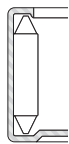


NEEDLE BUSHES



Technical features

Needle Bushes



Needle bushes consist of a thin, heat treated outer ring formed from accurately controlled sheet steel encasing a set of needles. Bushes may have a full complement of needles retained in the outer ring by their ends or by grease; others have the needles retained in a cage which is prevented from moving laterally in the outer ring.

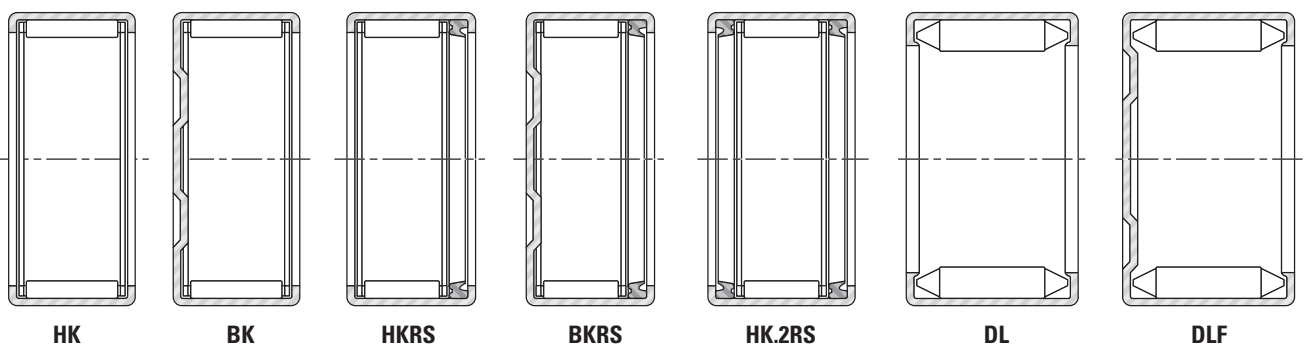
These bearings which occupy very little radial space are particularly economical to use and possess a high load capacity, relative to their size. They should be selected in preference to other bearings when conditions of mounting and operation permit.

When needle bushes are used without an inner ring and the needles rotate on a shaft of suitable hardness, they occupy minimum space and therefore provide a very satisfactory solution.

Maximum load capacity is obtained with a shaft hardness under the needles of at least 58 HRC. A lower hardness is acceptable if loads and required life permit. Hardened inner rings can be supplied for most Nadella needle bushes. They remove the necessity to harden the shaft and enable the bearings to accept full load capacity.

All needle bushes are normally supplied unlubricated (except where a special grease has been requested). However, they are coated with a thin film of grease to prevent corrosion.

TYPES OF NEEDLE BUSHES



| Full complement needle bushes | | Caged needle bushes | | | |
|-------------------------------|------------|---------------------|------------|-------------------|-----------------------|
| Retained needles | | open | closed end | open with seals | closed end with seals |
| open | closed end | | | | |
| DL | DLF | HK | BK | HK..RS HK..2RS | BK..RS |

| Suffixes | |
|----------|-------------------|
| AS1 | lubricating hole |
| RS | seal on one side |
| .2RS | seal on each side |

Technical features

Needle Bushes

CONSTRUCTION

The outer ring, in the form of a cup, is accurately drawn and no subsequent machining is performed. Needle bushes of series **HK** and **DL** have open ends. The **HK** series also are available with one seal, **HKRS**, and with two seals, **HK.2RS**. The stamped lip of a needle bush of series **HKRS** is at the seal end.

Needle bushes of series **BK** and **DLF** are closed at one end. They are used for shaft-end mounting. The open end is typically not sealed.

Needle bushes may be made available on request with a lubricating hole, indicated by suffix **AS1**.

The one-piece steel cage used in most cases of needle bushes is designed to provide rigidity and minimize wear. This cage design separates the needle roller guiding and retention functions.

Caged needle bushes incorporating seals

Caged needle bushes type **HK...RS** and **HK...2RS** have a seal incorporated on the inside of the face marked with the bearing part number. To this face should be applied the force necessary for installation or two seals version **2RS**. Thus, after fitting, the seal will normally be situated towards the outside of the bearing to prevent loss of lubricant and the entry of dirt, etc. (fig. 4).

