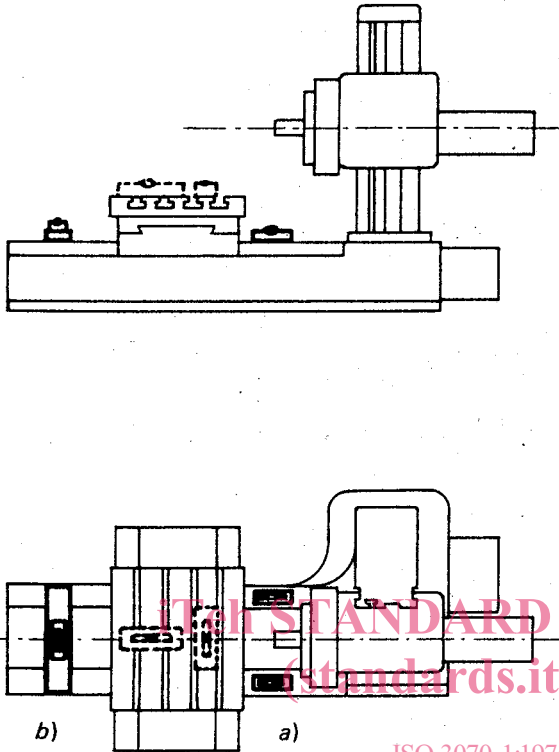
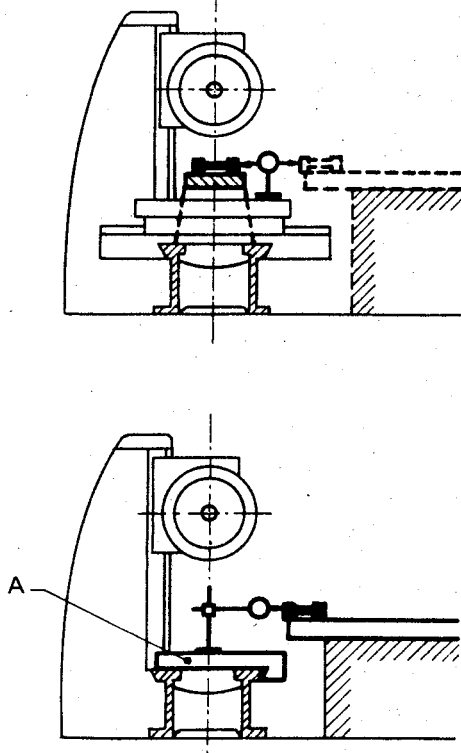
ISO 3070/0, *Test conditions for boring and milling machines with horizontal spindle — Testing of the accuracy — Part 0 : General introduction*.

1) At present at the stage of draft.

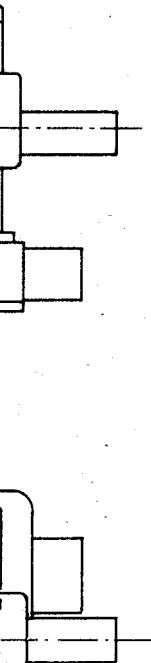
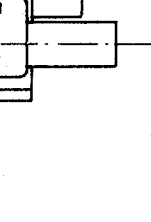

4 TEST CONDITIONS AND PERMISSIBLE DEVIATIONS

4.1 Geometrical tests

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No.	Diagram	Object	
G 1	 <p style="text-align: center;">ISO 3070-1:1975 https://standards.iteh.ai/catalog/standards/sist/0447b2a5-645a-43b8-90f6-a75238385730/iso-3070-1-1975</p>	<p style="text-align: center;">A – BED</p> <p>Verification of levelling of slideways :</p> <p>a) Longitudinal verification :</p> <ul style="list-style-type: none"> – straightness of slideways in the vertical plane; <p>b) Transverse verification :</p> <ul style="list-style-type: none"> – slideways should be in the same plane. 	<p>a)</p> <p>For each correspond</p> <p>b)</p>
G 2		<p>Checking of straightness of the slideways in a horizontal plane.</p>	<p>For each correspond</p>

