INTERNATIONAL STANDARD ISO 3070/I

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

First edition — 1975-02-01

UDC 621.914.4 **Ref. No. ISO 3070/I-1975 (E)**

Descriptors : machine tools, boring machines, milling machines, tests, testing conditions, verifying, precision.

Price based on 21 pages

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/I (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/I 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

Printed in 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.

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).

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

3 REFERENCES

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

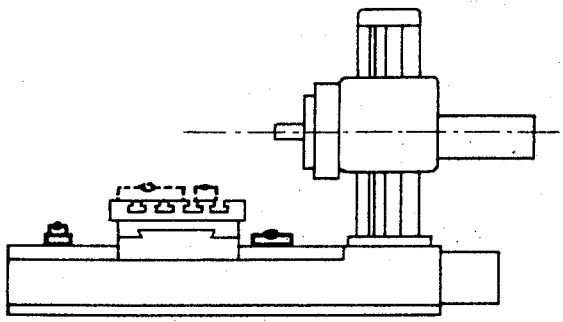
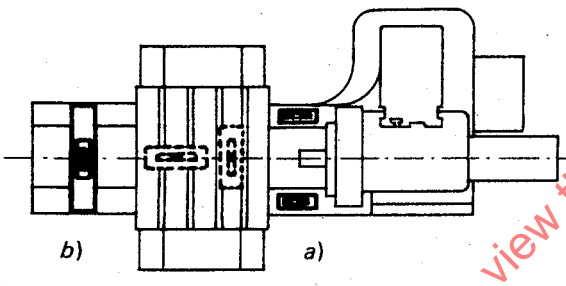
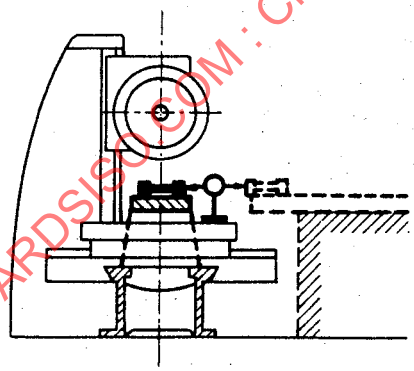
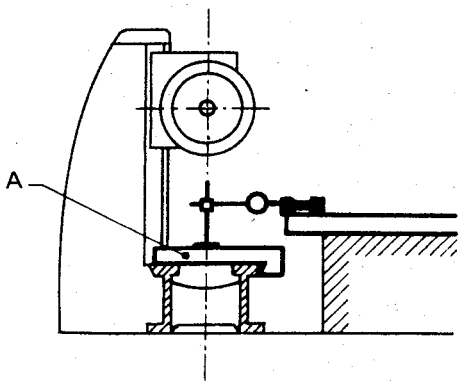
ISO/R 1101, *Tolerances of form and of position — Part I : Generalities, symbols, indications on drawings.*

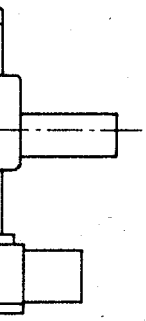
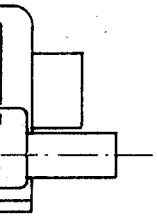
ISO 3070/0, *Test conditions for boring and milling machines with horizontal spindle — Testing of the accuracy — Part 0 : General introduction.*

1) At present at the stage of draft.

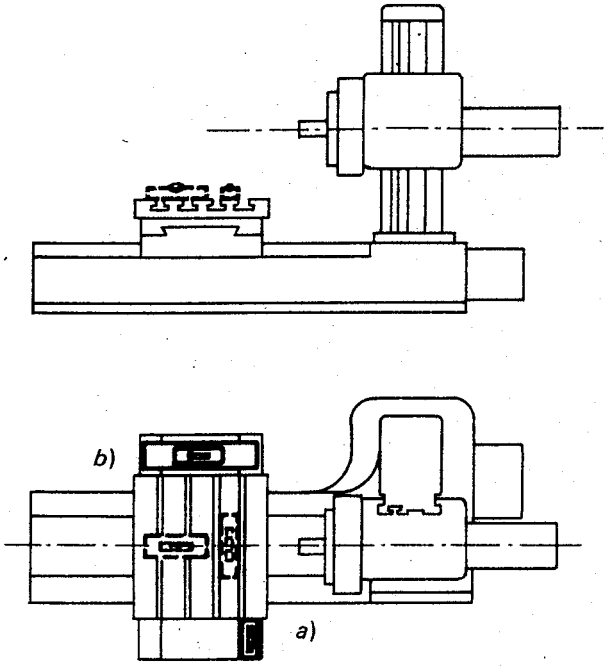
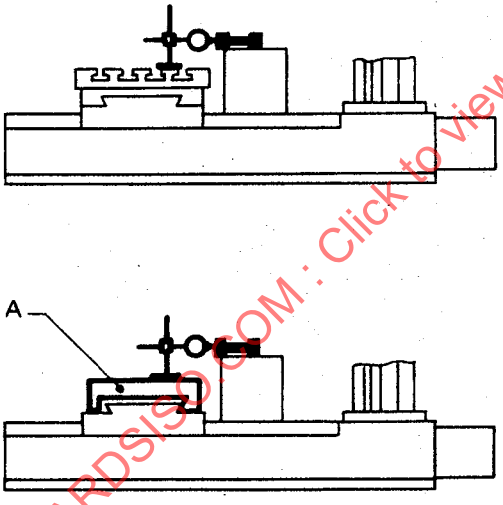
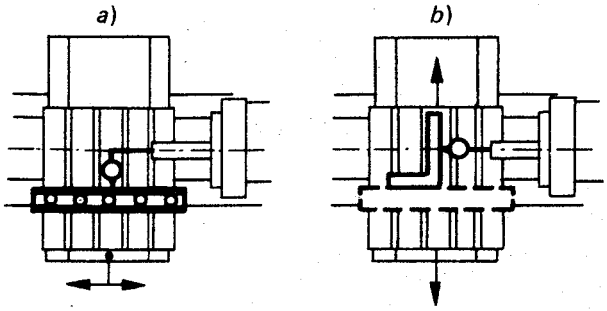
4 TEST CONDITIONS AND PERMISSIBLE DEVIATIONS

