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ANSI/AFBMA
Std. 17-1980

AMERICAN NATIONAL STANDARD AFBMA STANDARD

NEEDLE ROLLERS METRIC DESIGN

Sponsor
**The Anti-Friction Bearing
Manufacturers Association, Inc.**

**Approved October 27, 1980
American National Standards Institute, Inc.**

American National Standard

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FOREWORD

(This foreword is not part of ANSI/AFBMA Standard 17-1980, Needle Rollers, Metric Design.)

This American National Standard presents dimensions and tolerances for metric design needle rollers. It is in agreement with ISO 3096, Needle Rollers, Boundary Dimensions and ISO/DIS 6193, Needle Rollers, Tolerances.

Suggestions for the improvement of this standard gained through experience with its use will be welcomed. These should be sent to the American National Standards Institute, Inc., 1430 Broadway, New York, NY 10018.

The officers of Sectional Committee B3 of the American National Standards Institute and the organizations represented at the time this standard was submitted are as follows:

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- 1 — Terminology
- 4 — Tolerance Definitions and Gaging Practices
- 7 — Shaft and Housing Fits for Metric Radial Ball and Roller Bearings (Except Tapered Roller Bearings) Conforming to Basic Boundary Plans
- 8.2 — Ball and Roller Bearing Mounting Accessories, Inch Design
- 9 — Load Ratings and Fatigue Life for Ball Bearings
- 10 — Metal Balls
- 11 — Load Ratings and Fatigue Life for Roller Bearings
- 12 — Instrument Ball Bearings
- 13 — Roller Bearing Vibration and Noise
- 14 — Housings for Bearings With Spherical Outside Surfaces
- 16.2 — Airframe Ball, Roller and Needle Roller Bearing, Inch Design
- 17 — Needle Rollers, Metric Design
- 18.1 — Metric Design Radial Needle Roller Bearings
- 18.2 — Inch Design Radial Needle Roller Bearings
- 19 — Tapered Roller Bearings, Radial, Inch Design
- 20 — Metric Ball and Roller Bearings (Except Tapered Roller Bearings) Conforming to Basic Boundary Plans
- 21 — Metric Thrust Needle Roller and Cage Assemblies and Thrust Washers
- 21.2 — Thrust Bearings of Ball, Cylindrical Roller, Tapered Roller and Needle Roller Types, Inch Design
- 22 — Spherical Plain Bearings, Joint Type

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NEEDLE ROLLERS METRIC DESIGN

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NEEDLE ROLLERS METRIC DESIGN

1. SCOPE

This standard for Metric Design Industrial Needle Rollers includes:

- Definitions and Symbols
- Tolerances
- Identification
- Dimensions of Preferred Sizes

The needle rollers covered by this standard are for rolling contact needle roller bearings and other uses.

2. DEFINITIONS AND SYMBOLS

2.1 Nominal Diameter of a Needle Roller, D_w . The diameter value which is used for the purpose of general identification of a needle roller diameter. See Figures 1 and 2.

2.2 Single Diameter of a Needle Roller, D_{ws} . The distance between two tangents to the needle roller surface parallel to each other and in a plane perpendicular to the needle roller axis in a radial plane.

2.3 Single Plane Mean Diameter of a Needle Roller, D_{wmp} . The arithmetical mean of the largest and the smallest actual single diameters of the needle roller in a single radial plane.

2.4 Nominal Length of a Needle Roller, L_w . The length value which is used for the purpose of general identification of a needle roller length. See Figures 1 and 2.

2.5 Actual Length of a Needle Roller, L_{ws} . The distance between two radial planes which just contain the end extremities of the needle roller.

2.6 Nominal Corner Dimension (for flat end needle roller), r . See Figure 1.

2.7 Single Corner Dimension (for flat end needle roller), r_s . See Table 2.

2.8 Nominal End Radius (for rounded end needle roller), R . See Figure 2.

2.9 Deviation From Circular Form (of the line of intersection of a needle roller surface and a radial plane). The greatest radial distance between the circle circumscribed around the line and any point on the line. Information regarding measurement of the deviation from circular form is given in the Appendix.