adh

	Object	Permissible deviation	
		mm	in
	<p>A – BED</p> <p>Verification of levelling of slideways :</p> <p>a) Longitudinal verification :</p> <p>– straightness of slideways in the vertical plane;</p>	<p>a) 0,02 up to 1000</p> <p>(flat to convex) Local tolerance : 0,006 over any measuring length of 300</p> <p>For each 1000 mm (40 in) increase in length add to the corresponding preceding tolerance : 0,01 Maximum permissible deviation : 0,05</p>	<p>a) 0,0008 up to 40</p> <p>Local tolerance : 0.00024 12</p> <p>0.0004 0.002</p>
	<p>b) Transverse verification :</p> <p>– slideways should be in the same plane.</p>	<p>b) Variation of level : 0,02/1000</p>	<p>0.0008/40</p>
	<p>Checking of straightness of the slideways in a horizontal plane.</p>	<p>0,02 up to 1000</p> <p>Local tolerance : 0,006 over any measuring length of 300</p> <p>For each 1000 mm (40 in) increase in length, add to the corresponding preceding tolerance : 0,01 Maximum permissible deviation : 0,05</p>	<p>0.0008 up to 40</p> <p>Local tolerance : 0.00024 12</p> <p>0.0004 0.002</p>

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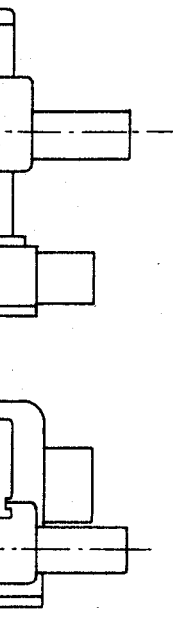

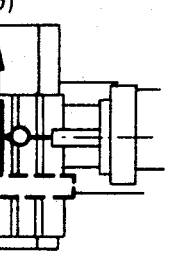
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Permissible deviation		Measuring instruments	Observations and references to the test code ISO/R 230
m	in		
0.02 1000	a) 0.0008 up to 40 (flat to convex) Local tolerance :	Precision level optical or other methods	a) Clauses 3.11, 3.21, 5.212.21 and 5.212.22 Measurements shall be made at a number of positions equally spaced along the length of the bed : 1) the table shall be placed in the middle of its longitudinal travel and transverse travel 2) the table shall then be placed at the extremities of the longitudinal travel and in the middle of the transverse travel. The levels may be placed on the table (this is valid for a) and b)).
0.06 0 0 mm (40 in) increase in length add to the preceding tolerance :	0.00024 12 0.0004 Maximum permissible deviation :		
0.01 5	0.002		
Variation of level :	0.0008/40	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 measured at any position shall not exceed the permissible deviation.
0.02 1000	0.0008 up to 40 Local tolerance :	Dial gauge, straightedge and supports or optical methods	Clause 5.232.1 The dial gauge shall be fixed on a support A of a suitable form such that it can slide in the slideways with the stylus touching, in the horizontal plane, a straightedge laid parallel to the slideways. The straightedge shall be placed on a fixed part, independent or integral with the machine and as near as possible to the slideways to be checked.
0.06 0 0 mm (40 in) increase in length, add to the preceding tolerance :	0.00024 12 0.0004 Maximum permissible deviation :		
0.01 5	0.002		

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No.	Diagram	Object	
G 3		<p align="center">B – TABLE SADDLE</p> <p>Checking of straightness of the slideways of the table base or table in a vertical plane :</p> <p>a) in the longitudinal direction of the slideways;</p> <p>b) in the transverse direction of the slideways.</p>	<p>a)</p> <p>For each correspond</p> <p>b)</p>
G 4	<p align="center">iTech STANDARD PREVIEW (standards.iteh.ai)</p> <p align="center">ISO 3070-1:1975 https://standards.iteh.ai/catalog/standards/sist/044762a5-645a-43b8-90f6-a75238385730/iso-3070-1-1975</p>	<p>Checking of straightness of the slideways of the table base or table in the horizontal plane.</p>	<p>For each correspond</p>
G 5		<p>Checking of squareness of the longitudinal movement of the table to its transverse movement.</p>	