If sealing is also necessary on the opposite side, a separate sealing ring type **DH** (see page 189), of the same internal and external diameters as the needle bush may be used or, if available, a needle bush **HK...2RS**. The bearing seal which is made of synthetic rubber permits operation up to 120°C (minimum running temperature -20°C).

The shaft to be introduced into the needle bush on assembly must be chamfered at its end or at its shoulder (fig. 4). When carrying out this operation the surface passing through the seal must be greased, in order to avoid damages.

INNER RINGS

Inner rings for needle bushes are normally supplied without oil hole and have a cylindrical needle track. In those infrequent cases where lubrication is provided through the shaft, inner rings can be supplied on request with an oil hole (series **JR...JS1**).



Inner rings series **JRZ...JS1** are without installation chamfers, allowing for maximum possible raceway contact. See section "Inner rings" on pag. 68 for further details.

LOAD RATING FACTORS

Dynamic loads

Needle bushes can accommodate only radial loads.

P = The maximum dynamic radial load that may be applied to a needle bush based on the dynamic load rating C , given in the bearing tables. This load should be $\leq C/3$.

Static loads

$$f_0 = \frac{C_0}{P_0}$$

f_0 = static load safety factor

C_0 = basic static load rating (kN)

P_0 = maximum applied static load (kN)

To ensure satisfactory operation of needle bushes, under all types of conditions, the static load safety factor f_0 should be ≥ 3 .

Technical features

Needle Bushes

INSTALLATION

For needle bushes one must accept that the thin outer ring is interference fitted to the housing bore and will correspond closely to the shape of the housing.

A housing with localised imperfections and thickness variations may cause deformation of the bush, which is detrimental to smooth operation. Best results are obtained with a geometrically uniform shape and even load distribution.

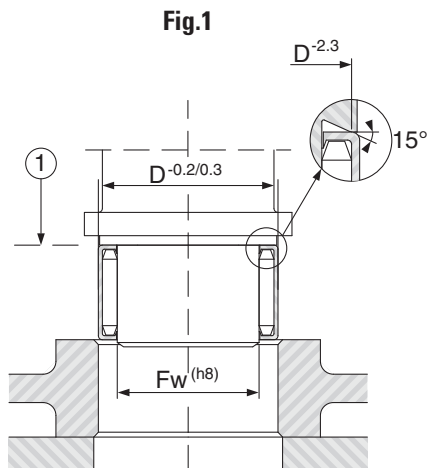
A mounting with interference of needle bushes in the housing obviates any lateral sealing device. The side of the bush not marked must remain moved away from any shoulder, seal, cover, spacer or edge of another bush. If for machining required there is a housing with shoulders, the latter must be sufficiently moved away from the bush to avoid deforming the edge during mounting.

The force required to insert the needle bush must be applied without shock to the side marked with the bearing part number.

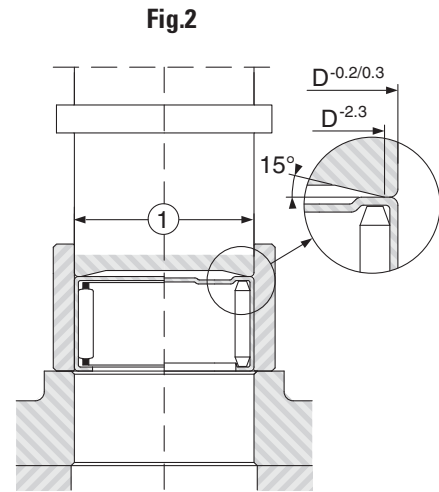
Thus it is advisable to use a small press fitted with a suitable mandrel to apply uniform force to the bush centred in the housing (fig. 1).

The axial movement of the mandrel should be limited by a shoulder coming against the face of the housing. Bushes having one closed end should preferably have the open end presented to the housing bore (fig. 2).

