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Rolling bearings—Rollers

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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 The Japan Bearing Industrial Association (JBIA) 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 1506 : 1991** is replaced with this Standard.

This revision has been made based on **ISO 3096 : 1996** *Rolling bearings—Needle rollers—Dimensions and tolerances* for the purposes of making it easier to compare this Standard with International Standard; to prepare Japanese Industrial Standard conforming with International Standard; and to propose a draft of an International Standard which is based on Japanese Industrial Standard.

Attention is drawn to the possibility that some parts of this Standard may conflict with a patent right, application for a patent after opening to the public, utility model right or application for registration of utility model after opening to the public which have technical properties. The relevant Minister and the Japanese Industrial Standards Committee are not responsible for identifying the patent right, application for a patent after opening to the public, utility model right or application for registration of utility model after opening to the public which have the said technical properties.

The title of this Standard has been changed from that of the previous edition “*Rollers for roller bearing*” to “*Rolling bearings—Rollers*”.

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In the event of any doubts arising as to the contents,
the original JIS is to be the final authority.

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Rolling bearings—Rollers

Introduction This Japanese Industrial Standard has been prepared by adopting, for the corresponding parts (needle rollers), the second edition of **ISO 3096:1996** *Rolling bearings—Needle rollers—Dimensions and tolerances* and adding to it the requirements unique to Japanese Industrial Standard (long cylindrical and cylindrical rollers).

The portions given sidelines or dotted underlines are the matters not stated in the original International Standard.

1 Scope This Standard specifies finished steel needle rollers, long cylindrical rollers and cylindrical rollers (hereafter referred to as “rollers”) to be used mainly as rolling elements of rolling bearings.

Remarks : The International Standard corresponding to this Standard is as follows.

In addition, symbols which denote the degree of correspondence in the contents between the relevant International Standard and **JIS** are IDT (identical), MOD (modified), and NEQ (not equivalent) according to **ISO/IEC GUIDE 21**.

ISO 3096:1996 *Rolling bearings—Needle rollers—Dimensions and tolerances* (MOD)

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 0104 *Rolling bearings—Vocabulary*

JIS B 0124 *Rolling bearings—Symbols for quantities*

JIS B 0401-2 *ISO system of limits and fits—Part 2: Tables of standard tolerance grades and limit deviations for holes and shafts*

Remarks : **ISO 286-2:1988** *ISO system of limits and fits—Part 2: Tables of standard tolerance grades and limit deviations for holes and shafts* is identical with the said standard.

JIS B 0601 *Geometrical Product Specification (GPS)—Surface texture: Profile method—Terms, definitions and surface texture parameters*

JIS B 0651 *Geometrical Product Specification (GPS)—Surface texture: Profile method—Nominal characteristics of contact (stylus) instruments*

JIS B 1515 *Measuring methods for rolling bearings*

JIS B 7451 *Instruments for the assessment of departure from roundness—Measurement of variations in radius*

Remarks : **ISO 4291:1985** *Methods for the assessment of departure from roundness—Measurement of variations in radius* is equivalent to the said standard.

JIS G 4805 *High carbon chromium bearing steels*

JIS Z 2244 *Vickers hardness test—Test method*

JIS Z 2245 *Rockwell hardness test—Test method*

3 Terms and definitions and quantity symbols For the purposes of this Standard, the definitions of the terms and the quantity symbols in **JIS B 0104** and **JIS B 0124**, respectively, apply, in addition to those shown in the following (see attached tables 1 to 8).