	Object	Permissible deviation	
		mm	in
	<p>B – TABLE SADDLE</p> <p>Checking of straightness of the slideways of the table base or table in a vertical plane :</p> <p>a) in the longitudinal direction of the slideways;</p>	<p>a) 0,02 up to 1000</p> <p>For each 1000 mm (40 in) increase in length, add to the corresponding preceding tolerance :</p> <p>0,01</p> <p>Maximum permissible deviation :</p> <p>0,05</p>	<p>a) 0.0008 up to 40</p> <p>For each 1000 mm (40 in) increase in length, add to the corresponding preceding tolerance :</p> <p>0.0004</p> <p>Maximum permissible deviation :</p> <p>0.002</p>
	<p>b) in the transverse direction of the slideways.</p>	<p>b) Variation of level :</p> <p>0,02/1000</p>	<p>0.0008/40</p>
	<p>Checking of straightness of the slideways of the table base or table in the horizontal plane.</p>	<p>0,02 up to 1000</p> <p>Local tolerance :</p> <p>0,006</p> <p>over any measuring length of</p> <p>300</p> <p>For each 1000 mm (40 in) increase in length, add to the corresponding preceding tolerance :</p> <p>0,01</p> <p>Maximum permissible deviation :</p> <p>0,05</p>	<p>0.0008 up to 40</p> <p>Local tolerance :</p> <p>0.00024</p> <p>12</p> <p>For each 1000 mm (40 in) increase in length, add to the corresponding preceding tolerance :</p> <p>0.0004</p> <p>Maximum permissible deviation :</p> <p>0.002</p>
	<p>Checking of squareness of the longitudinal movement of the table to its transverse movement.</p>	<p>0,04/1000</p>	<p>0.0016/40</p>

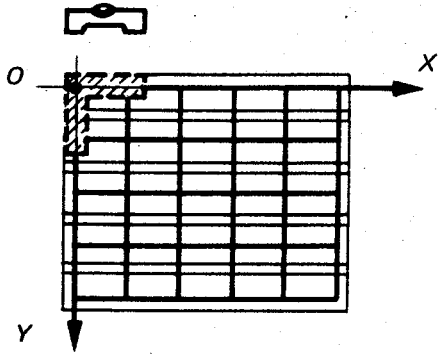
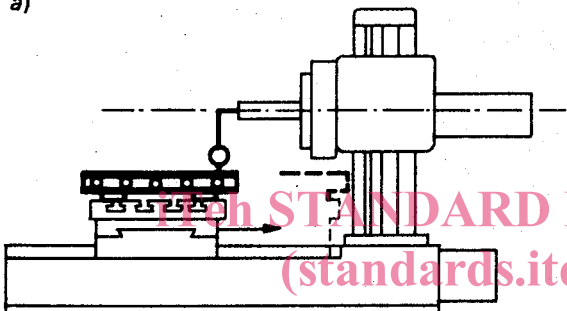
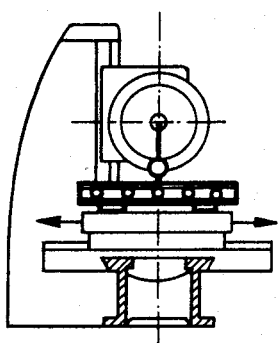
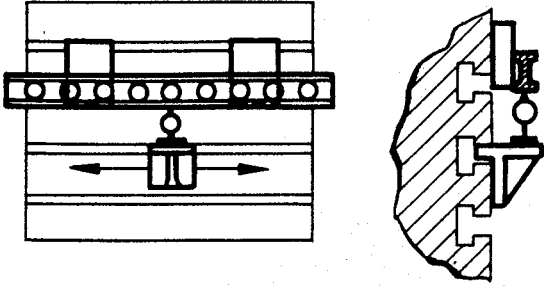
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
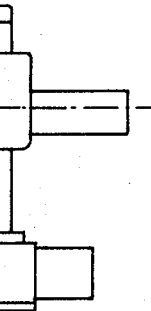

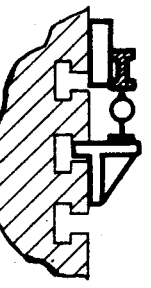
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Permissible deviation		Measuring instruments	Observations and references to the test code ISO/R 230
	in		
2 000 mm (40 in) increase in length, add to the preceding tolerance :	a) 0.0008 up to 40 0.0004 Maximum permissible deviation : 0.002	Precision level, optical or other methods	a) Clauses 3.11, 3.21, 5.212.21 and 5.212.22 Measurements shall be made at a number of positions equally spaced along the length of the slideways. Levels may be placed on the table (this is valid for a) and b)).
Variation of level :	0.0008/40	Precision level and support	b) Clause 5.412.7 A level shall be placed transversely on the slideways and measurements taken at a number of positions equally spaced along the length of the slideways. The variation of level measured at any position shall not exceed the permissible deviation.
2 000 Local tolerance : 6 over any measuring length of mm (40 in) increase in length, add to the preceding tolerance : Maximum permissible deviation :	0.0008 up to 40 0.00024 12 0.0004 0.002	ISO 3070-1:1975 Dial gauge, straight-edge, supports or optical methods	Clause 5.232.1 The dial gauge shall be fixed on a support A of a suitable form such that it can slide in the slideways with the stylus touching, in the horizontal plane, a straightedge laid parallel to the slideways. The straightedge shall be placed on a fixed part independent, or integral with the machine and as near as possible to the slideways to be checked.
000	0.0016/40	Dial gauge straightedge and square	Clause 5.522.4 a) The straightedge shall be set parallel to the table longitudinal movement; then the square shall be placed against the straightedge. The table shall then be locked in the central position. b) The transverse movement of the table shall then be checked. If the spindle can be locked, then the dial gauge may be mounted on it. If the spindle cannot be locked the dial gauge shall be placed on a fixed part of the machine.

