

# JIS

## JAPANESE INDUSTRIAL STANDARD

### Test Code for Performance and Accuracy of Single Spindle Automatic Lathes (Fixed Headstock Type)

JIS B 6217—1990

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In the event of any doubt arising,  
the original Standard in Japanese is to be final authority.

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Single Spindle Automatic Lathes  
(Fixed Headstock Type)

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1. Scope

This Japanese Industrial Standard specifies the test methods on operational performance and on rigidity of the single spindle automatic lathe (fixed headstock type) for bar of not more than 63 mm in maximum diameter of bore part of round collet capable of being used and for the chuck work of not more than 200 mm in nominal diameter of chuck.

Remarks 1. This Standard applies to the single functional lathe, by which a few and limited amount of chuck works only conducted automatically, too.

2. The coordinate axis of the machine to be used in this Standard shall be as follows (See JIS B 6310).

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

X axis: X axis is taken at right angles with Z axis in a horizontal plane lateral (horizontal direction).

Y axis: Y axis shall be taken at right angles with Z axis and X axis.

3. The units and numerical values given in { } in this Standard are based on the traditional units and are appended for informative reference.

2. Running Test Method

2.1 Performance Test The performance test shall be performed in accordance with Table 1.

Table 1. Performance Test

| No. | Test items                                            | Test method                                                                                                                                                        | Informative reference<br>Corresponding number of 3.2 of JIS B 6201 |
|-----|-------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------|
| 1   | Start, stop and running operation of the main spindle | Repeat the start, stop and reverse (including braking and inching) 10 times by an appropriate spindle speed and examine the smoothness and certainty of actuation. | 1-11                                                               |

Applicable Standards and International Corresponding Standards: See page 23.

Table 1. (Continued)

| No. | Test items                                                             | Test method                                                                                                                                                                                                                                                                                                                                                    | Informative reference<br>Corresponding number of 3.2 of JIS B 6201 |
|-----|------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------|
| 2   | Conversion operation of spindle speed                                  | Convert the spindle speed to the 3 stages of the lowest, medium, and the highest marked speeds and examine the smoothness of the actuation and the certainty of the indication of operating apparatus.<br><br>Further, actuate the automatic convertor as to an optional marked speed and examine the smoothness of actuation and the certainty of indication. | 1-12                                                               |
| 3   | The start, stop and running operation of tool slide                    | Repeatedly carry out the start and stop of tool slide 10 times by an appropriate feed and examine the smoothness and the certainty of actuation.                                                                                                                                                                                                               | 1-31                                                               |
| 4   | The conversion operation <sup>(1)</sup> of feed speed of tool slide    | Convert the feed speed of tool slide as to the 3 stages of the lowest, medium and the highest feeds and examine the smoothness of actuation and the certainty of indication of operating apparatus.                                                                                                                                                            | 1-32                                                               |
| 5   | The conversion operation <sup>(1)</sup> of the feed of tool slide      | Convert the feed of tool slide as to the marked 3 stages of the lowest, medium, and the highest feeds at an appropriate spindle speed and examine the smoothness of actuation and the certainty of indication of operating apparatus.                                                                                                                          | 1-33                                                               |
| 6   | Hand feed operation of tool slide                                      | Revolve the cam shaft by hand feed and examine the smoothness of actuations.                                                                                                                                                                                                                                                                                   | 1-37                                                               |
| 7   | Change-over operation of the feed and the rapid traverse of tool slide | Respectively examine the smoothness and the certainty as to the setting of the change-over command position of the feed and the quick traverse of tool slide (including the dog for change-over switch and the dog for switch valve) and the actuation.                                                                                                        | 1-51                                                               |

Table 1. (Continued)

