

JIS

JAPANESE INDUSTRIAL STANDARD

**Test Code for Performance and
Accuracy of Bed Type
Horizontal Milling Machines**

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Test Code for Performance and Accuracy of
Bed Type Horizontal Milling Machines

B 6226-1981
(Reaffirmed: 1986)

1. Scope

This Japanese Industrial Standard specifies the test and accuracy inspection methods for running performance of bed type horizontal milling machines of not more than 4000 mm in moving amount in X-axis direction of table.

Remarks 1. The names of axes of machine to be used in this standard shall be as follows:

Z-axis means the direction parallel to the main spindle, X axis, the horizontal direction in a plane perpendicular to Z axis, and Y axis, the direction perpendicular to Z-axis and Y-axis (See JIS B 6310).

2. In this standard, the units and numerical values shown in { } are in accordance with the International System of Units (SI) and are appended for informative reference.

Applicable Standards:

JIS B 4205-Plain Milling Cutters

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 6310-Axis and Motion Nomenclature for Numerically Controlled Machine Tools

JIS G 3101-Rolled Steel for General Structure

JIS G 4051-Carbon Steels for Machine Structural Use

JIS G 5501-Gray Iron Castings

Reference Standard:

JIS B 0170-Glossary of Common Terms of Cutting Tools

2. Running Test Methods

2.1 Function Test The function test of bed type horizontal milling machine shall be in accordance with Table 1.

Table 1

No.	Test item	Test method	Informative reference Corresponding No. to 3.2 of JIS B 6201
1	Operation for starting, stopping and running of main spindle	Carry out continuously 10 times the starting, and stopping [including inching ⁽¹⁾ and braking ⁽¹⁾] concerning positive and reverse revolutions ⁽¹⁾ at a suitable spindle speed to test the smoothness and security of working.	1-11
2	Conversion operation of spindle speed	Convert the spindle speed concerning all marked speeds to test the smoothness of working and security of indication of the operation device.	1-12
3	Starting and stopping of feed and running operations	Carry out starting and stopping [including inching ⁽¹⁾] at a suitable feed speed or feed amount concerning respectively the spindle head, table and spindle sleeve ⁽¹⁾ 10 times to test the smoothness and security of working.	1-21
4	Conversion operation of feed speed	Convert the feed speed on marked all feeds for the feed in X-axis direction of table, and on three feeds of the lowest, intermediate and the highest for variable speed type to test the smoothness of working and the security of indication. Concerning the feeds of table ⁽¹⁾ , spindle head ⁽¹⁾ and spindle sleeve ⁽¹⁾ in Z-axis direction and the feed of spindle head in Y-axis direction, carry out the test similar to the abovementioned test at an arbitrary feed.	1-22
5	Hand-feed operation	Move the spindle head, table and spindle sleeve ⁽¹⁾ with hand-feed handle to test the smoothness and uniformity of working over the whole length of movement. Further, test the security of function of micrometer collar ⁽¹⁾ .	1-27
6	Putting on-and-off of power feed and quick traverse, and its device operation	Concerning the spindle head, table and spindle sleeve ⁽¹⁾ respectively, test the setting of position for putting on and off of power feed and quick traverse, smoothness and security of working.	1-31

Table 1. (Continued)

No.	Test item	Test method	Informative reference Corresponding No. to 3.2 of JIS B 6201
7	Operation of automatic stopping device	Concerning respectively the spindle head, table, and spindle sleeve ⁽¹⁾ , test the smoothness and security of setting of automatic stopping position and the working.	1-26
8	Operation of automatic positioning device ⁽¹⁾	Concerning respectively the spindle head, table, and spindle sleeve ⁽¹⁾ , test the smoothness and security of setting of command position of automatic positioning device in power feed and of working.	1-32
9	Operation of arbor support device ⁽¹⁾	Move the over arm and arbor support over the whole length of motion to test the smoothness and the uniformity.	1-33
10	Fastening operation	Concerning each fastening mechanism of spindle head, table, spindle sleeve ⁽¹⁾ , spindle head saddle ⁽¹⁾ , over arm ⁽¹⁾ , arbor support ⁽¹⁾ and brace ⁽¹⁾ , fasten at an arbitrary position of respective movings and test the security.	1-33
11	Attaching and detaching of tool	Test the security and smoothness of attaching and detaching of tool.	1-41
12	Backlash removing device ⁽¹⁾ of feed screw	Test the security of function.	1-56
13	Electrical equipment	Test the insulation condition respectively once before and after the running test.	1-51
14	Safety device	Test the security of safety relating to the operator and the security of mechanical protective function.	1-52
15	Lubricating device	Test the security of function such as oil tight, suitable distribution of oil amount.	1-53
16	Oil-hydraulic device ⁽¹⁾	Test the security of function such as oil tight, pressure regulation, etc.	1-54
17	Accessory device	Test the security of function.	1-55

Note ⁽¹⁾ Carry out the test on the machine provided with this function.