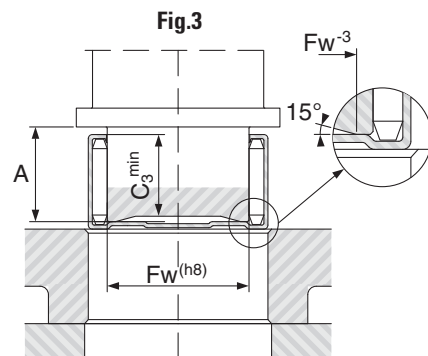
If this is not possible, the force may be applied to the inside face of the closed end in the case of bushes type **DLF** (fig. 3) (this must not be done in the case of bushes type **BK**).



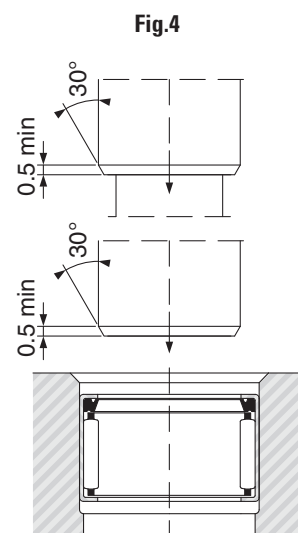
(1) Marked face



(1) Bore of ring $D + 0.3$ mm



$A \text{ min} = C3 \text{ min} + 1 \text{ mm}$



Technical features

Needle Bushes

RADIAL PLAY

The fit of a bush in its housing determines to a large extent the dimension under the needles after fitting and consequently the radial play during operation. The recommended shaft and housing tolerances give a radial play the limits of which are suitable for most normal applications. To obtain a closer clearance, it is possible to match the shaft diameters with the diameters under the needles of the bushes after the latter have been fitted into their housings.

The possible differences in the rigidity of housings and the variations of clamping force resulting from the tolerance build up do not permit one to establish a range of dimensions under the needles for every application. The radial play limits should also take into account the tolerance of the shaft used directly as a raceway or the outer diameter of the inner ring after it has been fitted on to the shaft.

It is suggested that when inner rings are used with needle bushes, they should be mounted with a loose transition fit on the shaft using g6 (g5) shaft diameter tolerance.

The inner ring should be end-clamped against a shoulder. If a tight transition fit must be used [shaft diameter tolerance h6 (h5)] to keep the inner ring from rotating relative to the shaft, the inner ring outer diameter, as mounted, must not exceed the raceway diameter required by the needle bush for the particular application. In case the outer diameter of the inner ring, when mounted on the shaft, exceeds the required raceway diameter for the matching needle bush, it should be ground to proper diameter while mounted on the shaft.

SHAFT TOLERANCES

| Types of bush | Operating conditions | Shaft tolerance, needle bushes without inner ring (recommended internal radial play) | Shaft tolerance, needle bushes with inner ring (recommended internal radial play) | Housing tolerance (recommended internal radial play) |
|-----------------------------|---|--|---|--|
| HK, BK, HKRS, HK.2RS | One piece heavy section steel or cast iron housing | h5 (h6) | h6 (h5) | N6 (N7) |
| DL,DLF | One piece heavy section steel or cast iron housing | h5 (h6) | h6 (h5) | H6 (H7) |
| HK, BK, HKRS, HK.2RS | Housing material of low rigidity (Non-ferrous metal (1) or thin casings in steel) | h5 (h6) | h6 (h5) | R6 (R7) |
| DL,DLF | Housing material of low rigidity (Non-ferrous metal (1) or thin casings in steel) | h5 (h6) | h6 (h5) | M6 (M7) |
| HK, BK, HKRS, HK.2RS | Outer ring rotation (one piece heavy section steel or cast iron housing) | f5 (f6) | g6 (g5) | R6 (R7) |
| DL,DLF | Outer ring rotation (one piece heavy section steel or cast iron housing) | f5 (f6) | g6 (g5) | M6 (M7) |
| HK, BK, HKRS, HK.2RS | Oscillating motion | j5 (j6) | h6 (h5) | (2) |
| DL,DLF | Oscillating motion | j5 (j6) | h6 (h5) | (2) |

(1) If a housing of non-ferrous metal reaches temperatures considerably higher (or lower) than 20°C, account should be taken of the difference in expansion (or contraction) of the bush and suitable adjustments to the fits should be made.

The cylindrical tolerance defined as the difference in radii of two coaxial cylinders (Standard ISO 1101) must normally be less than a quarter of the machining tolerance on the defined diameter. However, for precision applications or high speeds, it is recommended that the cylindrical tolerance is reduced to one eighth of the machining tolerance.