| No. | Test items                                                                                            | Test method                                                                                                                                                                                          | Informative reference<br>Corresponding<br>number of 3.2<br>of JIS B 6201 |
|-----|-------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------|
| 8   | Operation of automatic stop apparatus of tool slide                                                   | Respectively examine the certainty as to the setting and the actuation of the command position of automatic stop apparatus of tool slide.                                                            | 1-52                                                                     |
| 9   | The regulating operation of the opening and closing and the grasp force of spindle collet chuck       | Examine the smoothness of actuation and the certainty of function as to the opening and closing and the regulation of the grasp force of collet chuck.                                               | 1-72                                                                     |
| 10  | Index operation of tool slide                                                                         | Carry out the index operation of cross tool slide and longitudinal tool slide (including turret or drum or the like) and examine the smoothness and certainty of actuation.                          | 1-53                                                                     |
| 11  | The operation of the automatic stop apparatus of cam shaft interlocked with a material feed apparatus | Respectively examine the smoothness and certainty as to the setting and actuation of the command position of the automatic stop apparatus of cam shaft interlocked with the material feed apparatus. | 1-36<br>1-51                                                             |
| 12  | The attaching and detaching of tools                                                                  | Examine the smoothness and certainty of the attaching and detaching of tools (including revolving tools or the like).                                                                                | 1-71                                                                     |
| 13  | The attaching and detaching of a workpiece                                                            | Examine the certainty and smoothness of the automatic or manual attaching and detaching of workpiece.                                                                                                | 1-72                                                                     |
| 14  | Program controller <sup>(1)</sup>                                                                     | Examine the certainty of the sequence motion of each part of a machine by setting a cycle.                                                                                                           | 1-01                                                                     |
| 15  | Electric apparatus                                                                                    | Examine the state of insulation respectively once before and after the operation test, provided that this doesn't apply to a circuit using the semiconductor or the like.                            | 1-91                                                                     |

Table 1. (Continued)

| No. | Test items                               | Test method                                                                                                               | Informative reference<br>Corresponding<br>number of 3.2<br>of JIS B 6201 |
|-----|------------------------------------------|---------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------|
| 16  | Safety device                            | Examine the safety to workers and the certainty of the protection function of machine (See JIS B 6014).                   | 1-92                                                                     |
| 17  | Lubricating device                       | Examine the certainty of the function such as oil tight, the optimum distribution of oil amount, etc.                     | 1-93                                                                     |
| 18  | Cutting fluid apparatus                  | Examine the certainty of function such as the supply of cutting fluid, the regulation of oil amount, etc.                 | 1-99                                                                     |
| 19  | Hydraulic (pneumatic) pressure apparatus | Examine the certainty of function such as oil tight, air tight, pressure regulation, the control range of flow rate, etc. | 1-94                                                                     |
| 20  | Attachments                              | Examine the certainty of function.                                                                                        | 1-99                                                                     |

Note (1) Those tests are not applied to the lathe of cam control.

2.2 No-Load Running Test the no-load running test shall be carried out as follows:

- (1) Main Spindle Relations Start the operation from the lowest speed of main spindle, operate it, at three stages at least of the lowest, medium, and the highest speeds, continuously operate it, as a rule, at the highest speed for 30 to 60 min and measure respective items specified in Table 2 (refer to 3.3 of JIS B 6201).

Further, observe the vibration and the noise. When the vibration and the noise are especially questioned, the measuring methods are as specified in JIS B 6003 and JIS B 6004.

Table 2. Recording Form 1-1

| No. | Measuring time<br>(o'clock<br>·min) | Spindle speed           |                      | Temperature °C             |      |                          |                    | Required electric power<br>(Power source frequency Hz) |              |             | Description |
|-----|-------------------------------------|-------------------------|----------------------|----------------------------|------|--------------------------|--------------------|--------------------------------------------------------|--------------|-------------|-------------|
|     |                                     | min <sup>-1</sup> {rpm} |                      | Bearing of<br>main spindle |      | Room<br>temper-<br>ature | Hydraulic<br>fluid | Voltage<br>V                                           | Current<br>A | Input<br>kW |             |
|     |                                     | Marked                  | Actually<br>measured | Front                      | Rear |                          |                    |                                                        |              |             |             |
|     |                                     |                         |                      |                            |      |                          |                    |                                                        |              |             |             |
|     |                                     |                         |                      |                            |      |                          |                    |                                                        |              |             |             |
|     |                                     |                         |                      |                            |      |                          |                    |                                                        |              |             |             |
|     |                                     |                         |                      |                            |      |                          |                    |                                                        |              |             |             |

- (2) Feed Relations Take the feed at the lowest, medium and the highest ones at the end of the operation of the highest spindle speed and measure each item specified in Table 3 for each of them.

Further, observe the vibration and the noise. When the vibration and the noise are especially questioned, the measuring methods shall be in accordance with JIS B 6003 and JIS B 6004.

