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JAPANESE INDUSTRIAL STANDARD

Numerically controlled routing machines — Test methods for performance and accuracy

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Numerically controlled routing machines -
Test methods for performance and accuracy

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1. Scope

This Japanese Industrial Standard specifies the test methods relating to the functions, running performances and rigidities, as well as the inspecting methods on machine accuracies and machining accuracies of the wood working milling machines which process work pieces (hereafter referred to as the "numerically controlled routing machines") performing the travels of spindle of 300 mm or under in vertical stroke of spindle and table of 1500 mm x 300 mm or under in size by numerical control.

Remarks 1. The following standards are cited in this Standard:

JIS B 6507-General code of safety for wood working
machinery

JIS B 6521-Methods of measurement for noise emitted by
wood working machinery

JIS B 6603-Safety standards for construction of routers

2. Units and numerical values given in { } in this Standard are in accordance with conventional units, and are appended for informative reference.

2. Functional test methods

2.1 Functional tests without numerical control The functional tests without numerical control shall be in accordance with Table 1, carrying out by manual operations on respective parts.

Table 1. Functional tests without numerical control

No.	Test item	Test method
1	Electric equipment	Before and after the running test, test the insulating conditions once respectively. However, for the circuit which uses semi-conductor and the like, this is not applicable.
2	Start, stop and running operations of spindle	At an appropriate spindle rotational speed, carry out 10 times of start and stop (including braking) repeatedly on normal rotation and reverse rotation to examine the smoothness and reliability of actuations.
3	Changing operation of spindle rotational speed	Change the spindle rotational speed on every rotational speed(¹) of marking to examine the smoothness of actuations and the reliability of indications of operating device.
4	Selecting operation of spindle	For every spindle, examine the smoothness and reliability of actuation of selecting device of spindle.
5	Operations of travel limit automatic stopping devices of table and spindle	Carry out rapid traverse travel limit automatic stop on X-axis direction, Y-axis direction and Z-axis direction respectively to examine the smoothness and reliability of actuations.
6	Attaching and detaching of router bit	Examine the reliability and smoothness of attaching and detaching of router bit and fastening screw.
7	Numerically controlling device	Examine the smoothness and reliability of actuations of respective kinds of indicating lamp, tape reader, fan, etc. of numerically controlling device.
8	Safety device	Examine the reliability of the safety function for workers and machine protective function (See JIS B 6507 and JIS B 6603).
9	Lubricating equipment	Examine the reliability of functions of oil tightness, proper distribution of oil quantity, etc.
10	Oil hydraulic equipment	Examine the reliability of functions of oil tightness, pressure regulation, etc.
11	Pneumatic equipment	Examine the reliability of functions of air tightness, pressure regulation, etc.
12	Attachments	Examine the reliability of functions.

Note (1) In the case of variable speed, test shall be carried out on the three rotational speeds of the minimum, intermediate and maximum.

Remarks: For a numerically controlled router without the said functions, the relevant test items in Table 1 shall be omitted.

2.2 Functional tests by numerical control The functional tests by numerical control shall be carried out by allowing respective parts to actuate by numerical control tape for testing and other numerical control commands⁽²⁾, and be in accordance with Table 2.

Note (2) Other numerical control commands include those commands by the inputs by the card, on-line, and manual data input equipment and the manual inputs of push button and the like on the control panel.