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No.	Diagram	Object	
G 6		<p align="center">C – TABLE</p> <p>Checking of flatness of the table surface.</p>	<p>a)</p> <p>For each corresponding</p>
G 7	<p>a)</p>  <p align="center">ISO 3070-1:1975 https://standards.itech.ai/catalog/standards/sist/0447b2a5-645a-43b8-90f6-a75238385730/iso-3070-1-1975</p> <p>b)</p> 	<p>Checking of parallelism of the table surface to its movements :</p> <p>a) longitudinally;</p> <p>b) transversely.</p>	<p>a)</p> <p>For each tolerance</p> <p>b)</p>
G 8		<p>Checking of straightness of the median or reference T slot of the table.</p>	

	Object	Permissible deviation	
		mm	in
	<p>C – TABLE</p> <p>Checking of flatness of the table surface.</p>	<p>a) 0,03 up to 1000</p> <p>(flat to concave) Local tolerance :</p> <p>0,02 over any measuring length of 300</p> <p>For each 1000 mm (40 in) increase in length, add to the corresponding preceding tolerance :</p> <p>0,01</p> <p>Maximum permissible deviation :</p> <p>0,05</p>	<p>a) 0.0012 up to 40</p> <p>0.0008 12</p> <p>0.0004</p> <p>0.002</p>
	<p>Checking of parallelism of the table surface to its movements :</p> <p>a) longitudinally;</p>	<p>a) 0,04 up to 1000</p> <p>Local tolerance :</p> <p>0,015 over any measuring length of 300</p> <p>For each 1000 mm (40 in) increase in length add to the preceding tolerance :</p> <p>0,01</p> <p>Maximum permissible deviation :</p> <p>0,06</p>	<p>a) 0.0016 up to 40</p> <p>0.0006 12</p> <p>0.0004</p> <p>0.0024</p>
	<p>b) transversely.</p>	<p>b) 0,04 1000</p> <p>over any measuring length of</p>	<p>b) 0.0016 40</p>
	<p>Checking of straightness of the median or reference T slot of the table.</p>	<p>0,02 1000</p> <p>Maximum permissible deviation :</p> <p>0,03</p>	<p>0.0008 40</p> <p>0.0012</p>

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Permissible deviation		Measuring instruments	Observations and references to the test code ISO/R 230
mm	in		
0.03 1000	a) 0.0012 up to 40	Precision level or straightedge and gauge blocks	Clauses 5.322 and 5.323 Table not locked in its mid-position and possibly table saddle and table base locked in the middle of their travel.
(flat to concave) Local tolerance :	0.0008		
over any measuring length of 12 0 mm (40 in) increase in length, add to the preceding tolerance :	0.0004		
0.05	0.002		
0.04 1000	a) 0.0016 up to 40	Straightedge and dial gauge	Clauses 5.232.1 or 5.422.21 The stylus of the dial gauge shall be placed approximately in a vertical plane coaxial with the spindle axis. Measurement may be made on a straightedge laid parallel to the table surface. If the table length is greater than 1600 mm (64 in), carry out the inspection by successive movements of the straightedge. If the spindle can be locked, the dial gauge may be mounted on it. If the spindle cannot be locked, the dial gauge shall be placed on a fixed part of the machine. a) Carry out the test with the transverse movement locked for the table. b) Carry out the test with the longitudinal movement locked for the table.
Local tolerance :	0.0006		
over any measuring length of 12 mm (40 in) increase in length add to the preceding	0.0004		
0.06	0.0024		
0.04 1000	b) 0.0016 up to 40		
over any measuring length of 40			
0.02 1000	0.0008 up to 40	Straightedge and dial gauge, or gauge blocks, or microscope and taut wire	Clauses 5.212, 5.212.1, 5.212.3 or 5.232 The straightedge may be set directly on the table.
for any measuring length of :	40		
Maximum permissible deviation :	0.0012		
0.03	0.0012		