2.10 Single Plane Diameter Variation of a Needle Roller, V_{Dwp} . The difference between the largest and the smallest actual single diameter of the needle roller in a single radial plane.

2.11 Needle Roller Gage. A diameter deviation range limited by a high and a low deviation of the mean needle roller D_{wmp} from the nominal diameter, D_w , in a radial plane through the middle of the roller length.

A gage is designated by the high and low deviations expressed in micrometres, for example -3/-6.

2.12 Gage Lot. A quantity of needle rollers of the same grade and nominal sizes all having a mean diameter D_{wmp} within the same gage.

Needle rollers of any grade and nominal size are supplied in gage lots. If nothing to the contrary has been agreed between the user and supplier the gage lots may be of any one or more of the gages included in Table 1.

2.13 Gage Lot Diameter Variation, V_{DwL} . The difference between the mean diameter D_{wmp} of the needle roller having the largest mean diameter and that of the needle roller having the smallest mean diameter in the lot.

2.14 Needle Roller Grade. A specific combination of diameter and form tolerances. A needle roller grade is designated by a number.

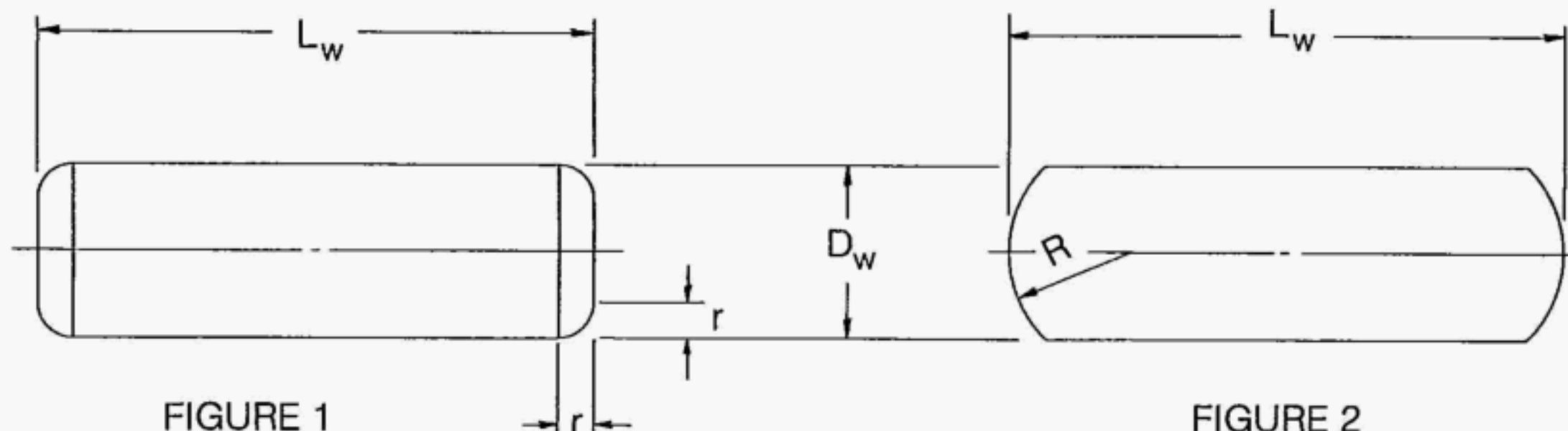


FIGURE 1

FIGURE 2

3. TOLERANCES

TABLE 1 — Part 1
DIAMETER TOLERANCES
NEEDLE ROLLERS
METRIC DESIGN

Deviations and Variations in micrometres				
Grade	Gage lot Diameter Variation V_{DwL}	Preferred Gages* Mean Diameter Deviations D_{wmp}	Allowable Deviation from Circular Form	Allowable Diameter Variation V_{Dwp}
	max	high/low	max	max
2	2	0/-2 -1/-3 -2/-4 -3/-5 -4/-6 -5/-7 -6/-8 -7/-9 -8/-10	1	1
3	3	0/-3 -1.5/-4.5 -3/-6 -4.5/-7.5 -6/-9 -7/-10	1.5	1.5
5	5	0/-5 -3/-8 -5/-10	2.5	2

*No single roller diameter within the entire roller length may exceed the actual maximum diameter at the middle of a roller length by more than:

0.5 μ m for Grade 2
 0.8 μ m for Grade 3
 1 μ m for Grade 5

NOTE: Any ordered quantity of needle rollers of any nominal size and any of the quoted Grades will be supplied sub-divided into quoted Gages at manufacturer's option if nothing to the contrary is agreed between the user and the manufacturer.