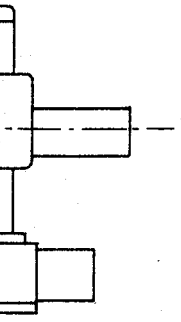
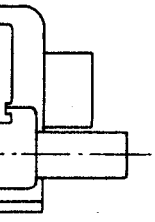
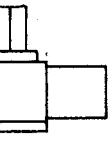
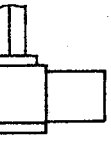
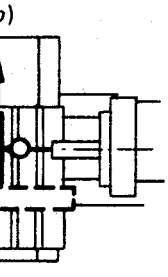
4.1 Geometrical tests

No.	Diagram	Object	
G 1	 	**A – BED** Verification of levelling of slideways : *a*) Longitudinal verification : – straightness of slideways in the vertical plane; *b*) Transverse verification : – slideways should be in the same plane.	*a*) For eac correspo *b*)
G 2	 	Checking of straightness of the slideways in a horizontal plane.	For each correspon

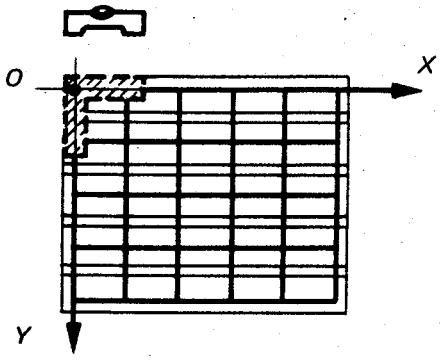
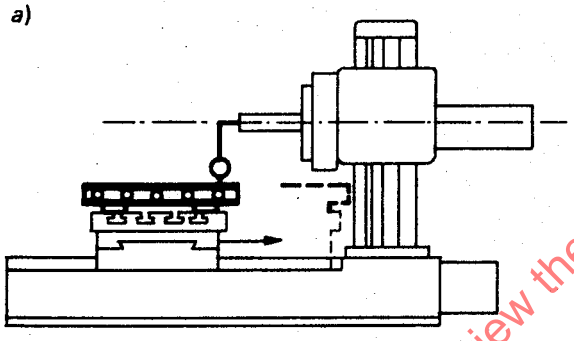
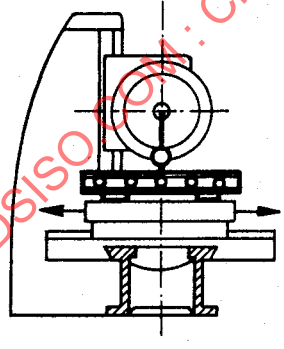
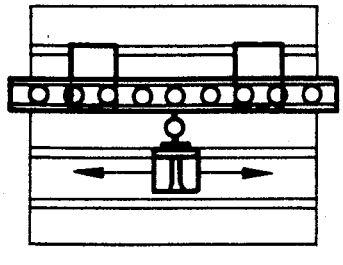
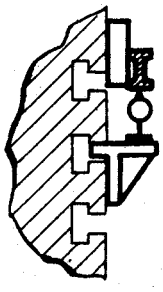
	Object	Permissible deviation	
		mm	in
	**A – BED** Verification of levelling of slideways : *a*) Longitudinal verification : – straightness of slideways in the vertical plane;	*a*) 0,02 up to 1000 (flat to convex) Local tolerance : 0,006 over any measuring length of 300 For each 1000 mm (40 in) increase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

