

JIS

JAPANESE INDUSTRIAL STANDARD

**Test Code for Performance and
Accuracy of Lathes**

JIS B 6202—1986

Translated and Published

by

Japanese Standards Association



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Test Code for Performance and Accuracy of Lathes B 6202-1986

1. Scope

This Japanese Industrial Standard specifies test and inspection methods of running performance, rigidity, mechanical accuracy and working accuracy of tool room lathe with swing over the bed not more than 500 mm and centre distance not more than 1500 mm, and of engine lathe with swing over the bed not more than 2000 mm and centre distance not more than 10000 mm.

Remarks 1. Coordinate axes of machines used in this standard are defined as follows [see JIS B 6310].

Axis Z: Axis Z is parallel to the main spindle (longitudinal direction).

Axis X: Axis X is at right angle to the axis Z on the horizontal plane, (transversal direction).

Axis Y: Axis Y is at right angle to axes Z and X.

2. The units and formulae given in { } in this standard are based on the customary units and are appended for reference.

2. Method of Running Test

2.1 Function Test The function test is carried out in compliance with Table 1.

Table 1

No.	Test item	Method of test	Reference Corresponding No. in 3.2 of JIS B 6201
1	Start, stop and operation of main spindle	Choose one suitable main spindle speed and perform start and stop operation (including inch and brake) for 10 consecutive times to ascertain the reliability of action.	1-11
2	Change of main spindle speed	Change the speed of main spindle throughout the entire indicated speed range, and ascertain the smoothness of operation and reliability indication.	1-12

Table 1 (Continued)

No.	Test item	Method of test	Reference Corresponding No. in 3.2 of JIS B 6201
3	Start, stop and operation of carriage and cross slide	Choose one suitable feed or speed ⁽¹⁾ for ordinary and screw cutting feed, and perform start and stop operation for 10 consecutive times to ascertain the reliability of operation.	1-21
4	Changing operation of feed	Change the speed of ordinary and screw cutting feed at 3 indicated speeds of minimum, medium and maximum. The smoothness of operation and reliability of indication shall be tested.	1-23
5	Changing operation of carriage and cross slide feed ⁽¹⁾	Change the feed to 3 steps of lowest, intermediate and highest speed. The smoothness of operation and the reliability of indication shall be tested. Quick feed is to be operated, the smoothness of operation for quick feed shall be tested also.	1-22
6	Operation of gear change for mechanical feed	Setting the position of operating gear for mechanical feed, smoothness of operation and reliability shall be tested.	1-21 1-31
7	Operation of carriage, slide base and tool slide	Test by hand operation the smoothness and uniformity of movement for the entire length of travel. In addition, the reliability of function of micrometer collar shall be tested.	1-27
8	Operation of tail stock and tail spindle ⁽²⁾	The smoothness and uniformity of hand operation and mechanical gearing ⁽¹⁾ through the entire length of movement shall be tested.	—
9	Clamping operation	Operating the clamping devices on carriage ⁽³⁾ and tail stock ⁽²⁾ at any arbitrary position of the movement, their reliability shall be tested.	1-33  Documents Document Sharing Hub

Table 1 (Continued)

No.	Test item	Method of test	Reference Corresponding No. in 3.2 of JIS B 6201
10	Fixing of tool	The reliability of fixing tool and the smooth movement of clamping screw shall be tested.	1-41
11	Electrical equipments	Insulation shall be tested once each before and after the running test. However, this is not applied to the circuit using the semiconductor.	1-51
12	Safety devices	The performance of safety devices for operator and protection of machine against damages shall be tested [see JIS B 6014].	1-52
13	Lubrication arrangement	The reliability of functioning such as oil tightness and correct distribution of oil, etc., shall be tested.	1-53
14	Pressure oil arrangement	The reliability of functioning such as oil tightness, pressure regulation, etc., shall be tested.	1-54
15	Fittings	The reliability of functioning of fittings shall be tested.	1-55

Notes (1) Applicable to machine tools provided with individual driving arrangement.

(2) No traversing of tail stock over tail stock base is made.

(3) No operation of swivel slide is made.

2.2 No Load Running Test The no load running test shall be commenced from the lowest speed of the main spindle to the highest speed throughout the each stage, as a rule, for the period of 30 to 60 min continuously, and measure each item given in Table 2 Recording Form 1-1 (see 3.3 in JIS B 6201).

Further, at the end of test for maximum spindle speed⁽⁴⁾, for the feed respectively to minimum, maximum and intermediate, the electric power shall be measured. Then vibration and noise shall be observed. When vibration and noise are particularly concerned, the test shall have to conform to JIS B 6003 and JIS B 6004. When separate motor is provided for carriage and tool rest, each item specified in Table 3 Recording Form 1-2 shall be measured.

Note (4) As large a feed as compatible within the scope of measurement shall be chosen.

Table 2. Recording Form 1-1

Test No.	Time (hr. min)	Main spindle speed min ⁻¹ (rpm)		Temperature °C			Power consumed (frequency of power source Hz)			Remarks
		Indicated	Actual	Main spindle		Room	Volt V	Ampere A	Input kW	
				Front	Rear					

Table 3. Recording Form 1-2

Measuring item Measuring part		Feed mm/min		Power consumed (frequency of power source Hz)			Remarks
		Indicated	Actual	Volt V	Ampere A	Input kW	
Carriage and cross slide	Minimum speed						
	Intermediate speed						
	Maximum speed						
	Quick feed						

2.3 Load Running Test The load running test, in conformity with the following conditions, shall be carried out by measuring power consumption required for turning test, torque test and chattering test. Vibration, noise and the smoothness of the finished surface shall be observed (see 3.4 in JIS B 6201).