(2) The tolerance depends on the shape of the housing.

Technical features

Needle Bushes

INSPECTION OF NEEDLE BUSHES

Although the bush is accurately drawn from strip steel, because of its fairly thin section, it may go out-of-round during heat treatment. When the bearing is pressed into a true round housing, or ring gage of correct size and wall thickness, it becomes round and is sized properly.

For this reason, it is incorrect to inspect an unmounted drawn cup bearing by measuring the outer diameter.

The correct method for inspecting the needle bush size is to:

1. Press the needle bush into a ring gage of proper size.
2. Plug the needle bush bore with the appropriate "GO" and "NO GO" gages, or measure it with a tapered arbor (lathe mandrel).

The "GO" gage size is the minimum needle roller complement bore diameter. The "NO GO" gage size is larger than the maximum needle roller complement bore diameter.

| FULL COMPLEMENT NEEDLE BUSHES Type DL, DLF | | | |
|---|------------|--|--------|
| Nominal bore diameter | Ring gage* | Needle roller complement bore diameter | |
| | | Max. | Min. |
| mm | mm | mm | mm |
| 5.000 | 9.000 | 5.036 | 5.009 |
| 6.000 | 12.000 | 6.034 | 6.009 |
| 8.000 | 14.000 | 8.034 | 8.009 |
| 9.000 | 14.000 | 9.034 | 9.009 |
| 10.000 | 16.000 | 10.034 | 10.009 |
| 12.000 | 18.000 | 12.035 | 12.009 |
| 13.000 | 19.000 | 13.035 | 13.009 |
| 14.000 | 23.000 | 14.035 | 14.009 |
| 15.000 | 24.000 | 15.035 | 15.009 |
| 16.000 | 26.000 | 16.035 | 16.009 |
| 17.000 | 23.000 | 17.035 | 17.009 |
| 18.000 | 24.000 | 18.035 | 18.009 |
| 20.000 | 26.000 | 20.035 | 20.009 |
| 22.000 | 28.000 | 22.035 | 22.009 |
| 25.000 | 33.000 | 25.041 | 25.015 |
| 28.000 | 36.000 | 28.041 | 28.015 |
| 30.000 | 38.000 | 30.041 | 30.015 |
| 35.000 | 43.000 | 35.041 | 35.015 |
| 40.000 | 48.000 | 40.041 | 40.015 |
| 44.000 | 52.000 | 44.041 | 44.015 |
| 45.000 | 52.000 | 45.041 | 45.015 |
| 47.000 | 55.000 | 47.041 | 47.015 |
| 50.000 | 58.000 | 50.041 | 50.015 |
| 55.000 | 63.000 | 55.041 | 55.015 |

| CAGED NEEDLE BUSHES Type HK, BK, HK...RS, BK...RS, HK...2RS | | | |
|--|------------|--|--------|
| Nominal bore diameter | Ring gage* | Needle roller complement bore diameter | |
| | | Max. | Min. |
| mm | mm | mm | mm |
| 3.000 | 6.484 | 3.024 | 3.006 |
| 4.000 | 7.984 | 4.028 | 4.010 |
| 5.000 | 8.984 | 5.028 | 5.010 |
| 6.000 | 9.984 | 6.028 | 6.010 |
| 7.000 | 10.980 | 7.031 | 7.013 |
| 8.000 | 11.980 | 8.031 | 8.013 |
| 9.000 | 12.980 | 9.031 | 9.013 |
| 10.000 | 13.980 | 10.031 | 10.013 |
| 12.000 | 15.980 | 12.034 | 12.016 |
| 12.000 | 17.980 | 12.034 | 12.016 |
| 13.000 | 18.976 | 13.034 | 13.016 |
| 14.000 | 19.976 | 14.034 | 14.016 |
| 15.000 | 20.976 | 15.034 | 15.016 |
| 16.000 | 21.976 | 16.034 | 16.016 |
| 17.000 | 22.976 | 17.034 | 17.016 |
| 18.000 | 23.976 | 18.034 | 18.016 |
| 20.000 | 25.976 | 20.041 | 20.020 |
| 22.000 | 27.976 | 22.041 | 22.020 |
| 25.000 | 31.972 | 25.041 | 25.020 |
| 28.000 | 34.972 | 28.041 | 28.020 |
| 30.000 | 36.972 | 30.041 | 30.020 |
| 35.000 | 41.972 | 35.050 | 35.025 |
| 40.000 | 46.972 | 40.050 | 40.025 |
| 45.000 | 51.967 | 45.050 | 45.025 |
| 50.000 | 57.967 | 50.050 | 50.025 |
| 60.000 | 67.967 | 60.060 | 60.030 |

