International Standard 6193

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Rolling bearings — Needle rollers — Tolerances

Roulements — Aiguilles — Tolérances

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards institutes (ISO member bodies). The work of developing International Standards is carried out through ISO technical committees. Every member body interested in a subject for which a technical committee has been set up has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work.

Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council.

International Standard ISO 6193 was developed by Technical Committee ISO/TC 4, *Rolling bearings*, and was circulated to the member bodies in September 1978.

It has been approved by the member bodies of the following countries :

Australia	Hungary	Poland
Austria	India	South Africa, Rep. of
Belgium	Italy	Sweden
Canada	Japan	Switzerland
Chile	Korea, Dem. P. Rep. of	United Kingdom
China	Korea, Rep. of	USA
Czechoslovakia	Libyan Arab Jamahiriya	USSR
France	Mexico	Yugoslavia
Germany, F. R.	Netherlands	

No member body expressed disapproval of the document.

Rolling bearings — Needle rollers — Tolerances

1 Scope and field of application

This International Standard specifies tolerances for needle rollers, for which the preferred nominal dimensions are given in ISO 3096.

2 References

ISO/R 286, *ISO system for limits and fits — Part 1 : General, tolerances and deviations.*

ISO 3096, *Needle roller bearings — Needle rollers — Dimensions — Metric series.*

3 Definitions, symbols and explanations

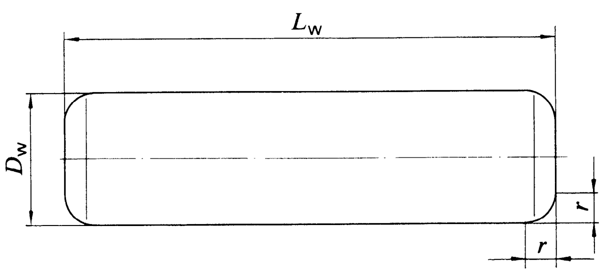

Figure 1 — Flat end needle roller

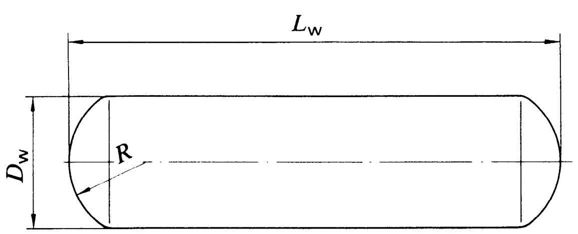

Figure 2 — Rounded end needle roller

3.1 nominal diameter of a needle roller, D_w : The value of the diameter used for the purpose of general identification of a needle roller diameter. See figures 1 and 2.

3.2 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, i.e. a radial plane.

3.3 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.

3.4 nominal length of a needle roller, L_w : The value of the length used for the purpose of general identification of a needle roller length. See figures 1 and 2.

3.5 actual length of a needle roller, L_{ws}: The distance between the two radial planes which just contain the end extremities of the needle roller.

3.6 nominal corner dimension (of flat end needle roller), r : See figure 1.

3.7 single corner dimension (of flat end needle roller), r_s.

3.8 nominal end radius (of rounded end needle roller), R : See figure 2.

3.9 deviation from circular form (of the line of intersection of a needle roller surface and a radial plane) : The greatest radial distance between any point on the line and the circle circumscribed round it.

NOTE — Methods for measuring the deviation from circular form are given in the annex.

3.10 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.

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

NOTE — A gauge is designated by the high and low deviations expressed in micrometres, for example −2/−4.

3.12 gauge lot : A quantity of needle rollers, of the same grade and nominal dimensions, all having a mean diameter D_{wmp} within the same gauge.

NOTE — Needle rollers of any grade and nominal dimensions are supplied in gauge lots. If nothing to the contrary has been agreed between the user and the supplier, the gauge lots may be of any one or more of the gauges included in table 1.

3.13 gauge 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.

3.14 needle roller grade : A specific combination of diameter and form tolerances.

NOTE — A needle roller grade is designated by a number.

4 Tolerances

4.1 Diameter and circular form

Table 1 specifies :

- maximum gauge lot diameter variation;
- preferred gauges;
- maximum deviation from circular form;
- maximum needle roller diameter variation.

In addition, no single roller diameter within the entire roller length shall exceed the actual maximum diameter at the middle of a roller length by more than :

0,5 µm for grade 2

0,8 µm for grade 3

1 µm for grade 5

4.2 Length

For tolerances on the length, L_{ws}, of needle rollers of all grades : h13, see ISO/R 286.

4.3 Corner dimension

Table 2 specifies the applicable corner dimension limits for flat end needle rollers of all grades.