- a) **designation** the designation to be used for the general identification of the dimensions of the roller, which is expressed by “nominal diameter × nominal length”
- b) **nominal diameter (D_w)** diameter value used for the purpose of general identification of a roller diameter
- c) **single diameter (D_{ws})** distance between two tangents to the roller surface parallel to each other and in a plane perpendicular to the roller axis i.e. a radial plane
- d) **mean diameter in a single plane (D_{wmp})** arithmetical mean of the largest and the smallest actual single diameters of the roller in a single radial plane
- e) **diameter variation in a single radial plane (V_{Dwp})** difference between the maximum value and the minimum value of single diameter of roller in a radial plane
- f) **variation of single plane mean diameter (V_{Dwmp})** difference between the maximum value and the minimum value in mean diameter in plane of a roller
- g) **nominal length (L_w)** length value used for the purpose of general identification of a roller length
- h) **single length (L_{ws})** distance between the two radial planes which just contain the end extremities of roller
- i) **dimension difference of length (ΔL_{ws})** difference between the single length and the nominal length
- j) **nominal chamfer dimension (r)** chamfer dimension value used for the purpose of general identification of a roller chamfer
- k) **single chamfer dimension (r_s)** actual radial distance or axial distance in an axial plane from the imaginary corner of flat end roller up to the intersecting point of chamfer of roller with the end surface or rolling contact surface
- l) **smallest permissible single chamfer dimension of roller ($r_{s\min}$)** the smallest permissible radial single chamfer dimension and axial single chamfer dimension of flat end roller
- m) **largest permissible single chamfer dimension of roller ($r_{s\max}$)** the largest permissible radial single chamfer dimension and axial single chamfer dimension of flat end roller

- n) **end surface runout with outside surface (S_{Dw})** deviation of roller end surface from radial plane of roller (see 12.8)
- o) **profile at the ends of rounded end rollers (R)** profile which may not necessarily be a true radius but shall fall within the limits of $D_w/2$ and $L_w/2$ (see attached table 1)
- p) **circularity deviation (ΔR_w)** difference between the largest radius and the smallest radius of the measured profile which is a line of intersection of one radial plane with the rolling contact surface of the roller, the values of the radii being taken from the centre of the least squares mean circle, LSC (see JIS B 7451)
- q) **gauge (S)** diameter deviation range limited by a high and a low deviation of the mean diameter in a single plane D_{wmp} from the nominal diameter D_w , in radial plane through the middle of roller length
- Remarks : A gauge is designated by the high and low deviation expressed in micrometres, for example -2/-4.
- r) **gauge lot** a group of rollers, of the same grade and nominal dimensions, all having a mean diameter in a single plane (D_{wmp}) within the same gauge
- Remarks : Rollers of any grade and nominal dimensions are supplied in gauge lots. If nothing to the contrary has been agreed between the customer and the supplier, the gauge lots may be of any one or more of the gauges included in attached tables 4 to 6.
- s) **variation of gauge lot diameter (V_{DwL})** difference between the mean diameters in a single plane D_{wmp} of the roller having the largest mean diameter and that of the roller having the smallest mean diameter in the gauge lot
- t) **variation of gauge lot length (V_{LwL})** difference between the single length L_{ws} of the roller having the largest single length and that of the roller having the smallest single length in the gauge lot
- u) **roller grade** specific combination of diameter and form tolerances for a roller, characteristic of its level of accuracy

4 Classification and division Rollers shall be classified into needle roller, long cylindrical roller and cylindrical roller and, divided, as a rule, according to table 1.

Table 1 Classification and division

Classification	Division	
	D_w	L_w/D_w
Needle roller	6 mm max.	3 or over up to and incl. 10
Long cylindrical roller	Exceeding 6 mm	3 or over up to and incl. 10
Cylindrical roller	—	Less than 3

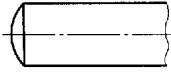
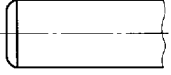
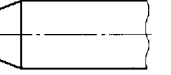
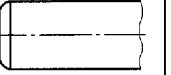
5 Grade The grades of rollers shall be as given in table 2.

Table 2 Grade

Classification	Grades
Needle roller	2, 3, 5
Long cylindrical roller	3, 5
Cylindrical roller	1, 1A, 2, 2A, 3, 5

6 End surface shape The roller end surface shapes and symbols shall be as given in table 3. The end surface of cylindrical roller shall be flat shape.

Table 3 Roller end surface shapes and symbols

Roller end surface shape	Round surface shape	Flat shape ⁽¹⁾	Sharp shape	Conical shape	Stepped shape
					
Symbol	A	F	C	T	M

Note (1) It includes that having a recess at the central part of roller end surface.

7 Designation and dimensions Designation and dimensions of rollers shall be as specified in attached tables 1 to 3.

Information : Dimensions of the roller end surface shape are not specified for sharp, conical or stepped shapes.