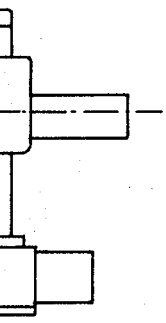
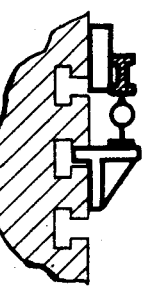
Permissible deviation			Measuring instruments	Observations and references to the test code ISO/R 230
m		in		
02	*a)*	0,0008	Precision level optical or other methods	*a)* Clauses 3.11, 3.21, 5.212.21 and 5.212.22 Measurements shall be made at a number of positions equally spaced along the length of the 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)*).
1000		up to 40		
(flat to convex)				
Local tolerance :				
06		0.00024		
over any measuring length of				
0		12		
0 mm (40 in) increase in length add to the preceding tolerance :				
01		0.0004		
Maximum permissible deviation :				
05		0.002		
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 measured at any position shall not exceed the permissible deviation.
1000		0.0008/40		
2		0.0008	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.
1000		up to 40		
Local tolerance :				
06		0.00024		
over any measuring length of				
0		12		
0 mm (40 in) increase in length, add to the receding tolerance :				
1		0.0004		
Maximum permissible deviation :				
5		0.002		

No.	Diagram	Object	
G 3		**B – TABLE SADDLE** Checking of straightness of the slideways of the table base or table in a vertical plane : *a)* in the longitudinal direction of the slideways; *b)* in the transverse direction of the slideways.	*a)* For eacl correspo *b)*
G 4		Checking of straightness of the slideways of the table base or table in the horizontal plane.	For each correspor
G 5		Checking of squareness of the longitudinal movement of the table to its transverse movement.	

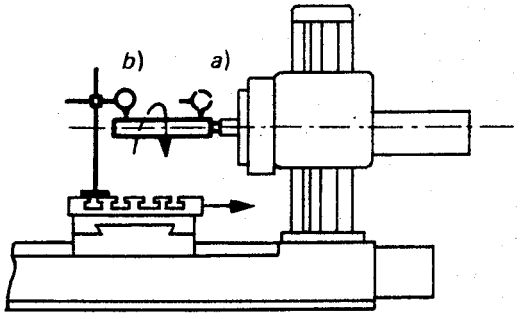
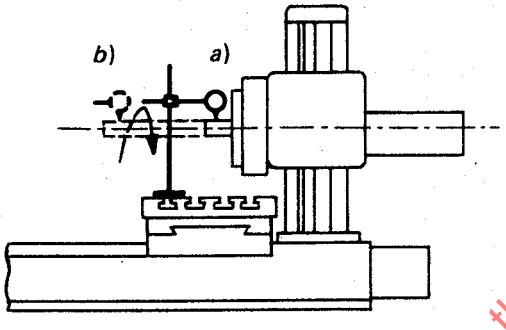
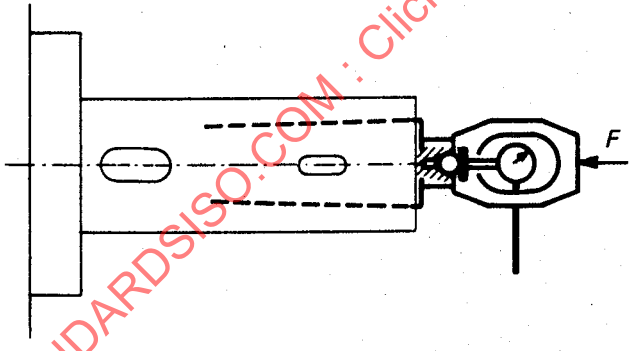
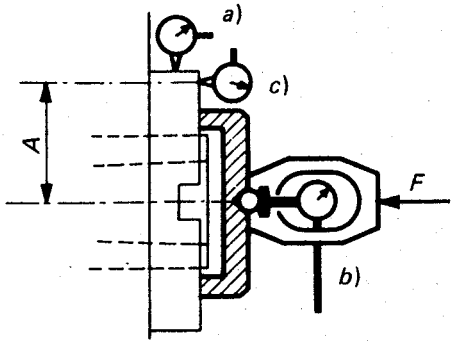
	Object	Permissible deviation	
		mm	in
	**B – TABLE SADDLE** Checking of straightness of the slideways of the table base or table in a vertical plane : *a*) in the longitudinal direction of the slideways;	*a*) 0,02 up to 1000 For each 1000 mm (40 in) increase in length, add to the corresponding preceding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

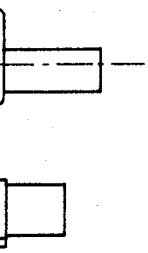
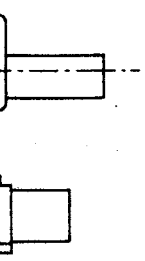
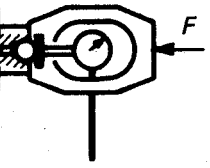
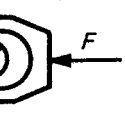
Permissible deviation		Measuring instruments	Observations and references to the test code ISO/R 230
n	in		
2	*a*) 0.0008	Precision level, optical or other methods	*a*) Clauses 3.11, 3.21, 5.212.21 and 5.212.22 Measurements shall be made at a number of positions equally spaced along the length of the slideways. Levels may be placed on the table (this is valid for *a*) and *b*)).
1000	up to 40		
) mm (40 in) increase in length, add to the receding tolerance :			
1	0.0004		
Maximum permissible deviation :			
5	0.002		
Variation of level :		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.
000	0.0008/40		
2	0.0008	Dial gauge, straightedge, 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	up to 40		
Local tolerance :			
6	0.00024		
over any measuring length of			
)	12		
mm (40 in) increase in length, add to the receding tolerance :			
	0.0004		
Maximum permissible deviation :			
5	0.002		
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.