Table 2. Functional tests by numerical control

No.	Test item	Test method
1	Start, stop and running operation of spindle	At an appropriate spindle rotational speed, carry out 10 times of start and stop (including braking) repeatedly on normal rotation and reverse rotation to examine the smoothness and reliability of actuations.
2	Changing operation of spindle rotational speed	Change the spindle rotational speed on every rotational speed ⁽¹⁾ of marking to examine the smoothness of actuations and reliability of indications of operating device.
3	Start, stop, reverse rotation of spindle and changing of spindle rotational speed	Rotate the spindle, change the spindle rotational speed on start, stop, reverse rotation and every marked speed of rotation ⁽¹⁾ to examine the reliability of functions and smoothness of actuations.
4	Start and stop of feed and change of feed speed	Change the feed speed to the three feed speeds of minimum, intermediate and maximum of marking and rapid feed, carry out start and stop on the positive and negative of each feed to examine the reliability of functions and smoothness of actuations. This test shall be carried out on each controlling shaft.
5	Inching	Carry out inching operation on each controlling shaft to examine the reliability of functions and smoothness of actuations.
6	Zero return	On each controlling shaft, carry out zero return ⁽³⁾ from an arbitrary returnable position to examine the reliability of functions and smoothness of actuations.

Table 2 (Continued)

No.	Test item	Test method
7	Operation of spindle selecting device	On every spindle, examine the smoothness of actuations and reliability of spindle selecting device.
8	Operations of table and spindle travel limit automatic stopping device	On the directions of X-axis, Y-axis and Z-axis, carry out travel limit automatic stopping respectively to examine the smoothness and reliability of actuations.
9	Other functions	On other functions being provided, examine respectively the reliability of functions and smoothness of actuations.

Note (3) The travel shall be made by rapid feed as a rule, and shall be made in a distance or over including the automatic acceleration and deceleration.

Remarks 1. Tests may be carried out at the same time with the continuous no load running tests.

2. For the numerically controlled router not provided with the said functions, the test items corresponding to these in Table 2 shall be omitted.

3. Running test methods

3.1 No load running test The no load running test shall be in accordance with the following:

- (1) Relating to spindles Rotate the spindle, continue running for about 30 min, and after the bearing temperatures have been stabilized measure the required electric power and noises, record on each item specified in Record Format 1-1 of Table 3, and at the same time observe by sense of touch that no abnormal vibration exists.

Furthermore, the measurement of noises shall be in accordance with JIS B 6521.

Table 3. Record format 1-1

No.	Measured o'clock time minute	Spindle rotational speed min ⁻¹ {rpm}	Temperature °C			Required electric power			Noise dB	Description	
			Marking Actual measure- ment	Spindle bearings		Room tempera- ture	Voltage V	Current A			Input kW
				Upper	Lower						

- Remarks 1. For that which is provided with the change gear of spindle rotational speed, the rotational speeds of at least two conditions including the maximum rotational speed shall be recorded.
2. As regards the measuring conditions of noise, these shall be recorded in the description column.
3. These measurements and observations shall be carried out on every spindle.

- (2) Relating to feeds Measure the three feed speeds of the minimum⁽⁴⁾, intermediate and maximum and rapid feed, record on each item specified in the Record Format 1-2 of Table 4, and at the same time observe by the sense of touch that no abnormal vibration is present.

Furthermore, at the intermediate feed speed, carry out the same measurements as above by actuating the feed speed override function.

Note ⁽⁴⁾ The minimum feed speed shall be 1 m/min.

Table 4. Record Format 1-2

Feed		Feed speed of X-axis direction m/min		Feed speed of Y-axis direction m/min		Feed speed of Z-axis direction m/min		Description
		Command	Actual measurement	Command	Actual measurement	Command	Actual measurement ⁽⁵⁾	
Minimum								
Inter- mediate	Without override							
	With override ⁽⁶⁾							
Maximum								
Rapid feed								

Note ⁽⁵⁾ Record on the speeds and its directions ($\pm$).

⁽⁶⁾ In the case where the feed speed override function has been allowed to actuate, record the override rate (%) in the command column.

3.2 Continuous no-load running test In the continuous no-load running test, carry out the continuous running of about 2 h by the test tapes including respective functions and other numerically controlled commands⁽²⁾ to examine for the presence of abnormalities.

In this case, the test tapes and other numerically controlled commands shall include at least the following contents:

- (1) Normal rotation, reverse rotation, start and stop on the intermediate spindle running speed⁽⁸⁾ of marking.