Table 3. Recording Form 1-2

| Measuring items                              |                   | Feed speed (mm/min) |                   | Required electric power<br>(Power source frequency Hz) |           |          | Description |
|----------------------------------------------|-------------------|---------------------|-------------------|--------------------------------------------------------|-----------|----------|-------------|
|                                              |                   | Marked              | Actually measured | Voltage V                                              | Current A | Input kW |             |
| Longitudinal tool slide and cross tool slide | The lowest speed  |                     |                   |                                                        |           |          |             |
|                                              | Medium speed      |                     |                   |                                                        |           |          |             |
|                                              | The highest speed |                     |                   |                                                        |           |          |             |
|                                              | Rapid traverse    |                     |                   |                                                        |           |          |             |
| Cam shaft drive motor                        |                   |                     |                   |                                                        |           |          |             |
| Hydraulic pump motor                         |                   |                     |                   |                                                        |           |          |             |
|                                              |                   |                     |                   |                                                        |           |          |             |
| Total operation <sup>(2)</sup>               |                   |                     |                   |                                                        |           |          |             |

Note <sup>(2)</sup> Measure the required electric power in total operations at the last of operation.

Further, record the conditions for total operations in the column of description.

2.3 Load Running Test The load running test shall be in accordance with the following.

Remark: This test is not conducted for the machines for bar work.

2.3.1 As to the load running test, the cutting power test and the chatter test shall be conducted.

Furthermore, the vibration, the noise and the state of machined surface shall be observed (refer to 3.4 of JIS B 6201). Where vibrations and noises are taken especially as a problem, JIS B 6003 and JIS B 6004 shall apply.

**2.3.2 Cutting Motive Power Test** In order to make sure that the single spindle automatic lathe can resist the specified electric power at the time of a high speed cutting, the high speed turning shall be conducted in accordance with the following conditions. (refer to Table 4) (refer to contrast number 3-11 of JIS B 6201)

Table 4. Recording Form 2

| Material of workplace |                               |                             |                                                        |                                         |                                   |                                       |                                                      |                                                        |                  |                                 |                                      |                                                 |             |
|-----------------------|-------------------------------|-----------------------------|--------------------------------------------------------|-----------------------------------------|-----------------------------------|---------------------------------------|------------------------------------------------------|--------------------------------------------------------|------------------|---------------------------------|--------------------------------------|-------------------------------------------------|-------------|
| No.                   | Workpiece                     |                             | Cutting conditions                                     |                                         |                                   |                                       |                                                      | Required electric power<br>(Power source frequency Hz) |                  |                                 |                                      |                                                 | Description |
|                       | Diameter<br><br>( $d$ )<br>mm | Length<br><br>( $l$ )<br>mm | Spindle speed<br>( $n$ )<br>$\text{min}^{-1}$<br>{rpm} | Cutting speed<br><br>( $V_c$ )<br>m/min | Depth of cut<br><br>( $a$ )<br>mm | Feed amount<br><br>( $S$ )<br>mm/rev. | Cutting area<br><br>( $a \cdot S$ )<br>$\text{mm}^2$ | Voltage<br><br>V                                       | Current<br><br>A | Load input<br><br>( $W$ )<br>kW | No-load input<br><br>( $W_0$ )<br>kW | Cutting electric power<br><br>( $W-W_0$ )<br>kW |             |
|                       |                               |                             |                                                        |                                         |                                   |                                       |                                                      |                                                        |                  |                                 |                                      |                                                 |             |
|                       |                               |                             |                                                        |                                         |                                   |                                       |                                                      |                                                        |                  |                                 |                                      |                                                 |             |
|                       |                               |                             |                                                        |                                         |                                   |                                       |                                                      |                                                        |                  |                                 |                                      |                                                 |             |
|                       |                               |                             |                                                        |                                         |                                   |                                       |                                                      |                                                        |                  |                                 |                                      |                                                 |             |

(1) **Tool** The tool shall be, as a rule, Type 31 or Type 32 specified in JIS B 4105.

(2) **Workpiece**

**Material:** The material shall be, as a rule, S 45 C specified in JIS G 4051.

**Shape:** Diameter ( $d$ ) :  $d \approx \frac{D}{3}$  (mm)

Length ( $l$ ) :  $l \approx \frac{D}{3}$  (mm)

where  $D$ : setting chuck nominal diameter (mm)

$l$ : length containing no grip tolerance (mm)

(3) **Cutting Conditions**

**Feed Amount ( $S$ ):** Start the cutting from  $s \approx \frac{D}{4000}$  mm/rev, successively increase the feed by, for instance,  $\frac{D}{2000}$ ,  $\frac{D}{1600}$ ,  $\frac{D}{1250}$  and  $\frac{D}{1000}$  mm and carry out the operation until reaching a definite electric power.

**Depth of cut ( $a$ ):**  $\frac{D}{100}$  mm as a rule

**Cutting speed ( $V_c$ ):** about 160 m/min. However, when this cutting speed is not reached because of the construction of lathe, use its highest speed.

**Remark:** This test is applied to longitudinal tool slides.