No.	Diagram	Object	
G 6		**C – TABLE** Checking of flatness of the table surface.	*a*) For eac correspo
G 7	*a*) 	Checking of parallelism of the table surface to its movements : *a*) longitudinally;	*a*) For each tolerance
	b) 	*b*) transversely.	*b*)
G 8	 	Checking of straightness of the median or reference T slot of the table.	

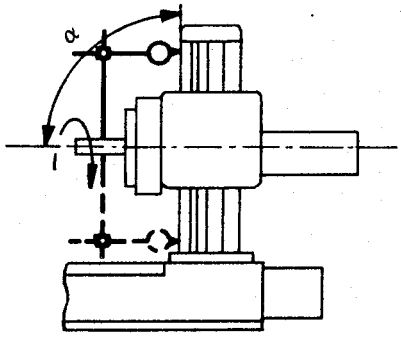
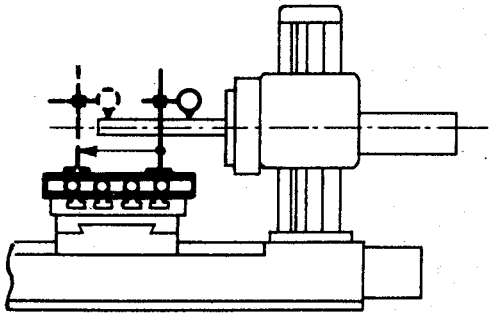
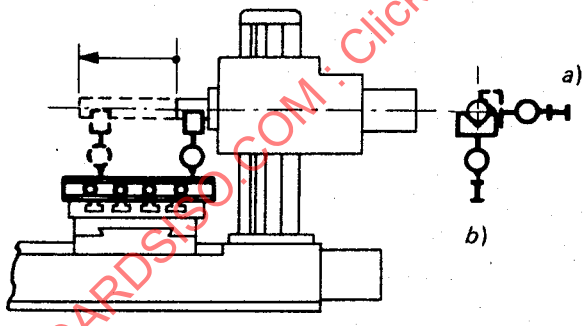
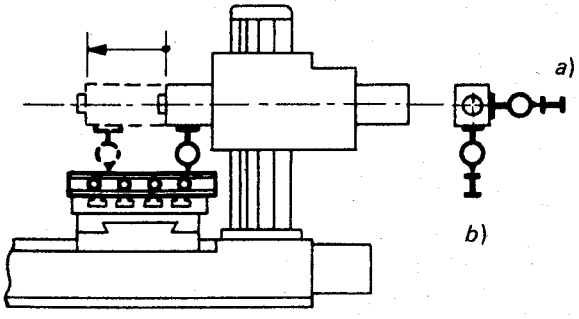
	Object	Permissible deviation	
		mm	in
	**C – TABLE** Checking of flatness of the table surface.	*a*) 0,03 up to 1000 (flat to concave) Local tolerance : 0,02 over any measuring length of 300 For each 1000 mm (40 in) increase in length, add to the corresponding preceding tolerance : 0,01 Maximum permissible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

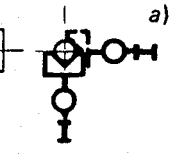
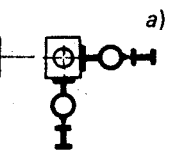
Permissible deviation			Measuring instruments	Observations and references to the test code ISO/R 230
m		in		
03	*a*)	0.0012	Precision level or straightedge and gauge blocks	Clauses 5.322 and 5.323 Table not locked in its mid-position and possibly table saddle and table base locked in the middle of their travel.
1000		up to 40		
(flat to concave)				
Local tolerance :				
02		0.0008		
over any measuring length of				
00		12		
0 mm (40 in) increase in length, add to the preceding tolerance :				
01		0.0004		
Maximum permissible deviation :				
05		0.002		
04	*a*)	0.0016	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.
1000		up to 40		
Local tolerance :				
15		0.0006		
over any measuring length of				
0		12		
mm (40 in) increase in length add to the proceding				
01		0.0004		
Maximum permissible deviation :				
06		0.0024		
04	*b*)	0.0016		
over any measuring length of				
00		40		
02		0.0008	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 :				
00		40		
Maximum permissible deviation :				
3		0.0012		

No.	Diagram	Object	
G 9		**D – SPINDLE HEAD** Measurement of run-out of the internal taper of the boring spindle : *a*) at the mouth of taper; *b*) at a distance of 300 mm (12 in) from the spindle nose.	*a*) *b*)
G 10		Measurement of run-out of the boring spindle : *a*) spindle retracted; *b*) spindle out 300 mm (12 in) (sliding spindle).	*a*) *b*)
G 11		Measurement of periodic axial slip of the boring spindle.	
G 12		*a*) Measurement of run-out of the milling spindle; *b*) Measurement of periodic axial slip; *c*) Measurement of camming of the face of the spindle nose (including periodic axial slip).	*a*) *b*) *c*)