8 Permissible deviations and values

8.1 Permissible deviations and values for needle rollers Permissible deviations and permissible values for the dimensions and shapes of needle rollers, as well as recommended gauge, are specified in attached table 4.

8.2 Permissible deviations and values for long cylindrical rollers Permissible deviations and permissible values for the dimensions and shapes of long cylindrical rollers, as well as recommended gauge, are specified in attached table 5.

8.3 Permissible deviations and values for cylindrical rollers Permissible deviations and permissible values for the dimensions and shapes of cylindrical rollers, as well as recommended gauge, are specified in attached table 6.

8.4 Single chamfer dimensions The permissible limit value of single chamfer dimensions of needle rollers of flat end surface shall be as given in attached table 7. The permissible limit value of single chamfer dimensions of long cylindrical roller and cylindrical roller shall be as given in attached table 8.

9 Hardness The hardness of roller shall be as given in attached table 9.

10 Surface roughness The surface roughness of rolling contact surface of roller shall be as given in table 4.

Table 4 Surface roughness of rolling contact surface (largest)

D_w (mm)	5 max.	Over 5 up to and incl. 18	Over 18 up to and incl. 50	Over 50
Surface roughness (μmRa)	0.1	0.2	0.4	0.8

Remarks : For the surface roughness Ra , see **JIS B 0601**.

11 Materials Materials of roller shall be alloy steel specified in **JIS G 4805**, or those at least equivalent thereto.

12 Measuring method and testing method

12.1 General matters General matters relating to measurement shall be as specified in **JIS B 1515**.

12.2 Single diameter The measurement of single diameter (D_{ws}) of roller shall be carried out in the radial plane according to two-point measurement. The mean diameter in a single plane (D_{wmp}) of roller shall be obtained in a radial plane as the arithmetical mean value of the maximum value and the minimum value of single diameter.

12.3 Diameter variation in a single radial plane The diameter variation in a single radial plane ($V_{D_{wp}}$) of needle roller shall be obtained in the radial plane at the middle of length as the difference between the maximum value and the minimum value of single diameter (D_{ws}).

12.4 Circularity deviation Circularity deviation (Δ_{Rw}) of roller shall, as a rule, be measured by using a circularity measuring device (see **JIS B 7451**) at the radial plane of the middle of length of roller. In practice, it is usually measured by a numerical evaluation of the roller circumference, as recorded on a polar chart which shows the measured circumference. Further, the circularity deviation may be obtained according to three-point measurement (see annex 2).

12.5 Variation of single plane mean diameter The variations of single plane mean diameter ($V_{D_{wmp}}$) of long cylindrical roller and cylindrical roller shall be obtained as the difference between the maximum value and the minimum value of the single plane mean diameters (D_{wmp}) of three radial planes, i.e. at the middle of roller length and at the cylindrical parts near both ends.

12.6 Variation of gauge lot diameter and gauge The variation of gauge lot diameter ($V_{D_{wl}}$) of roller shall be obtained as the difference between the single plane mean diameters (D_{wmp}) of the maximum roller and the minimum roller within the lot measured in the radial plane at the middle of length in the gauge lot.

The gauge of roller shall be that among the recommended gauges in attached tables 4 to 6 which corresponds to the actual dimensional difference between the single plane mean diameters (D_{wmp}) of gauge lot and the nominal diameter (D_w) obtained in the radial plane through the middle of length of roller.

12.7 Dimension difference of length and variation of gauge lot length The single length (L_{ws}) of roller shall, as a rule, be measured between the plane and a plane shape gauge head parallel thereto.

The dimension difference (ΔL_{ws}) of length of roller shall be obtained as the difference between the actual length and the nominal length (L_w).

The variation of gauge lot length (V_{LwL}) of cylindrical roller shall be obtained as the actual length difference between the maximum and the minimum actual lengths in the gauge lot.

12.8 End surface runout with outside surface End surface runout with the outside surface of cylindrical rollers shall be measured as follows. The roller is placed in the V-groove and is pushed from the opposite side to maintain constant point contact with the metal pad in close proximity to the periphery of one end. The shape gauge is brought into light contact with the end surface on the metal pad side in the axial direction at a position symmetrical to the contact point and the centre axis of the roller. The roller is then turned (see figure 1).