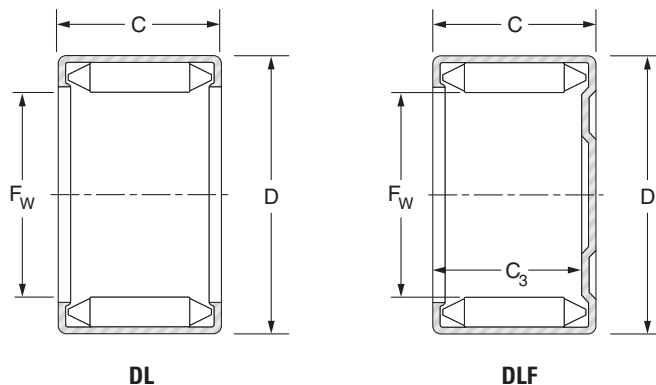
* The ring gage sizes are in accordance with ISO N6 lower limit.



Needle bushes, full complement, retained

open series DL

closed end series DLF

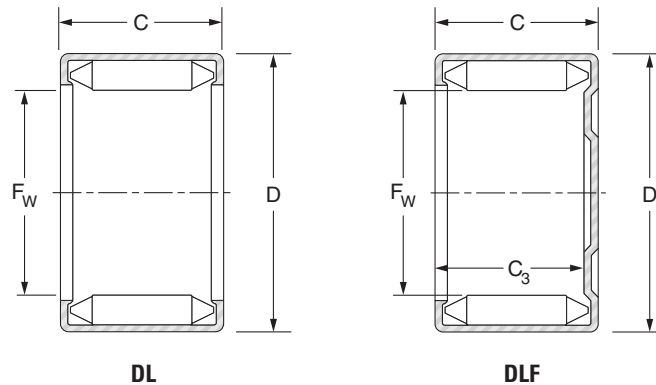


| Shaft ∅ mm | Designation | Fw mm | D mm | C mm | C ₃ min. mm | Load Ratings kN | | Speed limit min ⁻¹ | | Weight kg | Internal ring |
|------------------|-------------|----------|---------|---------|---------------------------|-----------------|----------------|----------------------------------|-------|--------------|---------------|
| | | | | | | Dynamic | Static | Grease | Oil | | |
| | | | | | | C | C ₀ | | | | |
| 6 | DL 6 10 | 6 | 12 | 10 | – | 2.90 | 3.80 | 33000 | 50000 | 0.004 | |
| | DLF 6 10 | 6 | 12 | 10 | 7.7 | 2.90 | 3.80 | 33000 | 50000 | 0.004 | |
| 8 | DL 8 10 | 8 | 14 | 10 | – | 4.50 | 6.50 | 24000 | 37500 | 0.005 | |
| | DLF 8 10 | 8 | 14 | 10 | 7.7 | 4.50 | 6.50 | 24000 | 37500 | 0.006 | |
| 10 | DL 10 12 | 10 | 16 | 12 | – | 7.00 | 10.9 | 20000 | 30000 | 0.008 | |
| | DLF 10 12 | 10 | 16 | 12 | 9.7 | 7.00 | 10.9 | 20000 | 30000 | 0.009 | |
| 12 | DL 12 10 | 12 | 18 | 10 | – | 6.00 | 9.7 | 16000 | 25000 | 0.008 | JR8x12x10.5 |
| | DLF 12 10 | 12 | 18 | 10 | 7.7 | 6.00 | 9.7 | 16000 | 25000 | 0.008 | JR8x12x12.5 |
| | DL 12 12 | 12 | 18 | 12 | – | 7.00 | 11.5 | 16000 | 25000 | 0.009 | JR8x12x12.5 |
