

JIS

JAPANESE
INDUSTRIAL
STANDARD

Translated and Published by
Japanese Standards Association

JIS B 7516 : 2005
(JMIF)

Metal rules

ICS 17.040.01

Reference number : JIS B 7516 : 2005 (E)

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CALIBRATION
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Foreword

This translation has been made based on the original Japanese Industrial Standard revised by the Minister of Economy, Trade and Industry through deliberations at the Japanese Industrial Standards Committee, as the result of proposal for revision of Japanese Industrial Standard submitted by Japan Measuring Instrument Federation (JMIF) with the draft being attached, based on the provision of Article 12 Clause 1 of the Industrial Standardization Law applicable to the case of revision by the provision of Article 14. Consequently **JIS B 7516 : 1987** is replaced with this Standard.

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Date of Establishment: 1959-12-01

Date of Revision: 2005-03-20

Date of Public Notice in Official Gazette: 2005-03-22

Investigated by: Japanese Industrial Standards Committee
Standards Board
Technical Committee on Testing and
Measurement Technology

JIS B 7516:2005, First English edition published in 2005-12

Translated and published by: Japanese Standards Association
4-1-24, Akasaka Minato-ku, Tokyo, 107-8440 JAPAN

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Printed in Japan

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Contents

	Page
1 Scope	1
2 Normative references	1
3 Definitions	1
4 Nominal size.....	2
5 Grade	2
6 Performance.....	2
6.1 Tolerance on length.....	2
6.2 Squareness of scale end face	2
6.3 Straightness of scale side face	3
7 Graduation	3
8 Dimensions	4
9 Appearance	4
10 Material.....	4
11 Measuring method	4
12 Inspection.....	6
13 Designation	6
14 Marking	6

(i)

Metal rules

1 Scope This Japanese Industrial Standard specifies metal rules, taking the end face as the reference point, of nominal size 150 mm to 2 000 mm (hereafter referred to as "rules").

2 Normative references The following standards contain provisions which, through reference in this text, constitute provisions of this Standard. The most recent editions of the standards (including amendments) indicated below shall be applied.

JIS B 7503 *Dial gauges*

JIS B 7513 *Precision surface plates*

JIS B 7514 *Steel straightedges*

JIS B 7524 *Feeler gauges*

JIS B 7526 *Squares*

JIS G 4305 *Cold rolled stainless steel plates, sheets and strip*

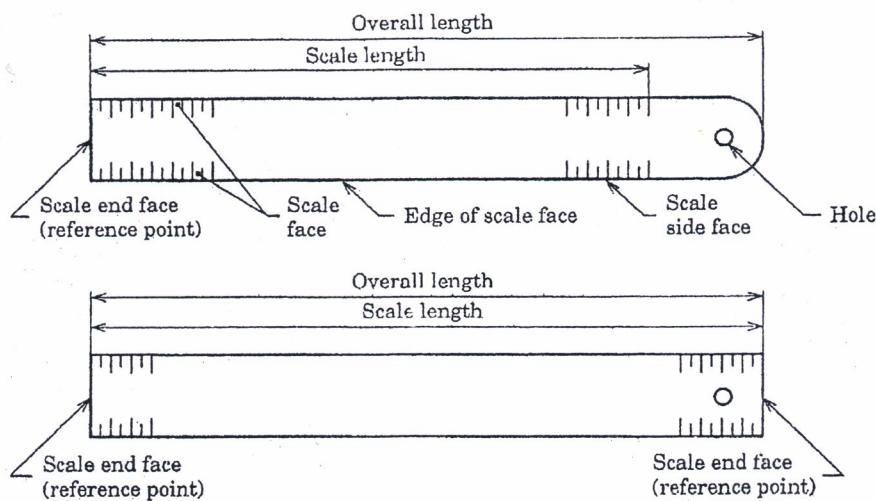
JIS Q 17025 *General requirements for the competence of testing and calibration laboratories*

JIS Z 8103 *Glossary of terms used in measurement*

3 Definitions For the purposes of this Standard, the definitions given in **JIS Z 8103** and the following definitions apply. Moreover, the name of each part of rules shall be as shown in figure 1.

- a) **reference point** the scale end face to be taken as the reference of measurement (see figure 1)
- b) **edge of scale face** lines on the scale face intersected by the scale side face or scale end face
- c) **scale end face** the end face whose edge is regarded as the centre line of scale mark
- d) **scale spacing** the length between two adjacent scale marks measured centre-to-centre of their thicknesses
- e) **scale interval*** magnitude of measuring amount corresponding to the scale spacing

Note * The scale interval mentioned here is an abstract idea.



Remarks: These drawings are only to indicate the name, not to specify shape and construction.

Figure 1 Name of each part

4 Nominal size The nominal size of rules shall be 150 mm, 300 mm, 600 mm, 1 000 mm, 1 500 mm and 2 000 mm according to the scale length. It is permissible for the unit of nominal sizes to use centimetre (cm) and to use metre (m) also in the case of 1 000 mm or more.