The roller end surface runout with outside surface is the circumference runout obtained as the difference between the maximum value and the minimum value of readings of measuring device when rotating the roller once.

Further, carry out this measurement relating to both end surface.

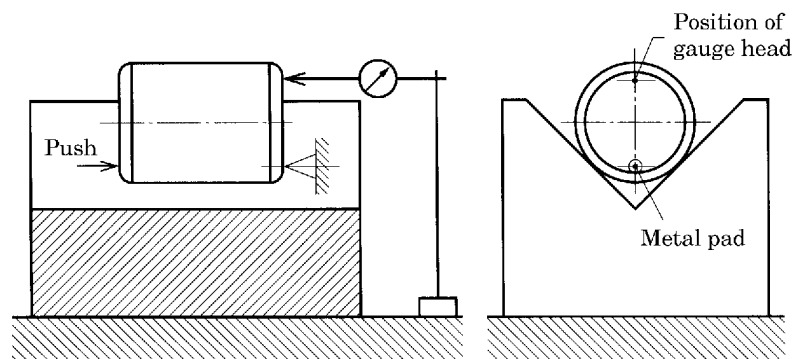


Figure 1 Measuring of roller end surface runout with outside surface

12.9 Single chamfer dimension The chamfer dimensions of the roller of flat end surface shall be measured by using a suitable measuring device.

12.10 Hardness The hardness test shall be in accordance with **JIS Z 2244** or **JIS Z 2245**.

12.11 Surface roughness The measurement of surface roughness of rolling contact surface shall be in accordance with **JIS B 0651**.

13 Inspection The inspection of the roller shall be carried out relating to dimensions, shape, roller end surface runout with outside surface, variation of gauge lot diameter and variation of gauge lot length, single chamfer dimensions, hardness, and surface roughness of rolling contact surface, according to clause 12.

14 Designation of products Rollers shall be designated by classification, nomenclature, end surface shape⁽²⁾, gauge and grade.

Example 1 Needle roller 2×11.8 A-3/-6 Grade 3

Example 2 Long cylindrical roller 6×50 F-5/-10 Grade 5

Example 3 Cylindrical roller 15×22 -2/-4 Grade 2

Note (2) It does not apply to cylindrical rollers.

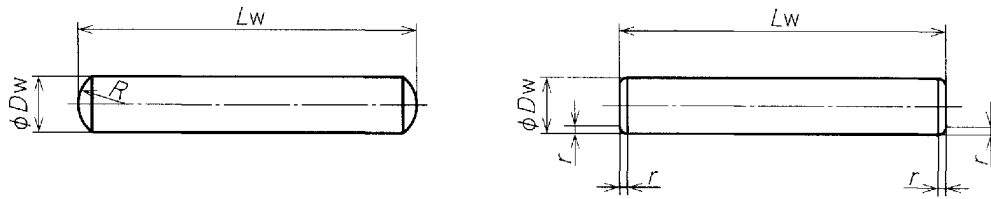
15 Packaging and marking

15.1 Packaging Rollers, after performing rust prevention by grease, or others, shall be stored in a suitable container.

15.2 Marking The package of rollers shall be marked with the following matters:

- Classification
- Designation
- End surface shape (excluding the cylindrical roller.)
- Gauge
- Grade
- Quantity
- Manufacturer's name or its mark
- Year and month of manufacture or the mark