| | DLF 12 12 | 12 | 18 | 12 | 9.7 | 7.00 | 11.5 | 16000 | 25000 | 0.010 | JR8x12x12.5 |
| 13 | DL 13 12 | 13 | 19 | 12 | – | 8.50 | 14.2 | 15000 | 23000 | 0.010 | JR10x13x12.5 |
| | DLF 13 12 | 13 | 19 | 12 | 9.7 | 8.50 | 14.2 | 15000 | 23000 | 0.011 | JR10x13x12.5 |
| 14 | DL 14 12 | 14 | 20 | 12 | – | 7.90 | 13.5 | 14000 | 21500 | 0.011 | JR10x14x12.5 |
| | DLF 14 12 | 14 | 20 | 12 | 9.7 | 7.90 | 13.5 | 14000 | 21500 | 0.012 | JR10x14x12.5 |
| 15 | DL 15 12 | 15 | 21 | 12 | – | 9.40 | 16.4 | 13000 | 20000 | 0.011 | JR12x15x12.5 |
| | DLF 15 12 | 15 | 21 | 12 | 9.7 | 9.40 | 16.4 | 13000 | 20000 | 0.012 | JR12x15x12.5 |
| 16 | DL 16 12 | 16 | 22 | 12 | – | 8.70 | 15.5 | 12000 | 18500 | 0.012 | JR12x16x12.5 |
| | DLF 16 12 | 16 | 22 | 12 | 9.7 | 8.70 | 15.5 | 12000 | 18500 | 0.013 | JR12x16x12.5 |
| 17 | DL 17 12 | 17 | 23 | 12 | – | 9.00 | 16.2 | 11000 | 17500 | 0.013 | JR13x17x12.5 |
| | DLF 17 12 | 17 | 23 | 12 | 9.7 | 9.00 | 16.2 | 11000 | 17500 | 0.014 | JR13x17x12.5 |
| 18 | DL 18 12 | 18 | 24 | 12 | – | 10.7 | 19.5 | 11000 | 16500 | 0.014 | JR13x18x12.5 |
| | DLF 18 12 | 18 | 24 | 12 | 9.7 | 10.7 | 19.5 | 11000 | 16500 | 0.016 | JR13x18x12.5 |
| | DL 18 16 | 18 | 24 | 16 | – | 16.0 | 29.5 | 11000 | 16500 | 0.019 | JR15x18x16.5 |
| | DLF 18 16 | 18 | 24 | 16 | 13.7 | 16.0 | 29.5 | 11000 | 16500 | 0.021 | JR15x18x16.5 |

