

JIS

JAPANESE INDUSTRIAL STANDARD

Test Code for Performance and
Accuracy of Jig Boring Machines

JIS B 6224 —1978

Translated and Published

by

Japanese Standards Association

Printed in Japan

Translation without guarantee
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standard in Japanese is to be evidence

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Test Code for Performance and Accuracy
of Jig Boring Machines

B 6224-1978

1. Scope

This Japanese Industrial Standard specifies testing and accuracy inspecting methods for the jig boring machines of vertical type and of table travelling distance in longitudinal direction up to and including 1600 mm.

Remark: The larger direction in table travelling distance is defined as the longitudinal direction, and the direction at right angles with that in a horizontal plane is defined as the lateral direction.

2. Testing Methods

2.1 Functional Tests The functional tests shall be in accordance with Table 1.

Applicable Standards:

JIS B 4302-Morse Taper Shank Twist Drills

JIS B 6003-Methods of Vibration Testing for Machine Tools

JIS B 6004-Method of Sound Level Measurement for Machine Tools

JIS B 6201-Test Code for Performance and Accuracy of Machine Tools

JIS B 7519-Microindicators

JIS B 7533-Lever Type Dial Test Indicators

JIS B 7538-Autocollimators

JIS B 7539-Cylindrical Squares

JIS B 7541-Standard Scales

JIS G 4051-Carbon Steels for Machine Structural Use

JIS G 4403-High Speed Tool Steels

Table 1

No.	Test item	Testing method	Reference Corresponding to No. of 3.2 in JIS B 6201
1	Start, stop and running operation of main spindle	Test the smoothness and reliability of working, operating 10 times of starting and stopping (including inching ⁽¹⁾ and braking ⁽¹⁾) continuously with respect to normal and reverse ⁽¹⁾ rotations at a suitable main spindle speed.	1-11
2	Changing operation of main spindle speed	Test the smoothness of working and reliability of indication, changing the main spindle speeds with respect to all of the marked main spindle speeds ⁽²⁾ .	1-12
3	Changing operation of main spindle (spindle sleeve) feed	Test the smoothness of working and reliability of indication, changing the feeds with respect to all of the marked feeds ⁽²⁾ .	1-22
4	Engaging and disengaging of main spindle (spindle sleeve) power feed and operation of automatic stopping device ⁽¹⁾ or automatic reversing device ⁽¹⁾	Test the smoothness and reliability of engaging and disengaging workings of main spindle (spindle sleeve) power feed, and test the smoothness and reliability respectively with respect to the setting of commanding positions and working of the automatic stopping device of main spindle (spindle sleeve) or of the automatic reversing device.	1-26 1-31 1-32
5	Hand feed operation of main spindle (spindle sleeve)	Test the smoothness and uniformity of workings along over-all length of movement, travelling the main spindle (spindle sleeve) with hand feed handle. In addition, test the smoothness and uniformity of working, by carrying out the fine feed with fine hand feed handle at an arbitrary position of movement.	1-27

Table 1 (Continued)

No.	Test item	Testing method	Reference Corresponding to No. of 3.2 in JIS B 6201
6	Operation of engaging and disengaging device for power feed of spindle head or cross rail ⁽¹⁾	Test the smoothness and reliability of workings, by carrying out engaging and disengaging of power feed of spindle head or cross-rail.	1-31
7	Hand feed operation of table and spindle head ⁽¹⁾	Test the smoothness and uniformity of workings along overall length of respective movements, by travelling the table and spindle head with hand feed handle.	1-27
8	Operation of engaging and disengaging device for table power feed ⁽¹⁾	Test the smoothness and reliability of workings, by carrying out engaging and disengaging of table power feed.	1-31
9	Positioning operation	Test the smoothness and reliability of workings, as well as the distinctness of positioning indications, by carrying out positioning operations at three positions of center and near both ends of movements for the longitudinal and lateral directions ⁽¹⁾ of table or for each direction of the spindle head ⁽¹⁾ .	—
10	Clamping operation	Test the reliability, by clamping at an arbitrary position on each movement with respect to each clamping mechanism of spindle sleeve ⁽¹⁾ , spindle head, cross-rail ⁽¹⁾ and table.	1-33

Table 1 (Continued)

No.	Test item	Testing method	Reference Corresponding to No. of 3.2 in JIS B 6201
11	Operation of position read out device for positioning ⁽¹⁾	Test the smoothness of workings and reliability of indications throughout the total range of movement, by operating the position read out device for positioning respectively in longitudinal and lateral directions of the table.	—
12	Operation of fine feed device of reference scale ⁽¹⁾	Test the smoothness and reliability of workings throughout the total range of movement, by operating the fine feed device respectively in longitudinal and lateral directions of reference scale of the table.	—
13	Electrical apparatus	Test the insulating conditions once each before and after the test running.	1-51
14	Safety device	Test the reliability of the safety for the operators and protecting functions for the machine.	1-52
15	Lubricating device	Test the reliability of functions such as oil-tightness and proper distribution of oil.	1-53
16	Oil hydraulic and pneumatic apparatus ⁽¹⁾	Test the reliability of functions such as oil-tightness, air-tightness and pressure control.	1-54
17	Accessory apparatus	Test the reliability of functions.	1-55

Notes ⁽¹⁾ Each test is to be carried out, where the function concerned is provided.