2.2 No-Load Running Test The no-load running test of bed type horizontal milling machine shall be as follows:

- (1) **Main-Spindle Relation** Start from the lowest speed of main spindle, run on each stage, successively continue the running at the highest speed, as a rule, for 30 to 60 min and measure each item specified in Table 2 Record Form 1-1 [see 3.3 of JIS B 6201].

Further, observe the vibration and noise. In the case where the vibration and noise are made problem specially, the test shall be in accordance with JIS B 6003 and JIS B 6004.

Table 2. Record Form 1-1

No.	Measuring time h and min	Spindle speed rpm		Temperature °C					Required electric power (power source frequency Hz)			Description
		Marked	Actually measured	Main bearing		Arbor bearing		Room temper- ature	Voltage V	Current A	Input kW	
				Front	Rear	Front	Rear					

- (2) **Feed Relation** Concerning three feeds of the lowest, intermediate and the highest, and quick traverse, measure each item specified in Table 3 Record Form 1-2 (see 3.3 of JIS B 6201).

In the case where the electric motor for feed is separated from the one for main spindle, measure exclusively on the one for feed. In the case not separated, record the effect on the description column, and the main spindle shall be at the lowest speed.

Further, observe the vibration and noise. In the case where the vibration and noise are made problem specially, it shall be in accordance with JIS B 6003 and JIS B 6004.

Table 3 Record Form 1-2

No.	Feed of table in X-axis direction					Feed of table in Z-axis direction (¹)(⁴)					Feed of spindle head in Y-axis direction					Description
	Feed speed mm/min		Required electric power(¹) (power source frequency Hz)			Feed speed mm/min		Required electric power(¹) (power source frequency Hz)			Feed speed mm/min		Required electric power(¹) (power source frequency Hz)			
	Marked	Actually measured (²)	Voltage V	Current A	Input kW	Marked	Actually measured (²)	Voltage V	Current A	Input kW	Marked	Actually measured (²)	Voltage V	Current A	Input kW	

Notes (²) Record it concerning the speed and its direction.

(³) In the case where the electric power required for feed is caused with difference according to the direction, record respectively on them.

(⁴) In case where the measurement of electric power is remarkably difficult due to the short measuring time even total stroke is fed, the measurement of quick traverse or the highest feed may be omitted.

2.3 Load Running Test

2.3.1 General For the load running test of bed type horizontal milling machine, carry out cutting power test to measure the required electric power.

Further, observe the vibration, noise and condition of finished surface (see 3.4 of JIS B 6201). In the case where the vibration and noise are made problem specially, the test shall be in accordance with JIS B 6003 and JIS B 6004.

Furthermore, dry type cutting shall be applied.

2.3.2 Cutting Power Test For the cutting power test, test whether it is able to endure the definite electric power at a high speed cutting or not, carry out planing according to table feed under the following conditions, measure the required electric power and observe the condition of finished surface and an existence of chatter.

Further, the planing shall be carried out according to face milling cutter and for the machine provided with an arbor support, also the test according to plain milling cutter shall be carried out (see Table 4 Record Form 2-1) (see No. 3-11 and 3-14 of JIS B 6201).

Table 4 Record Form 2-1

[illegible]

Notes (5) Record the division of upward milling and downward milling in the description column.

(⁶) In the case where the electric motor for main spindle and that for feed are not separated, inscribe in the column of electric power for main spindle, and record the effect in the description column.

(⁷) It means the difference between the load input and the no-load input.

(⁸) The required electric power, in the case of obtaining the cutting amount per 1 kW, shall be the combination of load input for main spindle and that for feed.

- (1) **Tools** The tool shall, as a rule, be cemented carbide face milling cutter and in the case of carrying out the test according to the plain milling cutter, be the plain milling cutter specified in JIS B 4205, its diameter shall be in accordance with Table 5, and record the required items according to Table 6 Record Form 2-2 and Table 7 Record Form 2-3.

Table 5

Unit: mm

Moving amount of table in X-axis direction	Diameter of cemented carbide face milling cutter	Diameter of plain milling cutter
500 max.	75 to 100	63
Exceeding 500 up to and including 1000	100 to 150	80
Exceeding 1000 up to and including 2000	150 to 200	100
Exceeding 2000 up to and including 4000	200 to 250	100 to 125

Table 6. Record Form 2-2

Cemented carbide face milling cutter ⁽⁹⁾								Description
Diameter mm	No. of teeth sheets	Side rake angle deg.	Back rake deg.	Side clearance angle deg.	Front clearance angle deg.	Approach angle deg.	Chamfered corner width mm	

Note ⁽⁹⁾ The name of tool tip shall be in accordance with Fig. 1.