Needle bushes, full complement, retained

open series DL

closed end series DLF

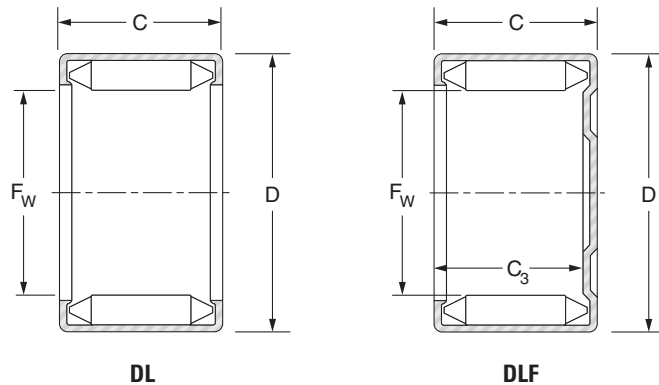


| Shaft Ø mm | Designation | Fw mm | D mm | C mm | C ₃ min. mm | Load Ratings kN | | Speed limit min ⁻¹ | | Weight kg | Internal ring |
|------------------|-------------|----------|---------|---------|---------------------------|-----------------|----------------|----------------------------------|-------|--------------|---------------|
| | | | | | | Dynamic | Static | Grease | Oil | | |
| | | | | | | C | C ₀ | | | | |
| 20 | DL 20 12 | 20 | 26 | 12 | – | 10.2 | 19.5 | 10000 | 15000 | 0.015 | JR15x20x12 |
| | DLF 20 12 | 20 | 26 | 12 | 9.7 | 10.2 | 19.5 | 10000 | 15000 | 0.017 | JR15x20x12 |
| | DL 20 16 | 20 | 26 | 16 | – | 16.0 | 30.5 | 10000 | 15000 | 0.020 | JR17x20x16 |
| | DLF 20 16 | 20 | 26 | 16 | 13.7 | 16.0 | 30.5 | 10000 | 15000 | 0.022 | JR17x20x16 |
| 22 | DL 22 16 | 22 | 28 | 16 | – | 17.0 | 33.0 | 8800 | 13500 | 0.022 | JR17x22x16 |
| | DLF 22 16 | 22 | 28 | 16 | 13.7 | 17.0 | 33.0 | 8800 | 13500 | 0.025 | JR17x22x16 |
| 25 | DL 25 16 | 25 | 33 | 16 | – | 16.0 | 32.5 | 7800 | 12000 | 0.035 | JR20x25x17 |
| | DLF 25 16 | 25 | 33 | 16 | 13.7 | 16.0 | 32.5 | 7800 | 12000 | 0.039 | JR20x25x17 |
| | DL 25 20 | 25 | 33 | 20 | – | 22.8 | 46.0 | 7800 | 12000 | 0.043 | JR20x25x20.5 |
| | DLF 25 20 | 25 | 33 | 20 | 17.7 | 22.8 | 46.0 | 7800 | 12000 | 0.047 | JR20x25x20.5 |
| 28 | DL 28 20 | 28 | 36 | 20 | – | 24.5 | 52.0 | 7200 | 11000 | 0.047 | JR22x28x20.5 |
| | DLF 28 20 | 28 | 36 | 20 | 17.7 | 24.5 | 52.0 | 7200 | 11000 | 0.051 | JR22x28x20.5 |
| 30 | DL 30 16 | 30 | 38 | 16 | – | 21.7 | 46.5 | 6500 | 10000 | 0.040 | JR25x30x17 |
| | DLF 30 16 | 30 | 38 | 16 | 13.7 | 21.7 | 46.5 | 6500 | 10000 | 0.045 | JR25x30x17 |
| | DL 30 20 | 30 | 38 | 20 | – | 26.0 | 56.0 | 6500 | 10000 | 0.050 | JR25x30x20.5 |
| | DLF 30 20 | 30 | 38 | 20 | 17.7 | 26.0 | 56.0 | 6500 | 10000 | 0.055 | JR25x30x20.5 |
| | DL 30 25 | 30 | 38 | 25 | – | 35.5 | 76.0 | 6500 | 10000 | 0.063 | JR25x30x26 |
| | DLF 30 25 | 30 | 38 | 25 | 22.7 | 35.5 | 76.0 | 6500 | 10000 | 0.068 | JR25x30x26 |
| 35 | DL 35 16 | 35 | 43 | 16 | – | 24.0 | 54.0 | 5500 | 8500 | 0.046 | JR30x35x17 |
| | DLF 35 16 | 35 | 43 | 16 | 13.7 | 24.0 | 54.0 | 5500 | 8500 | 0.053 | JR30x35x17 |
| | DL 35 20 | 35 | 43 | 20 | – | 29.0 | 65.0 | 5500 | 8500 | 0.057 | JR30x35x20.5 |
| | DLF 35 20 | 35 | 43 | 20 | 17.7 | 29.0 | 65.0 | 5500 | 8500 | 0.064 | JR30x35x20.5 |
| 40 | DL 40 16 | 40 | 48 | 16 | – | 26.5 | 62.0 | 4900 | 7500 | 0.051 | JR35x40x17 |
| | DLF 40 16 | 40 | 48 | 16 | 13.7 | 26.5 | 62.0 | 4900 | 7500 | 0.061 | JR35x40x17 |
| | DL 40 20 | 40 | 48 | 20 | – | 36.0 | 84.0 | 4900 | 7500 | 0.064 | JR35x40x20.5 |
| | DLF 40 20 | 40 | 48 | 20 | 17.7 | 36.0 | 84.0 | 4900 | 7500 | 0.074 | JR35x40x20.5 |