5 Grade Rules shall be graded into Grade 1 and Grade 2 according to the performance.

6 Performance

6.1 Tolerance on length The tolerance on length of rules shall comply with the following formulas, taking the reference temperature at 20 °C, according to the arbitrary length from the reference point and the length between arbitrary two scale marks. For the tolerance on scale spacing, table 3 in 7 c) shall apply.

$$\text{Grade 1: } \pm [0.10 + 0.05 \times (L/0.5)] \text{ mm}$$

$$\text{Grade 2: } \pm [0.10 + 0.10 \times (L/0.5)] \text{ mm}$$

where, L is a numerical value expressing the measured value in metres, which has no unit.

Among the calculated values of $L/0.5$, the fraction less than 1 shall be rounded up to an integer place.

6.2 Squareness of scale end face The squareness of the scale end face of a rule in respect of its scale side face shall be as shown in table 1, per 10 mm length of the end face.

Table 1 Squareness of scale end face

Unit: mm	
Grade 1	0.035 max.
Grade 2	0.050 max.

6.3 Straightness of scale side face The horizontal straightness of scale side face of a rule shall be as shown in table 2, according to the nominal size.

Table 2 Straightness of scale side face

Nominal size	Straightness	
	Grade 1	Grade 2
150	0.23 max.	0.36 max.
300	0.26 max.	0.42 max.
600	0.32 max.	0.54 max.
1 000	0.40 max.	0.70 max.
1 500	0.50 max.	0.90 max.
2 000	0.60 max.	1.10 max.

7 Graduation The graduation of rules shall be as follows:

- a) The scale marks shall extend the edge of scale face and also their squareness to the edge of scale face shall not exceed 0.2 mm per 5 mm.
- b) The scale interval shall be 0.5 mm, 1 mm, 2 mm, 5 mm, 10 mm, 20 mm, 50 mm and 100 mm. Two or more scale intervals and their combination may also be employed.
- c) For a scale of single interval, both the tolerance on scale spacing and the difference of spacing between two adjacent scales shall be within the values as given in table 3.

Table 3 Tolerance on scale spacing and difference of spacing between two adjacent scales

Unit: mm		
Scale interval i	$i \leq 1$	$1 < i \leq 100$
Tolerance on scale spacing and difference of spacing between two adjacent scales	± 0.1	± 0.15

- d) The thickness of scale marks shall be 0.1 mm to 0.3 mm, which may be different according to the kind of scale marks (0.5 mm line, 1 mm line, 5 mm line, 10 mm line, etc.). For the scale marks of the same nominal thickness, the minimum value of the actual thicknesses shall be at least 70 % of the maximum value.

- e) The scale shall be definite and be free from such defects impedimental to measurement as tottering and discontinuity of scale marks.
- f) The principal scale marks shall be marked with the length from the reference point or its numerical value.

8 Dimensions The overall length, thickness and width of rules shall be as shown in table 4. For the rule of which both end faces are taken as the scale end faces (reference points), the column of "overall length and tolerance" in table 4 does not apply.

Table 4 Dimensions

Nominal size mm	Overall length and tolerance		Thickness and tolerance		Width and tolerance	
	mm	mm	mm	%	mm	%
150	175	± 5	0.5	± 10	15	± 2
300	335		1.0		25	
600	640		1.2		30	
1 000	1 050		1.5		35	
1 500	1 565		2.0		40	
2 000	2 065		2.0		40	

9 Appearance The appearance of rules shall be as follows:

- a) Indices and other inscription shall be clear and free from such defects impedimental to measurements as omission and error.
- b) The scale end face (reference point) and scale side face shall be processed smoothly.
- c) The scale face shall be flat to a level of no hindrance to measurements.

10 Material The grade and hardness of material of rules shall be as given in table 5.

Table 5 Grade and hardness of material

Grade	Hardness
S'JS420 J2 of JIS G 4305 or that equivalent or superior to this in quality	Hv 400 min.

11 Measuring method The measuring method for the performance of rules shall be as given in table 6. The instruments with the measuring accuracy at least equivalent thereto may be used.