When vibration and noise are particularly concerned, the test shall have to conform to JIS B 6003 and JIS B 6004.

All cutting shall be made in dry condition.

2.3.1 Cutting Power Test The cutting power test shall be carried out at the highest cutting speed to determine the durability for the specified electrical power, and shall be made under high speed outside-turning conforming to the following requirements (see Table 4 Recording Form 2, also 3-11 in JIS B 6201).

Table 4. Recording Form 2

Test No.	Diameter (d) mm	Cutting condition					Power consumed (frequency of power source Hz)					Remarks
		Main spindle speed (n) min ⁻¹ (rpm)	Cutting speed (V_c) mm/min	Depth of cut (a) mm	Feed (S) per revolution mm	Area cut ($a \cdot S$) mm ²	Volt V	Ampere A	Input (W) kW	No load input ⁽⁵⁾ (W_o) kW	Cutting power ($W - W_o$) kW	

Note (5) No-load input obtained in the condition with the regular work set.

- (1) **Cutting Tool** As a rule, the tool of Type 31 in JIS B 4105 shall be used.
- (2) **Work** As a rule, the material shall be of S 45 C in JIS G 4051 conforming to Table 5.

Table 5

Unit: mm		
Swing over bed (D)	Diameter (d) (approx.)	Length (l) (approx.)
1000 or under	Use diameter by which not less than 50 % of indicated maximum main spindle speed is obtainable when $V_c \approx 160$ m/min. When its value is less than $D/10$, use $D/10$.	$\frac{D}{2}$
Over 1000	$D/4$ to $D/2$	

(3) Cutting Condition

Feed (S): $S \approx \frac{D}{4000}, \frac{D}{2000}, \frac{D}{1600}, \frac{D}{1250}, \frac{D}{1000}$ (mm per revolution)

where D: swing over bed (mm)

Feed shall be increased until the specified power is reached.

Cutting depth (a) } As a rule, the value shall conform to Table 6.
Cutting speed (V_c) } When the cutting speed given in Table 6
can not be reached on account of the
construction of the machine, use the maximum
speed possible.

Table 6

Swing over bed (D) mm	Depth of cut ⁽⁶⁾ (a) mm (approx.)	Cutting speed (V_c) m/min (approx.)
200	1.7	160
250	2.1	
315	2.6	
400	3.3	
500	4.2	
630	5.3	
800	6.7	
1000	8.3	
1250	10.4	Value obtainable by using 50 % or over of specified maximum main spindle speed
1600	13.3	
2000	17.0	

Note (6) When swing over bed is not specified in Table 6, select one by D/120.

Remark: The work shall be held by chuck and centre.

2.3.2 Cutting Torque Test The cutting torque test shall be carried out by heavy cutting to determine the durability for the specified torque under the following condition (see Table 7 Recording Form 3, and also 3-12 in JIS B 6201).

Table 7. Recording Form 3

Test No.	Diameter (d) mm	Cutting condition					Power consumed (frequency of power source Hz)					Main component of cutting force (F) N {kgf}	Torque (T) N·m {kgf·m}	Remarks
		Spindle speed (n) min ⁻¹ {rpm}	Cutting speed (V _c) m/min	Depth of cut (a) mm	Feed (S) per revolution mm	Area cut (a·S) mm ²	Volt V	Ampere A	Input (W) kW	No load input (W ₀) kW	Cutting power (W-W ₀) kW			

Notes (7) The main cutting force (F) must be written into Recording Form when dynamometer is used.

(8) Torque (T) is obtained by the following formulas:

When the measurement is made by dynamometer:

$$T = F \cdot r \text{ (N} \cdot \text{m)} \{ \text{kgf} \cdot \text{m} \}$$

When ampere meter is used:

$$T = \frac{9550 (W - W_0)}{n} \text{ (N} \cdot \text{m)} \quad \left\{ T = \frac{974 (W - W_0)}{n} \text{ (kgf} \cdot \text{m)} \right\}$$

where F : main component of cutting force (N) measured by dynamometer

r : cutting radius (m)

W : input power (kW)

W₀ : no load input power (kW)

n : main spindle speed (min⁻¹) {rpm}

(1) Cutting Tool As a rule, cutting tool of Type 31 in JIS B 4105 shall be used.

(2) Work As a rule, the material of work shall be of S 45 C in JIS G 4051, and conform to the following:

Diameter (d): $d \approx \frac{D}{4}$ to $\frac{D}{2}$ (mm)

Length (l) : $l \approx \frac{D}{2}$ (mm)

where D : swing over bed (mm)

(3) Cutting Condition

Feed (S): $S \approx \frac{D}{4000}, \frac{D}{2000}, \frac{D}{1000}, \frac{D}{800}, \frac{D}{630}, \frac{D}{500}, \frac{D}{400}$ (mm per revolution)

where D : swing over bed (mm)



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