TABLE 1 — Part 2
DIAMETER TOLERANCES
NEEDLE ROLLERS
METRIC DESIGN

Deviations and Variations in 0.001 inch				
Grade	Gage lot Diameter Variation V_{DwL}	Preferred Gages* Mean Diameter Deviations D_{wmp}	Allowable Deviation from Circular Form	Allowable Diameter Variation V_{Dwp}
	max	high/low	max	max
2	0.08	0/-0.08 -0.04/-0.12 -0.08/-0.16 -0.12/-0.20 -0.16/-0.24 -0.20/-0.28 -0.24/-0.31 -0.28/-0.35 -0.31/-0.39	0.04	0.04
3	0.12	0/-0.12 0.06/-0.18 -0.12/-0.24 -0.18/-0.30 -0.24/-0.35 -0.28/-0.39	0.06	0.06
5	0.20	0/-0.20 -0.12/-0.31 -0.20/-0.39	0.10	0.08

*No single roller diameter within the entire roller length may exceed the actual maximum diameter at the middle of a roller length by more than:

0.000 020 inch for Grade 2

0.000 030 inch for Grade 3

0.000 040 inch for Grade 5

NOTE: Any ordered quantity of needle rollers of any nominal size and any of the quoted Grades will be supplied subdivided into quoted Gages at manufacturer's option if nothing to the contrary is agreed between the user and the manufacturer.

TABLE 3 — Part 1
LENGTH DIMENSION TOLERANCE LIMITS
NEEDLE ROLLERS
METRIC DESIGN

Dimensions in mm, Deviations in Micrometres

Nominal Length of Needle Roller, L_w		Length Deviations	
mm		h13	
over	incl	high	low
3	6	0	-180
6	10	0	-220
10	18	0	-270
18	30	0	-330
30	50	0	-390

TABLE 3 — Part 2
LENGTH DIMENSION TOLERANCE LIMITS
NEEDLE ROLLERS
METRIC DESIGN

Dimensions in Inches, Deviations in 0.001 Inch

Nominal Length of Needle Roller, L_w		Length Deviations	
inch		h13	
over	incl	high	low
0.1181	0.2362	0	-7
0.2362	0.3937	0	-9
0.3937	0.7087	0	-11
0.7087	1.1811	0	-13
1.1811	1.9685	0	-15

4. IDENTIFICATION

Needle roller identification consists of a letter A or B, to describe whether the end form is rounded or flat respectively; if the requirement is for "modified length contour" — letter R; the numbers describing nominal dimensions; Grade.

PART IDENTIFICATION

End Form	Modified Length Contour	Nominal Diameter	Nominal Length	Grade
A-rounded end B-flat end	R	see Table 4	see Table 4	see Table 1

Examples

REQUIREMENT	IDENTIFICATION
Rounded end needle roller 2.5 mm nominal diameter 13.8 mm nominal length Grade G2	A 2.5 x 13.8 G2*
Flat end needle roller modified length contour 3 mm nominal diameter 9.8 mm nominal length Grade G3	BR 3 x 9.8 G3*

Supply of needle rollers is to be in accordance with the NOTE under Table 1.

*When needle rollers are packaged, their specific "gage" is substituted, for the Grade designation, in package marking.