Attached Table 1 Designation and dimensions of needle roller



Unit: mm

Designation	D_w	L_w	$r_{s \min} (^3)$	Designation	D_w	L_w	$r_{s \min} (^3)$
1 × 5.8	1	5.8	0.1	3 × 25.8	3	25.8	0.1
1 × 6.8	1	6.8	0.1	3 × 27.8	3	27.8	0.1
1 × 7.8	1	7.8	0.1	3 × 29.8	3	29.8	0.1
1 × 9.8	1	9.8	0.1	3.5 × 11.8	3.5	11.8	0.1
1.5 × 5.8	1.5	5.8	0.1	3.5 × 13.8	3.5	13.8	0.1
1.5 × 6.8	1.5	6.8	0.1	3.5 × 15.8	3.5	15.8	0.1
1.5 × 7.8	1.5	7.8	0.1	3.5 × 17.8	3.5	17.8	0.1
1.5 × 9.8	1.5	9.8	0.1	3.5 × 19.8	3.5	19.8	0.1
1.5 × 11.8	1.5	11.8	0.1	3.5 × 21.8	3.5	21.8	0.1
1.5 × 13.8	1.5	13.8	0.1	3.5 × 23.8	3.5	23.8	0.1
2 × 6.8	2	6.8	0.1	3.5 × 25.8	3.5	25.8	0.1
2 × 7.8	2	7.8	0.1	3.5 × 27.8	3.5	27.8	0.1
2 × 9.8	2	9.8	0.1	3.5 × 29.8	3.5	29.8	0.1
2 × 11.8	2	11.8	0.1	3.5 × 31.8 ⁽⁴⁾	3.5	31.8	0.1
2 × 13.8	2	13.8	0.1	3.5 × 34.8	3.5	34.8	0.1
2 × 15.8	2	15.8	0.1	4 × 11.8	4	11.8	0.1
2 × 17.8	2	17.8	0.1	4 × 13.8	4	13.8	0.1
2 × 19.8	2	19.8	0.1	4 × 15.8	4	15.8	0.1
2.5 × 7.8	2.5	7.8	0.1	4 × 17.8	4	17.8	0.1
2.5 × 9.8	2.5	9.8	0.1	4 × 19.8	4	19.8	0.1
2.5 × 11.8	2.5	11.8	0.1	4 × 21.8	4	21.8	0.1
2.5 × 13.8	2.5	13.8	0.1	4 × 23.8	4	23.8	0.1
2.5 × 15.8	2.5	15.8	0.1	4 × 25.8	4	25.8	0.1
2.5 × 17.8	2.5	17.8	0.1	4 × 27.8	4	27.8	0.1
2.5 × 19.8	2.5	19.8	0.1	4 × 29.8	4	29.8	0.1
2.5 × 21.8	2.5	21.8	0.1	4 × 31.8 ⁽⁴⁾	4	31.8	0.1
2.5 × 23.8	2.5	23.8	0.1	4 × 34.8	4	34.8	0.1
3 × 9.8	3	9.8	0.1	4 × 37.8 ⁽⁴⁾	4	37.8	0.1
3 × 11.8	3	11.8	0.1	4 × 39.8	4	39.8	0.1
3 × 13.8	3	13.8	0.1	4.5 × 17.8 ⁽⁴⁾	4.5	17.8	0.1
3 × 15.8	3	15.8	0.1	4.5 × 19.8 ⁽⁴⁾	4.5	19.8	0.1
3 × 17.8	3	17.8	0.1	4.5 × 21.8 ⁽⁴⁾	4.5	21.8	0.1
3 × 19.8	3	19.8	0.1	4.5 × 23.8 ⁽⁴⁾	4.5	23.8	0.1
3 × 21.8	3	21.8	0.1	4.5 × 25.8 ⁽⁴⁾	4.5	25.8	0.1
3 × 23.8	3	23.8	0.1	4.5 × 29.8 ⁽⁴⁾	4.5	29.8	0.1

Attached Table 1 (concluded)

Unit: mm

Designation	D_w	L_w	$r_{s\min}^{(3)}$	Designation	D_w	L_w	$r_{s\min}^{(3)}$
$4.5 \times 31.8^{(4)}$	4.5	31.8	0.1	$5 \times 37.8^{(4)}$	5	37.8	0.1
$4.5 \times 34.8^{(4)}$	4.5	34.8	0.1	5×39.8	5	39.8	0.1
$4.5 \times 37.8^{(4)}$	4.5	37.8	0.1	5×49.8	5	49.8	0.1
$4.5 \times 39.8^{(4)}$	4.5	39.8	0.1	6×17.8	6	17.8	0.1
5×15.8	5	15.8	0.1	6×19.8	6	19.8	0.1
5×17.8	5	17.8	0.1	6×21.8	6	21.8	0.1
5×19.8	5	19.8	0.1	6×23.8	6	23.8	0.1
5×21.8	5	21.8	0.1	6×25.8	6	25.8	0.1
5×23.8	5	23.8	0.1	6×27.8	6	27.8	0.1
5×25.8	5	25.8	0.1	6×29.8	6	29.8	0.1
5×27.8	5	27.8	0.1	6×34.8	6	34.8	0.1
5×29.8	5	29.8	0.1	6×39.8	6	39.8	0.1
$5 \times 31.8^{(4)}$	5	31.8	0.1	6×49.8	6	49.8	0.1
5×34.8	5	34.8	0.1	6×59.8	6	59.8	0.1