4.4 End radius

The end radius limits for rounded end needle rollers are specified in ISO 3096.

Table 1 — Gauge lot diameter variation, preferred gauges, deviation from circular form and diameter variation

Values in micrometres

Grade	Gauge lot diameter variation V_{DwL} max.	Preferred gauges High/low deviation of mean diameter D_{wmp}	Deviation from circular form Max.	Diameter variation V_{Dwp} 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

NOTES

1 Tolerance values apply only at the middle of the needle roller length. However, each single diameter of a roller shall also comply with the requirements of 4.1.

2 Needle rollers of any nominal dimensions and any of the quoted grades will be supplied sub-divided into quoted gauges at the manufacturer's option, if nothing to the contrary is agreed between the user and the manufacturer.

Table 2 — Corner dimension limits for flat end needle roller

Values in millimetres

Nominal diameter of needle roller D_w		Corner dimension limits	
>	⩽	r_s min.	r_s max.
–	1	0,1	0,3
1	3	0,1	0,4
3	5	0,1	0,6

NOTE — The nominal corner dimension, r, corresponds to the minimum dimension, r_s min.

The corner of a roller shall clear a fillet radius equal to r_s min.

Annex

Measurement of deviation from circular form

A.1 Method using roundness measuring instruments

Deviation from circular form shall 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 highly magnified radial deviations of the needle roller, which are recorded as either the needle roller, or the contacting stylus, is precisely rotated about the needle roller axis. The accuracy of spindle rotation and the sensitivity of the transducer shall be within 0,025 µm.

Because of the high radial magnification, it is essential that care 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.

A.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 length will give a good indication of out-of-roundness for two waves or other 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 in figure 3, to measure the out-of-roundness of a 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 table 3. To determine the deviation from circular form, divide the indicator reading by this factor.

It is essential that the point of contact between the stylus and the roller be on the axis A-A which is the bisector of the vee and the axis B-B, which is the plane through the middle of the needle roller length; also the spindle of the indicator shall be in alignment with axes A-A and B-B.

Table 3 — Magnification factor
(Indicator 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

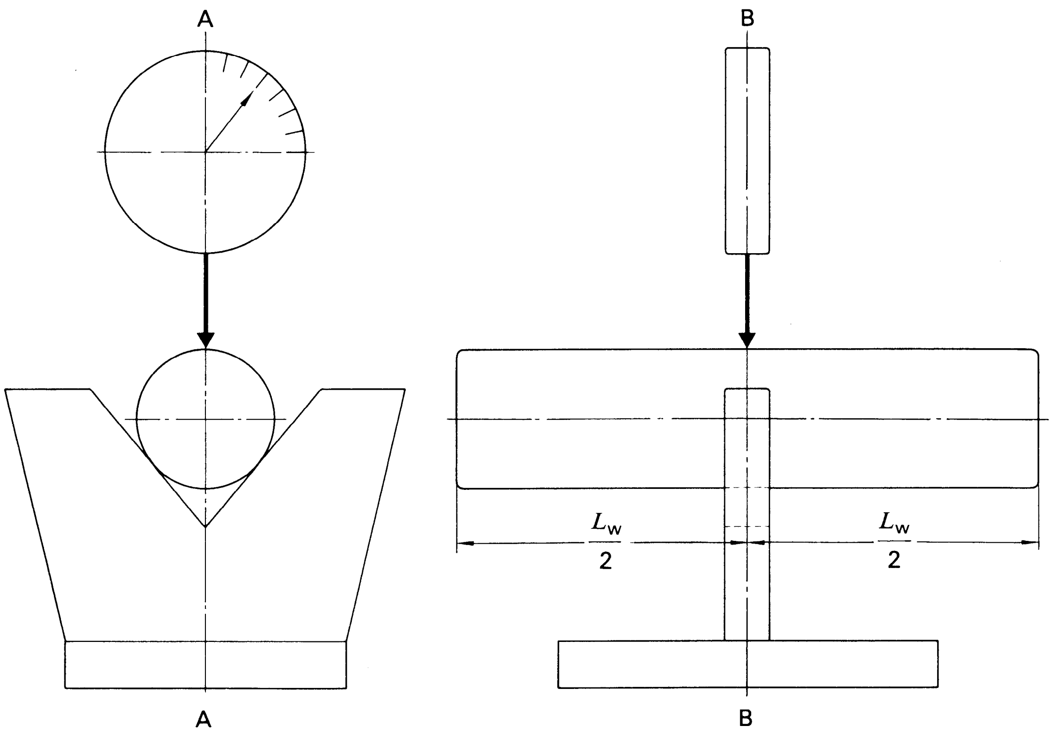

Figure 3 — General arrangement for vee block measurements

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