5. DIMENSIONS OF PREFERRED SIZES

TABLE 4 — Part 1
DIMENSIONS OF PREFERRED SIZES
NEEDLE ROLLERS
METRIC DESIGN

Dimensions in mm

Nominal Diameter D_w	Nominal Length L_w	Nominal Diameter D_w	Nominal Length L_w	Nominal Diameter D_w	Nominal Length L_w
1	5.8	3	9.8	4	15.8
1	6.8		11.8		17.8
1	7.8		13.8		19.8
1	9.8		15.8		21.8
1.5	5.8		17.8		23.8
1.5	6.8		19.8		25.8
1.5	7.8		21.8		27.8
1.5	9.8		23.8		29.8
1.5	11.8		25.8		34.8
1.5	13.8		27.8		39.8
2	7.8	3.5	11.8	5	19.8
2	9.8		13.8		21.8
2	11.8		15.8		23.8
2	13.8		17.8		25.8
2	15.8		19.8		27.8
2	17.8		21.8		29.8
2	19.8		23.8		34.8
2.5	7.8		25.8		39.8
2.5	9.8		27.8		49.8
2.5	11.8		29.8		
2.5	13.8		34.8		
2.5	15.8				
2.5	17.8				
2.5	19.8				
2.5	21.8				
2.5	23.8				

TABLE 4 — Part 2
DIMENSIONS OF PREFERRED SIZES
NEEDLE ROLLERS
METRIC DESIGN

Dimensions in Inches

Nominal Diameter D_w	Nominal Length L_w	Nominal Diameter D_w	Nominal Length L_w	Nominal Diameter D_w	Nominal Length L_w
0.03937	0.228	0.11811	0.386	0.15748	0.622
0.03937	0.268			0.15748	0.701
0.03937	0.307			0.15748	0.780
0.03937	0.386			0.15748	0.858
0.05906	0.228			0.15748	0.937
0.05906	0.268			0.15748	1.016
0.05906	0.307			0.15748	1.094
0.05906	0.386			0.15748	1.173
0.05906	0.465			0.15748	1.370
0.05906	0.543			0.15748	1.567
0.07874	0.307	0.13780	0.465	0.19685	0.780
0.07874	0.386				
0.07874	0.465				
0.07874	0.543				
0.07874	0.622				
0.07874	0.701				
0.07874	0.780				
0.09843	0.307				
0.09843	0.386				
0.09843	0.465				
0.09843	0.543				
0.09843	0.622				
0.09843	0.701				
0.09843	0.780				
0.09843	0.858				
0.09843	0.937				