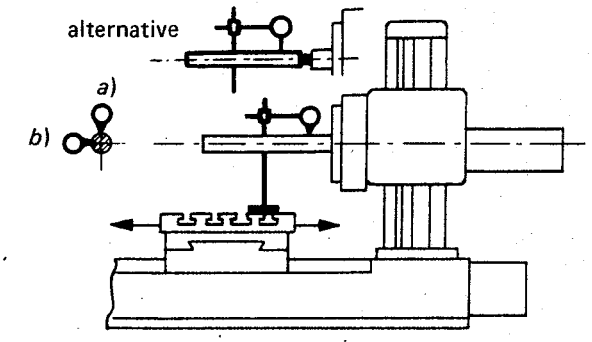
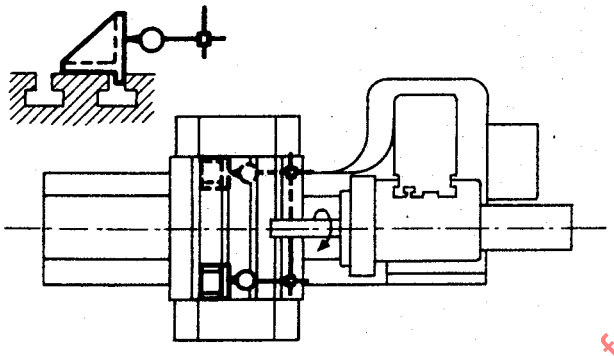
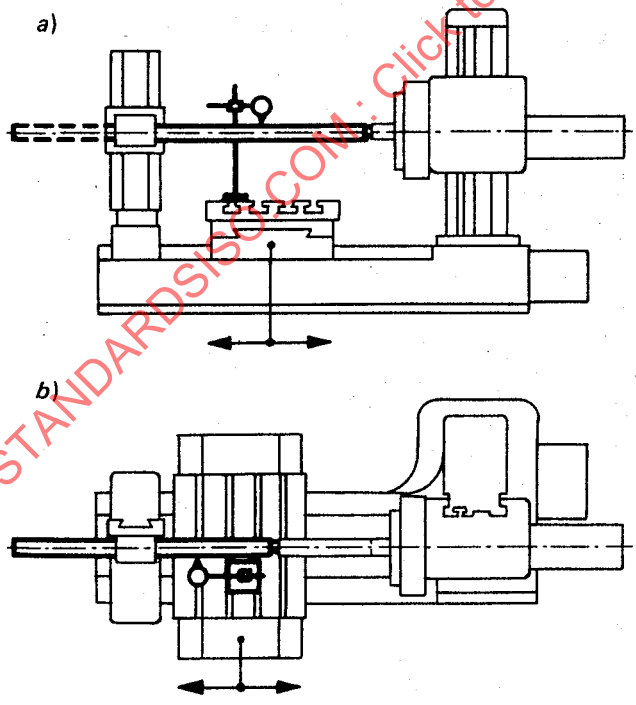
	Object	Permissible deviation			
		mm		in	
	**D – SPINDLE HEAD** Measurement of run-out of the internal taper of the boring spindle : *a*) at the mouth of taper;	*a*)	0,01	*a*)	0.0004
	b) at a distance of 300 mm (12 in) from the spindle nose.	*b*)	0,02	*b*)	0.0008
	Measurement of run-out of the boring spindle : *a*) spindle retracted;	*a*)	0,01	*a*)	0.0004
	b) spindle out 300 mm (12 in) (sliding spindle).	*b*)	0,02	*b*)	0.0008
	Measurement of periodic axial slip of the boring spindle.		0,01		0.0004
	a) Measurement of run-out of the milling spindle;	*a*)	0,01	*a*)	0.0004
	b) Measurement of periodic axial slip;	*b*)	0,01	*b*)	0.0004
 *b*)	*c*) Measurement of camming of the face of the spindle nose (including periodic axial slip).	*c*)	0,02	*c*)	0.0008

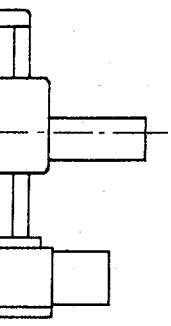
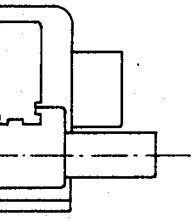
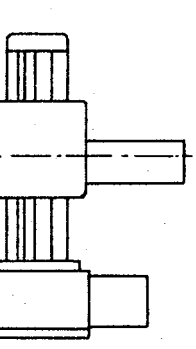
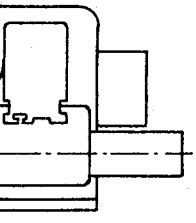
Permissible deviation			Measuring instruments	Observations and references to the test code ISO/R 230
m		in		
,01	*a)*	0.0004	Dial gauge and test mandrel	Clause 5.612.3 Carry out measurements with the spindle retracted (sliding spindle).
,02	*b)*	0.0008		
,01	*a)*	0.0004	Dial gauge	Clause 5.612.2
,02	*b)*	0.0008		
,01		0.0004	Dial gauge	Clauses 5.622.1 and 5.622.2 Carry out this test with the spindle retracted (sliding spindle). The existence, value and direction of application of the force *F* shall be stated by the manufacturer.
0,01	*a)*	0.0004	Dial gauge	*a)* Clause 5.612.2
0,01	*b)*	0.0004		*b)* Clauses 5.622.1 and 5.622.2 The existence, value and direction of application of the force *F* shall be specified by the manufacturer.
0,02	*c)*	0.0008		*c)* Clause 5.632 The distance *A* of dial gauge *c)* from the spindle axis shall be as large as possible.