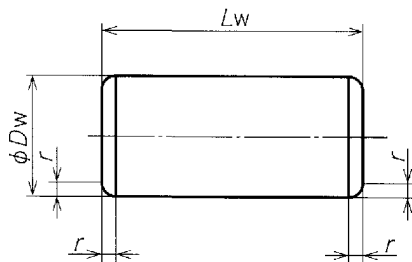
Notes ⁽³⁾ It is the minimum permissible single chamfer dimension, and applies to roller of flat end surface. Accurate shape of chamfer dimensions is not specified. However, its profile on the axial plane should not protrude from a virtual circular arc with radius $r_{s\min}$ contacting the roller end surface and rolling contact surface.

⁽⁴⁾ Dimensions not stated in the original International Standard.

Remarks 1 The figure indicates that of round end surface and flat end surface.

2 Attached table 1 indicates the recommended designations and dimensions.

Attached Table 2 Designation and dimensions of long cylindrical roller



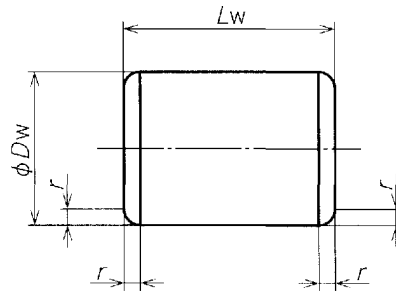
Unit: mm

Designation	D_w	L_w	$r_{s \min} (^{\circ})$	Designation	D_w	L_w	$r_{s \min} (^{\circ})$
6.5 × 20	6.5	20	0.3	9 × 28	9	28	0.3
6.5 × 25	6.5	25	0.3	9 × 35.5	9	35.5	0.3
6.5 × 31.5	6.5	31.5	0.3	9 × 45	9	45	0.3
7 × 22.4	7	22.4	0.3	9 × 56	9	56	0.3
7 × 28	7	28	0.3	10 × 31.5	10	31.5	0.3
7 × 35.5	7	35.5	0.3	10 × 40	10	40	0.3
7 × 45	7	45	0.3	10 × 50	10	50	0.3
7 × 56	7	56	0.3	10 × 63	10	63	0.3
7.5 × 31.5	7.5	31.5	0.3	12 × 40	12	40	0.3
7.5 × 40	7.5	40	0.3	12 × 50	12	50	0.3
8 × 25	8	25	0.3	12 × 63	12	63	0.3
8 × 31.5	8	31.5	0.3	15 × 45	15	45	0.5
8 × 40	8	40	0.3	15 × 56	15	56	0.5
8 × 50	8	50	0.3	15 × 71	15	71	0.5
8 × 63	8	63	0.3	15 × 90	15	90	0.5

Remarks 1 The figure indicates the roller of flat end surface.