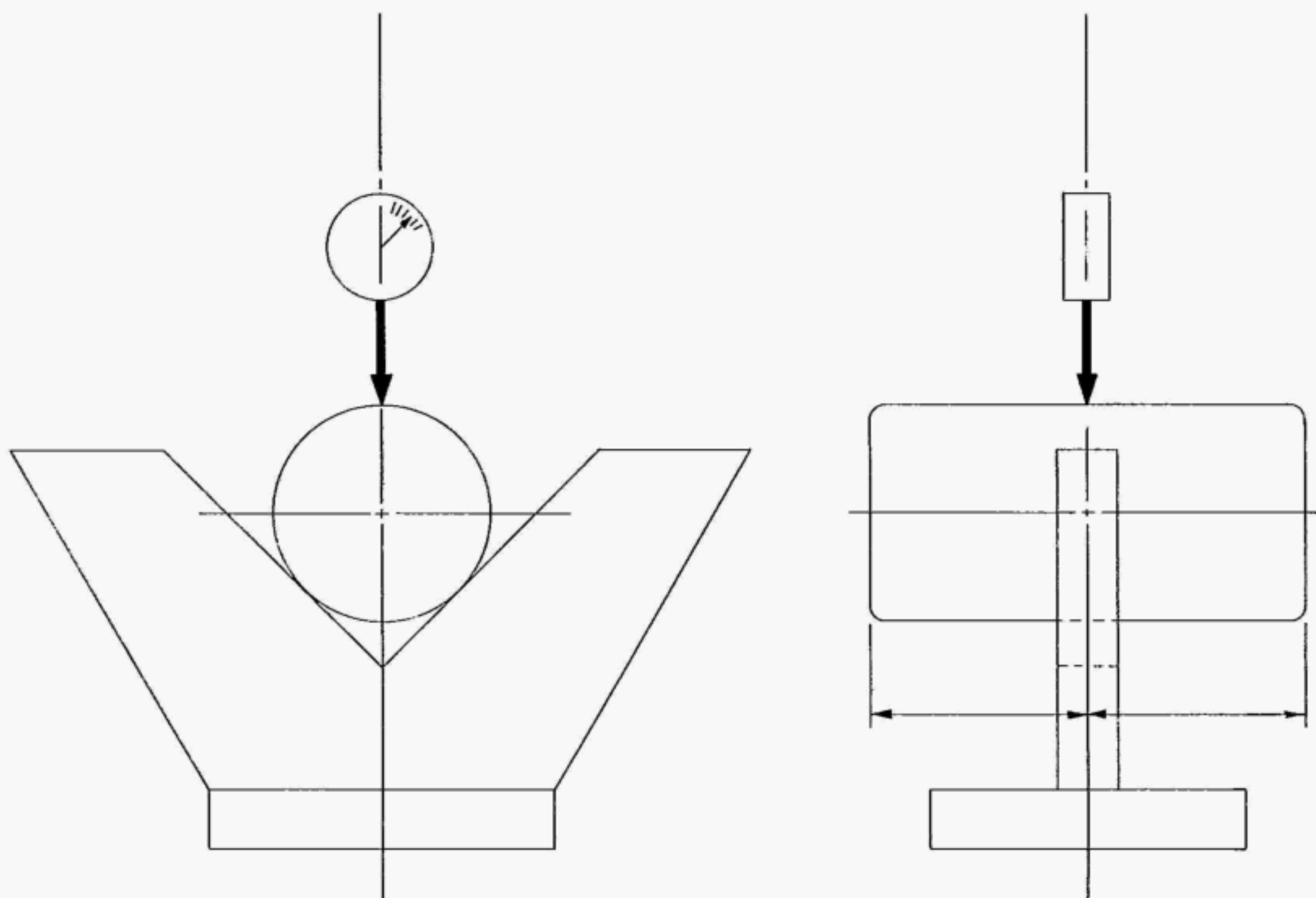
6. APPENDIX

Measurement of Deviation from Circular Form

1. Method Using Roundness Measuring Instrument: Deviation from circular form is to be measured at the middle of the needle roller length. In practice it is usually measured by a numerical evaluation of the needle roller circumference, as recorded on a polar chart which shows the measured circumference. The measured circumference is a graphical representation of the needle roller's radial deviations, highly magnified, which are recorded either as the needle roller or contacting stylus is precisely rotated about the needle roller axis. The accuracy of spindle rotation and the sensitivity of the transducer must be within $0.025 \mu\text{m}$ (0.000001 inch).

Because of the high radial magnification some care must be taken in interpreting the polar chart, and there are several commonly used procedures for finding the radial separation of the measured circumference from a perfect circle. One of these is the minimum circumscribed circle method, which is relatively simple and is generally satisfactory for needle rollers.

2. Method Using Vee Block Measurements: Deviation from circular form for needle rollers may result in circumferential profiles having two or more waves or radial deviations from a perfect circle. Measuring single diameters at the middle of a needle roller will give a good indication of out-of-roundness for two waves or even numbers of waves but may fail to detect or properly measure out-of-roundness having odd numbers of waves. For needle rollers it is practical to use a Vee block measuring device, arranged as shown on the sketch, to measure the out-of-roundness of the profile having odd numbers of waves. The angle of the Vee has a pronounced influence on the indicator reading and no one angle is adequate for all waviness. The most practical Vee angles appear to be 90° and 120° and the magnification factor for the ratio of the indicator reading to the actual wave height or deviation from circular form is shown in the table below the sketch. To determine the deviation from circular form, divide the indicator reading by this factor.

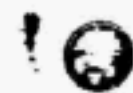


The point of contact between stylus and roller must be on axis A — A which is the bisector of the Vee and Axis B — B which is the plane through the middle of the needle roller length; also the spindle of the indicator must be in alignment with Axes A — A and B — B.

MAGNIFICATION FACTOR

(Gage Reading/Deviation from Circular Form)

Vee Angle	Number of Waves									
	3	5	7	9	11	13	15	17	19	21
90°	2	2	-	-	2	2	-	-	2	2
120°	1	2	2	1	-	-	1	2	2	1



American National Standards

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