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# INTERNATIONAL STANDARD 2772/1

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## Test conditions for box type vertical drilling machines — Testing of the accuracy — Part I : Geometrical tests

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**Descriptors** : machine tools, drilling machines (tools), tests, testing conditions, verifying, precision.

## 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 2772/1 was drawn up by Technical Committee ISO/TC 39, *Machine tools*, and circulated to the Member Bodies in June 1972.

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

Belgium	Ireland	South Africa, Rep. of
Czechoslovakia	Italy	Spain
Egypt, Arab Rep. of	Netherlands	Thailand
France	New Zealand	Turkey
Germany	Poland	United Kingdom
Hungary	Romania	U.S.S.R.

The Member Bodies of the following countries expressed disapproval of the document on technical grounds :

Japan  
Switzerland

# Test conditions for box type vertical drilling machines — Testing of the accuracy — Part I : Geometrical tests

## 1 SCOPE AND FIELD OF APPLICATION

This International Standard describes, with reference to ISO/R 230, both geometrical and practical tests on general purpose and normal accuracy box type vertical drilling machines, and gives the corresponding permissible deviations which apply.

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 characteristics (such as speeds, feeds, etc.), which should generally be checked before testing accuracy.

## 2 REFERENCE

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

## 3 PRELIMINARY REMARKS

**3.1** In this International Standard, all the dimensions are expressed in millimetres and in inches.

**3.2** 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.

**3.3** 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.

**3.4** 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.

**3.5** 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 0,01 mm (0.000 4 in).

**3.6** The practical tests relating to this kind of machine will be the subject of an Addendum constituting Part II.

4 TEST CONDITIONS AND PERMISSIBLE DEVIATIONS

4.1 Geometrical tests

No.	Diagram	Object	Permissible deviations		Measuring instruments	Observations and references to the test code ISO/R 230
			mm	in		
G0		Levelling of the machine : a) in the plane of symmetry of the machine; b) in the plane perpendicular to the plane of symmetry of the machine and passing through the spindle axis.	0,03/300	0.0012/12	Level and straightedge	Clauses 3.11 and 5.212.21
G1		<b>A - TABLE</b> Checking of flatness of the table surface (and of the base plate if it is machined).	0,05 for any measuring length of 300 (flat or concave)	0.0012 for any measuring length of 12 (flat or concave)	Precision level or straightedge and gauge blocks	Clauses 5.322 and 5.323
G2		<b>B - SPINDLE</b> Measurement of run-out of the internal taper of the spindle : a) near the spindle nose; b) at a distance of $l$ from the spindle nose.	For $l = 100$ a) 0,015 b) 0,02	For $l = 4$ a) 0.0006 b) 0.0008	Dial gauge and test mandrel	Clause 5.612.3  For details of test mandrels and the determination of the corresponding distance $l$ , reference should be made to clause A3 of Appendix A (Tables E and F).

No.	Diagram	Object	Permissible deviations		Measuring instruments	Observations and references to the test code ISO/R 230
			mm	in		
G3		<p>Checking of straightness of the vertical column ways of the table and squareness of the spindle axis to the table surface:</p> <p>a) in the plane of symmetry of the machine;</p> <p>b) in the plane perpendicular to the plane of symmetry of the machine.</p>	<p>a) 0,05/300* with <math>\alpha \leq 90^\circ</math></p> <p>b) 0,05/300</p>	<p>a) 0,002/12* with <math>\alpha \leq 90^\circ</math></p> <p>b) 0,002/12</p>	<p>Dial gauge and straightedge</p>	<p>Clauses 5.512.1, 5.512.42 and 5.232.1</p> <p>Straightness checking should be carried out at a number of positions equally spaced between the extreme positions of the table.</p> <p>Squareness checking should be carried out first with the table in the upper position 1) and then in the lower position 2).</p> <p>Spindle head, table, cross slide and knee locked.</p> <p>* Distance between the two points touched.</p>
G4		<p><b>C - SPINDLE HEAD</b></p> <p>Checking of squareness of the table surface to the vertical movement of the spindle head:</p> <p>a) in the plane of symmetry of the machine;</p> <p>b) in the plane perpendicular to the plane of symmetry of the machine.</p>	<p>a) 0,1/300 with <math>\alpha \leq 90^\circ</math></p> <p>b) 0,1/300</p>	<p>a) 0,004/12 with <math>\alpha \leq 90^\circ</math></p> <p>b) 0,004/12</p>	<p>Dial gauge and square</p>	<p>Clause 5.522.2</p> <p>Table locked in mid-position.</p> <p>Cross slide and knee locked.</p> <p>Spindle head locked when taking measurements.</p>
G5		<p>Checking of squareness of the table surface to the vertical movement of the spindle housing or quill:</p> <p>a) in the plane of symmetry of the machine;</p> <p>b) in the plane perpendicular to the plane of symmetry of the machine.</p>	<p>a) 0,1/300 with <math>\alpha \leq 90^\circ</math></p> <p>b) 0,1/300</p>	<p>a) 0,004/12 with <math>\alpha \leq 90^\circ</math></p> <p>b) 0,004/12</p>	<p>Dial gauge and square</p>	<p>Clause 5.522.2</p> <p>Table locked in mid-position.</p> <p>Spindle head, cross slide and knee locked.</p>

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