No.	Diagram	Object	
G 13		Checking of squareness of the boring spindle axis to the column ways.	
G 14		Checking of parallelism of the boring spindle axis to the table surface in the vertical plane.	
G 15		Checking of straightness of the boring spindle movement (sliding spindle) *a*) in a horizontal plane; *b*) in a vertical plane.	 *a*) *b*)
G 16		Checking of straightness of the sliding ring movement : *a*) in a horizontal plane; *b*) in a vertical plane.	 *a*) *b*)

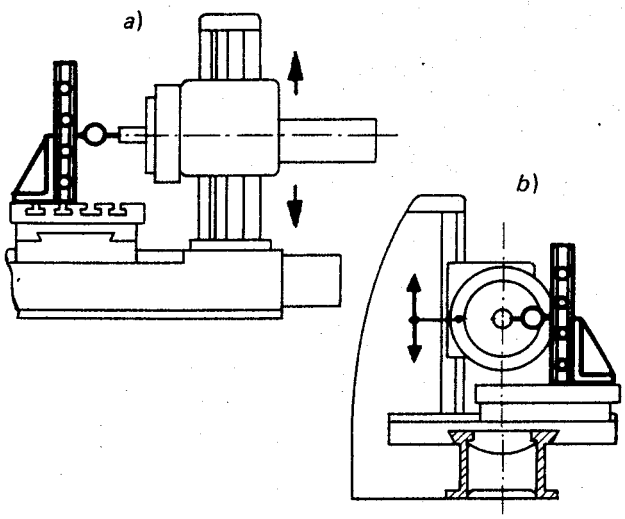
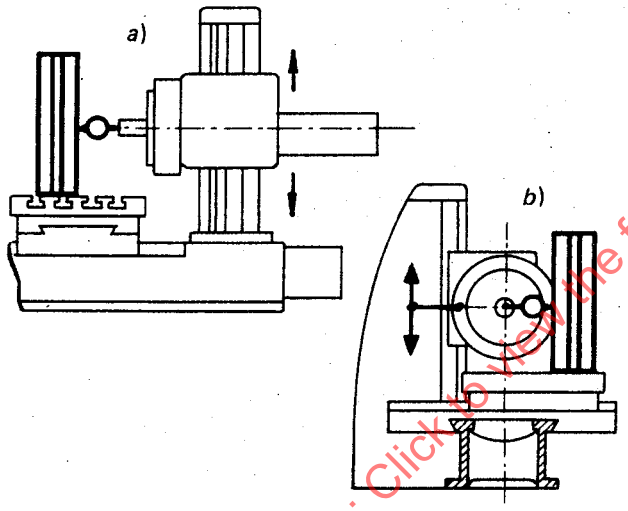
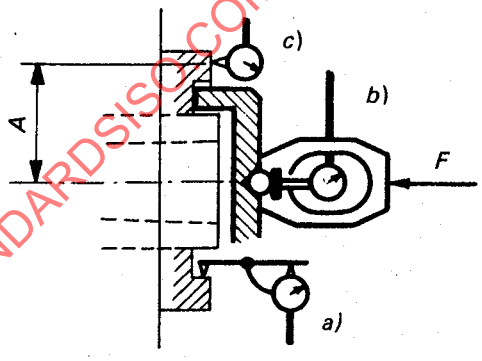
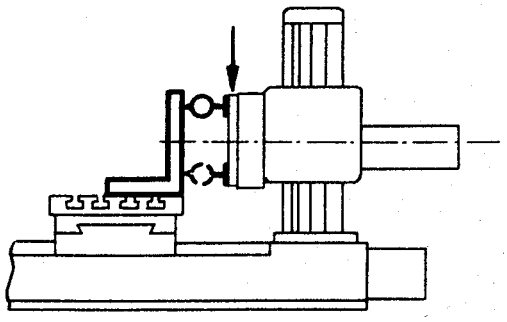
	Object	Permissible deviation	
		mm	in
	Checking of squareness of the boring spindle axis to the column ways.	0,03/1000* with $\alpha \leqslant 90°$	0.0012/40* with $\alpha \leqslant 90°$
	Checking of parallelism of the boring spindle axis to the table surface in the vertical plane.	0,02 over a measuring length of 300	0.0008 over a measuring length of 12
 a) b)	Checking of straightness of the boring spindle movement (sliding spindle)		
	a) in a horizontal plane;	a) 0,02 for a measuring length of 300	a) 0.0008 for a measuring length of 12
	b) in a vertical plane.	b) 0,02 for a measuring length of 300	b) 0.0008 for a measuring length of 12
 a) b)	Checking of straightness of the sliding ring movement :		
	a) in a horizontal plane;	a) 0,02 for a measuring length of 500	a) 0.0008 for a measuring length of 20
	b) in a vertical plane.	b) 0,02 for a measuring length of 500	b) 0.0008 for a measuring length of 20