Table 6 Measuring method of performances

Item	Measuring method	Measuring instrument
6.1 Tolerance on length	<p>Measure the length intended to be inspected by using a standard scale of length⁽¹⁾ and micrometer microscope (see figure 2).</p> <p>Where the standard scale of length⁽¹⁾ and the object measured are the same in material, the measurement may be made under a normal temperature, as their rates of linear expansion are identical.</p>	Standard scale of length ⁽¹⁾ Micrometer microscope (0.01 mm max. in scale interval)
6.2 Squareness of scale end face	<p>a) Setting up a dial gauge, square and stopper on the surface plate, set the zero point of dial gauge with the square.</p> <p>b) Removing the square, put the end face of scale to the stopper to read the indication of dial gauge (see figure 3).</p>	Precision surface plate (JIS B 7513) Square (JIS B 7526) Dial gauge (JIS B 7503)
6.3 Straightness of scale side face	Placing the rule so that the scale side face is in contact with the surface plate or steel straightedge, measure the gap between the scale side face and surface plate or steel straightedge with a feeler gauge (see figure 4).	Feeler gauge (JIS B 7524) Precision surface plate (JIS B 7513) or steel straightedge (JIS B 7514)

Note ⁽¹⁾ The standard scale of length refers to a length scale having calibration certificate, in which the uncertainty shall be mentioned, issued by a calibration laboratory accredited or registered based on JIS Q 17025 or ISO/IEC 17025.

Remarks : Figures 2 to 4 are examples.

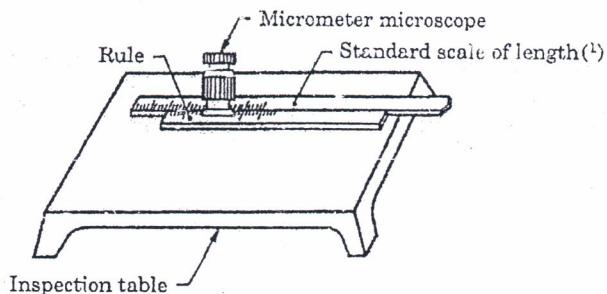


Figure 2 Measurement method (6.1 Tolerance on length)

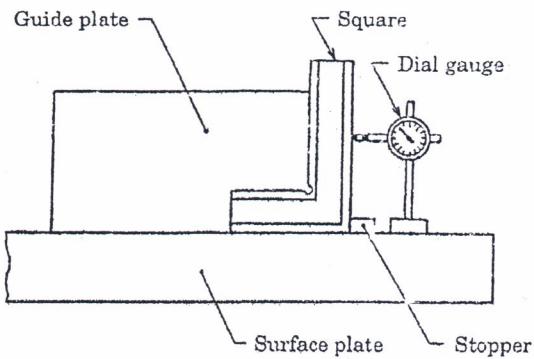


Figure 3 Measurement method (6.2 Squareness of scale end face)

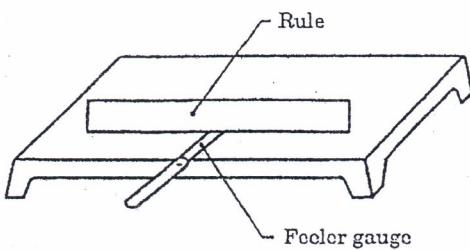


Figure 4 Measurement method (6.3 Straightness of scale side face)

12 Inspection Rules shall be inspected for the performance, scale, dimensions, appearance and material, and the results shall comply with the requirements in clauses 6 to 10.

13 Designation Rules shall be designated by the number or title of this Standard, nominal size and grade.

Example 1 JIS B 7516 150 mm Grade 1

Example 2 Metal rule 150 mm Grade 1

14 Marking The following information shall be marked on a part of the rule.

- a) Grade
- b) Nominal size
- c) Manufacturer's name or its abbreviation
- d) That it is made of stainless steel

Errata for JIS (English edition) are printed in *Standardization Journal*, published monthly by the Japanese Standards Association, and also provided to subscribers of JIS (English edition) in *Monthly Information*.

Errata will be provided upon request, please contact:
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Metal Rules Grade 1 of JIS B 7516-2005 (Abstract)
 (as of Jul/08)

Standard	Grade 1 of JIS B 7516-2005							
Material	SUS420 J2 of JIS G 4305 or that equivalent of superior to this in quality.							
Hardness of Material	Hv 400 min							
Size								
	Nominal size	Overall Length	Thickness (mm)	Width (mm)				
		size	tolerance	size	tolerance	size	tolerance	
	150	175		0.5		15		
	300	335		1.0		25		
	600	640	± 5mm	1.2	± 10%	30		
	1,000	1,050		1.5		35		
	1,500	1,565		2.0		40		
Unit (mm)	2,000	2,065		2.0		40		
Flatness of scale face	The scale face shall be flat to a level of no hindrance to measurements.							
Straightness of scale side face	Nominal size	Straightness	Nominal size	Straightness				
Unit (mm)								
	150	0.23 max	1,000	0.40 max				
	300	0.26 max	1,500	0.50 max				
	600	0.32 max	2,000	0.60 max				
Squareness of scale end face	The squareness of the scale end face of a rule in respect of its scale side shall be 0.035 mm max. per 10 mm length of the end face							
Tolerance of length (mm)	Length		Tolerance					
temperature at 20°C								
	500 max		± 0.15					
	over 500 ~ 1,000 max		± 0.20					
	over 1,000 ~ 1,500 max		± 0.25					
	over 1,500 ~ 2,000 max		± 0.30					

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