2 Attached table 2 indicates the recommended designations and dimensions.

Attached Table 3 Designation and dimensions of cylindrical roller



Unit: mm

Designation	D_w	L_w	$r_{s \min} (^{\circ})$	Designation	D_w	L_w	$r_{s \min} (^{\circ})$
3 × 3	3	3	0.1	11 × 15	11	15	0.3
3 × 5	3	5	0.1	12 × 12	12	12	0.3
3.5 × 5	3.5	5	0.2	12 × 18	12	18	0.3
4 × 4	4	4	0.2	13 × 13	13	13	0.3
4 × 6	4	6	0.2	13 × 20	13	20	0.3
4 × 8	4	8	0.2	14 × 14	14	14	0.3
4.5 × 4.5	4.5	4.5	0.2	14 × 20	14	20	0.3
4.5 × 6	4.5	6	0.2	15 × 15	15	15	0.5
5 × 5	5	5	0.2	15 × 22	15	22	0.5
5 × 8	5	8	0.2	16 × 16	16	16	0.5
5 × 10	5	10	0.2	16 × 24	16	24	0.5
5.5 × 5.5	5.5	5.5	0.2	17 × 17	17	17	0.5
5.5 × 8	5.5	8	0.2	17 × 24	17	24	0.5
6 × 6	6	6	0.2	18 × 18	18	18	0.5
6 × 8	6	8	0.2	18 × 26	18	26	0.5
6 × 12	6	12	0.2	19 × 19	19	19	0.6
6.5 × 6.5	6.5	6.5	0.3	19 × 28	19	28	0.6
6.5 × 9	6.5	9	0.3	20 × 20	20	20	0.6
7 × 7	7	7	0.3	20 × 30	20	30	0.6
7 × 10	7	10	0.3	21 × 21	21	21	0.6
7 × 14	7	14	0.3	21 × 30	21	30	0.6
7.5 × 7.5	7.5	7.5	0.3	22 × 22	22	22	0.6
7.5 × 11	7.5	11	0.3	22 × 34	22	34	0.6
8 × 8	8	8	0.3	23 × 23	23	23	0.6
8 × 12	8	12	0.3	23 × 34	23	34	0.6
9 × 9	9	9	0.3	24 × 24	24	24	0.6
9 × 14	9	14	0.3	24 × 36	24	36	0.6
10 × 10	10	10	0.3	25 × 25	25	25	0.7
10 × 14	10	14	0.3	25 × 36	25	36	0.7
11 × 11	11	11	0.3	26 × 26	26	26	0.7

Attached Table 3 (concluded)

Unit: mm

Designation	D_w	L_w	$r_{s\min}^{(5)}$	Designation	D_w	L_w	$r_{s\min}^{(5)}$
26 × 40	26	40	0.7	40 × 65	40	65	1
28 × 28	28	28	0.7	42 × 42	42	42	1
28 × 44	28	44	0.7	45 × 45	45	45	1
30 × 30	30	30	0.7	48 × 48	48	48	1
30 × 48	30	48	0.7	50 × 50	50	50	1
32 × 32	32	32	1	52 × 52	52	52	1.5
32 × 52	32	52	1	54 × 54	54	54	1.5
34 × 34	34	34	1	56 × 56	56	56	1.5
34 × 55	34	55	1	60 × 60	60	60	1.5
36 × 36	36	36	1	64 × 64	64	64	1.5
36 × 58	36	58	1	68 × 68	68	68	1.5
38 × 38	38	38	1	75 × 75	75	75	2
38 × 62	38	62	1	80 × 80	80	80	2
40 × 40	40	40	1				

Note (5) It indicates the minimum permissible single chamfer dimensions. Accurate shape of chamfer dimensions is not specified. However, its profile on the axial plane should not protrude from a virtual circular arc with radius $r_{s\min}$ contacting the roller end surface and rolling contact surface.

Remarks : Attached table 3 indicates the recommended designations and dimensions.

Attached Table 4 Permissible deviations, permissible values and recommended gauges of dimensions and shapes of needle rollers

Unit: μm

Grade	Diameter variation in a single radial plane ⁽⁶⁾ V_{Dwp} (max.)	Deviation from circular form ⁽⁶⁾ Δ_{Rw} (max.)	Gauge lot diameter variation ⁽⁶⁾ V_{DwL} (max.)	Dimension difference of length ⁽⁷⁾ Δ_{Lws} (tolerance)	Recommended gauge S
2	1	1	2	h13	0/-2, -1/-3, -2/-4, -3/-5, -4/-6 -5/-7, -6/-8, -7/-9, -8/-10
3	1.5	1.5	3	h13	0/-3, -1.5/-4.5, -3/-6, -4.5/-7.5 -6/-9, -7/-10
5	2	2.5	5	h13	0/-5, -3/-8, -5/-10

Notes (6) It applies to the middle of roller length.

(7) It is in accordance with division of L_w (see **JIS B 0401-2**).

Remarks : Every single diameter over all the lengths of rollers shall not be larger by exceeding the following value than the actual maximum diameter at the middle of roller length:

- a) Grade 2 0.5 μm
- b) Grade 3 0.8 μm
- c) Grade 5 1 μm