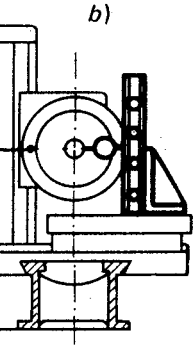
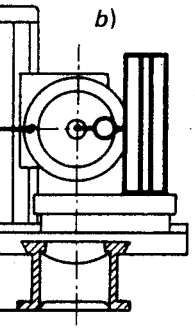
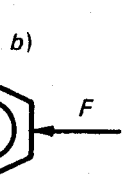
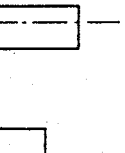
Permissible deviation		Measuring instruments	Observations and references to the test code ISO/R 230
n	in		
000*	0.0012/40*	Dial gauge	Clauses 5.512.1, 5.512.42 and 5.442 Spindle head locked in mid-travel, spindle retracted (sliding spindle). For large machines for which sizes have a great importance the measuring reference shall be related to a plane parallel to the column ways. * Distance between the two points touched.
$\leqslant 90°$	with $\alpha \leqslant 90°$		
over a measuring length of	0.0008 12	Dial gauge	Clause 5.412.4 Spindle head locked in mid-travel, table and table saddle locked. Spindle out (sliding spindle).
0,02	*a)* 0.0008	Straightedge and dial gauge	Clause 5.232.1 Spindle head locked. The straightedge shall be set parallel to the sliding spindle movement; then the stylus of a dial gauge fixed on the spindle nose should touch the functional surface of the straightedge. Repeat the same operations in the two planes : horizontal and vertical. It should be noted that for *b)* the permissible deviation involves the normal deflection of the spindle. In the case of a machine having a ram, it shall be maintained locked, in retracted position.
for a measuring length of			
300	12		
0,02	*b)* 0.0008		
for a measuring length of			
300	12		
0,02	*a)* 0.0008	Straightedge and dial gauge	Clause 5.232.1 Spindle head locked. Boring spindle retracted. The straightedge shall be set parallel to the ram movement. Then touch the functional surface of the straightedge with a dial gauge fixed at the end of the ram. Repeat the same operations in the two planes : horizontal and vertical.
for a measuring length of			
500	20		
0,02	*b)* 0.0008		
for a measuring length of			
500	20		

No.	Diagram	Object	
G 17		Checking of parallelism of the boring spindle axis to the table movement : *a*) in the vertical plane; *b*) in the horizontal plane.	 *a*) *b*)
G 18		Checking of squareness of the boring spindle axis to the median or reference T slot of the table (in the case of fixed table only).	
G 19		Checking of coincidence of the steady block bore with the boring spindle axis : *a*) in the vertical plane (in the case of machines having synchronized movements of the steady block and spindle head); *b*) in the horizontal plane.	 *a*) *b*)

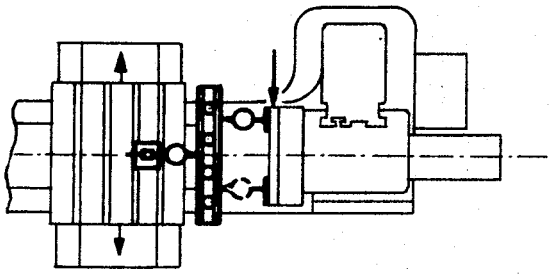
	Object	Permissible deviation	
		mm	in
	Checking of parallelism of the boring spindle axis to the table movement :		
	a) in the vertical plane;	*a*) 0,03 for a measuring length of 500	*a*) 0.0012 for a measuring length of 20
	b) in the horizontal plane.	*b*) 0,03 for a measuring length of 500	*b*) 0.0012 for a measuring length of 20
	Checking of squareness of the boring spindle axis to the median or reference T slot of the table (in the case of fixed table only).	0,03/1000*	0.0012/40*
	Checking of coincidence of the steady block bore with the boring spindle axis :		
	a) in the vertical plane (in the case of machines having synchronized movements of the steady block and spindle head);	*a*) 0,04/1000	*a*) 0.0016/40
	*b*) in the horizontal plane.	*b*) 0,03/1000	*b*) 0.0012/40