⁽²⁾ In the case of the continuous speed control, tests are to be carried out at three points of the lowest, intermediate and highest main spindle speeds or of feeds.

2.2 No-Load Running Tests The testing methods of no-load running shall be in accordance with the following:

- (1) Concerning Main Spindle Measure each item specified in Recording Form 1-1 of Table 2 by running the main spindle, starting from the lowest rotational speed and to each step, and succeedingly, continuing running for 60 minutes at the maximum rotational speed [see 3.3 of JIS B 6201].

Furthermore, observe vibrations and noises. Where the vibrations and noises are particularly in problem, these shall be inspected and measured in accordance with JIS B 6003 and JIS B 6004.

In addition, measure required electric powers respectively for the minimum, intermediate and maximum vertical feeds taken at the last stage of the maximum speed running of the main spindle.

Moreover, measure and record respective amounts of feed.

For the separated type of the feed motor and main spindle drive motor, measure those with respect to the feed motor, and record in the description column to that effect.

Table 2. Recording Form 1-1

No.	Time of measurement h/min	Main spindle speed rpm		Temperature °C			Required electric power (source frequency Hz)			Description
				Main spindle bearing		Room temperature	Voltage V	Current A	Input kW	
		Marking	Actually measured	Upper	Lower					

- (2) Concerning Feeds Measure each item specified in Recording Form 1-2 of Table 3 with respect to three feed speeds of the minimum, intermediate and maximum and to the rapid feed [see No. 2.3 of JIS B 6201].

For the separated type of the feed motor and main spindle motor, measure only those with respect to the feed motor. For the non-separated type of the feed motor and main spindle motor, record in the description column to that effect, in this case rotate the main spindle at the lowest speed.

Moreover, observe vibrations and noises. Where the vibrations and noises are particularly in problem, these shall be inspected and measured in accordance with JIS B 6003 and JIS B 6004.

Table 3. Recording Form 1-2

Division of uses of motor		Feed speed mm/min		Required electric power (source frequency Hz)			Description
		Marking	Actually measured	Voltage V	Current A	Input kW	
Longitudinal feed of table	Minimum speed						
	Intermediate speed						
	Maximum speed						
	Rapid feed						
Lateral feed of table or spindle head	Minimum speed						
	Intermediate speed						
	Maximum speed						
	Rapid feed						
Vertical feed of spindle head or cross-rail	Minimum speed						
	Intermediate speed						
	Maximum speed						
	Rapid feed						

2.3 Testing Methods of Load Running Carry out the load running tests under the following various conditions by performing drilling; measure each item given in Recording Form 2 of Table 4, and observe vibrations, noises and finishing conditions of the holes [see 3.3 of JIS B 6201].

Where the vibrations and noises are particularly in problem, these shall be inspected and measured in accordance with JIS B 6003 and JIS B 6004.

Table 4. Recording Form 2

Material of work pieces		Nominal dia. of drill								
No.	Cutting conditions			Required electric power (source frequency Hz)						Description
	Main spindle speed rpm	Cutting speed m/min	Feed mm/rev	Voltage V	Current A	Load input kW	No load input kW	Cutting power kW	Feed (3) power kW	

Note (3) This is written for the separated type of feed motor and drive motor.

(1) Tools

(a) Nominal diameter of the drill shall be the maximum diameter given in the specifications for steel, and the shape shall conform to JIS B 4302.

(b) The material shall be in accordance with JIS G 4403.

(2) Work Pieces The material of work pieces shall generally be S 45 C specified in JIS G 4051, and the thickness shall generally be 1.5 to 2 times the nominal diameter of drill.

(3) Cutting Conditions

Cutting speed: $V = 25$ (m/min)

Feed: All feeds shall be applied, starting from the minimum feed of the machine. However, when the power has reached a definite power at a feed, it shall be stopped at this feed.

3. Inspecting Methods on Accuracy

3.1 General The general matters concerning the accuracy inspection shall be as the following:

(1) Independently of the provisions of 2.5 of JIS B 6201, the accuracy inspection shall be carried out under the condition of 20°C.