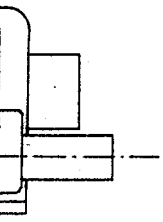
Permissible deviation			Measuring instruments	Observations and references to the test code ISO/R 230
m		in		
,03 for a measuring length of 500	*a)*	0.0012 20	Dial gauge and, possibly, test mandrel	Clauses 5.412.1 and 5.422.3 Spindle head locked in mid-travel. Possibly table and table base locked in central position. The measurement shall be carried out either directly on the spindle or with the aid of a test mandrel mounted in the spindle nose.
,03 for a measuring length of 500	*b)*	0.0012 20		
1000*		0.0012/40*	Dial gauge	Clauses 5.512.1 and 5.512.52 Spindle head locked in mid-travel. Table saddle and possibly table base locked in central position. * Distance between the two points touched.
/1000	*a)*	0.0016/40	Dial gauge and boring bar or test mandrel(s)	Clause 5.44 Does not conform with test code. Due to the great distance between supports a cylindrical bar or a test mandrel shall be used of sufficient length to pass completely through the steady block while mounted in the boring spindle when in its retracted position. A dial gauge shall be set on the table with the stylus touching the test mandrel and the table moved over its entire traverse. Repeat the same operations with the spindle extended. Test *a)* shall be carried out setting the spindle head and the steady block first in high position, then in low position, or vice versa. Test *b)* shall be carried out with the spindle head and steady block locked in mid-travel. Table and table base locked in central position. In the case of large machines, it may be desirable to use in place of a single mandrel two short test mandrels placed in the spindle nose and in the steady block bore.
/1000	*b)*	0.0012/40		

No.	Diagram	Object	
G 20		Checking of straightness of the vertical movement of the spindle head : *a*) in the vertical plane coaxial with the spindle axis; *b*) in the vertical plane perpendicular to the spindle axis.	*a*) *b*)
G 21		Checking of squareness of the table surface to the vertical movement of the spindle head : *a*) in the vertical plane coaxial with the spindle axis; *b*) in the plane perpendicular to the spindle axis.	 *a*) *b*)
G 22		**E – MOVABLE PLATE** (mounting) *a*) Measurement of run-out of the face centering; *b*) Measurement of periodic axial slip; *c*) Measurement of camming of the support surface of the adapting plate (including periodic axial slip).	 *a*) *b*) *c*)
G 23		**F – INTEGRAL SURFACING HEAD** Checking of squareness of the movement of the radial facing slide to the table surface.	

	Object	Permissible deviation	
		mm	in
	Checking of straightness of the vertical movement of the spindle head : *a*) in the vertical plane coaxial with the spindle axis; *b*) in the vertical plane perpendicular to the spindle axis.	*a*) 0,02 for a measuring length of 500 *b*) 0,02 for a measuring length of 500	*a*) 0.0008 for a measuring length of 20 *b*) 0.0008 for a measuring length of 20
	Checking of squareness of the table surface to the vertical movement of the spindle head : *a*) in the vertical plane coaxial with the spindle axis; *b*) in the plane perpendicular to the spindle axis.	*a*) 0,02/500 *b*) 0,02/500	*a*) 0.0008/20 *b*) 0.0008/20
	**E – MOVABLE PLATE** (mounting) *a*) Measurement of run-out of the face centering; *b*) Measurement of periodic axial slip; *c*) Measurement of camming of the support surface of the adapting plate (including periodic axial slip).	*a*) 0,01 *b*) 0,01 *c*) 0,02	*a*) 0.0004 *b*) 0.0004 *c*) 0.0008
	**F – INTEGRAL SURFACING HEAD** Checking of squareness of the movement of the radial facing slide to the table surface.	0,025/300	0.001/12

Permissible deviation			Measuring instruments	Observations and references to the test code ISO/R 230
mm		in		
02	*a*)	0.0008	Dial gauge and straightedge	Clause 5.232.1 Carry out the test with the table saddle locked, possibly the table and table base locked in mid-position. Does not conform with test code, a square may be used instead of a straightedge. If the spindle can be locked, the dial gauge can be mounted on it. If the spindle cannot be locked, the dial gauge shall be placed on the spindle head of the machine.
for a measuring length of				
00		20		
02	*b*)	0.0008		
for a measuring length of				
00		20		
500	*a*)	0.0008/20	Dial gauge and square	Clause 5.522.2 Carry out the test with the table saddle and possibly table base locked in mid-position. Lock the spindle head when taking measurements. If the spindle can be locked, the dial gauge can be mounted on it. If the spindle cannot be locked, the dial gauge shall be placed on the spindle head of the machine.
500	*b*)	0.0008/20		
01	*a*)	0.0004	Dial gauge	*a*) Clause 5.612.2 *b*) Clauses 5.622.1 and 5.622.2 The existence, value and direction of force *F* shall be specified by the manufacturer. *c*) Clause 5.632 The distance *A* of dial gauge *c*) from the spindle axis shall be as large as possible.
1	*b*)	0.0004		
2	*c*)	0.0008		
300		0.001/12	Dial gauge and square	Clause 5.522.2 Repeat the same operation after turning the plate by 180°.

No.	Diagram	Object	
G 24		Checking of parallelism of the facing slide movement to the transverse movement of the table.	

	Object	Permissible deviation	
		mm	in
	Checking of parallelism of the facing slide movement to the transverse movement of the table.	0,025 for a measuring length of 300	0.001 12

Permissible deviation		Measuring instruments	Observations and references to the test code ISO/R 230
m	in		
25 for a measuring length of 0	0.001 12	Straightedge and dial gauge.	A straightedge laid parallel to the transverse movement of the table shall be placed on the bed. The stylus of a dial gauge fixed on the radial facing slide of the surfacing head shall touch the straightedge. Repeat the test after turning the facing head by 180°.