Needle bushes, full complement, retained

open series DL

closed end series DLF

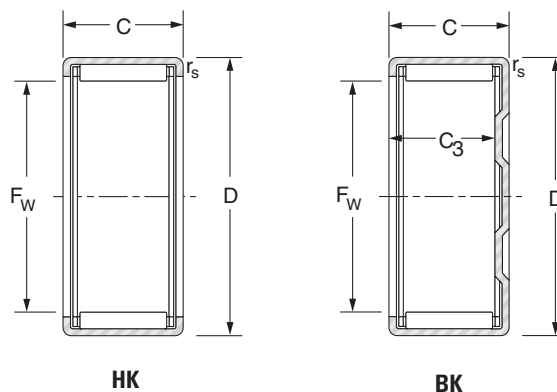


| Shaft ∅ mm | Designation | Fw mm | D mm | C mm | C ₃ min. mm | Load Ratings kN | | Speed limit min ⁻¹ | | Weight kg | Internal ring |
|------------------|-------------|----------|---------|---------|---------------------------|-----------------|----------------|----------------------------------|------|--------------|---------------|
| | | | | | | Dynamic | Static | Grease | Oil | | |
| | | | | | | C | C ₀ | | | | |
| 44 | DL 44 16 | 44 | 52 | 16 | – | 23.80 | 57.00 | 4400 | 6800 | 0.056 | |
| | DLF 44 16 | 44 | 52 | 16 | 13.7 | 23.80 | 57.00 | 4400 | 6800 | 0.066 | |
| 47 | DL 47 16 | 47 | 55 | 16 | – | 25.00 | 61.00 | 4200 | 6400 | 0.060 | |
| | DLF 47 16 | 47 | 55 | 16 | 13.7 | 25.00 | 61.00 | 4200 | 6400 | 0.071 | |
| 50 | DL 50 12 | 50 | 58 | 12 | – | 20.00 | 50.00 | 3900 | 6000 | 0.047 | |
| | DLF 50 12 | 50 | 58 | 12 | 9.7 | 20.00 | 50.00 | 3900 | 6000 | 0.061 | |
| | DL 50 18 | 50 | 58 | 18 | – | 36.50 | 92.00 | 3900 | 6000 | 0.071 | |
| | DLF 50 18 | 50 | 58 | 18 | 15.7 | 36.50 | 92.00 | 3900 | 6000 | 0.085 | |
| | DL 50 20 | 50 | 58 | 20 | – | 37.00 | 93.00 | 3900 | 6000 | 0.077 | JR45x50x20 |
| | DLF 50 20 | 50 | 58 | 20 | 17.7 | 37.00 | 93.00 | 3900 | 6000 | 0.091 | JR45x50x20 |
| 55 | DL 55 20 | 55 | 63 | 20 | – | 39.5 | 102.0 | 3600 | 5500 | 0.086 | JR50x55x20 |
| | DLF 55 20 | 55 | 63 | 20 | 17.7 | 39.5 | 102.0 | 3600 | 5500 | 0.102 | JR50x55x20 |

Caged needle bushes

open series HK

closed end series BK



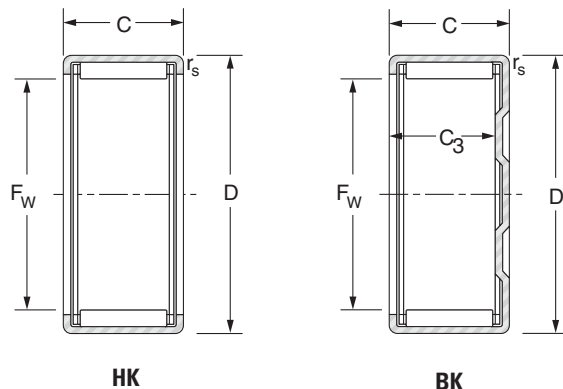
| Shaft Ø mm | Designation | Fw mm | D mm | C mm | C ₃ min. mm | r _s min. mm | Load Ratings kN | | Speed limit min ⁻¹ | | Weight kg | Internal ring |
|------------------|-------------|----------|---------|---------|---------------------------|---------------------------|-----------------|----------------|----------------------------------|-------|--------------|---------------|
| | | | | | | | Dynamic | Static | Grease | Oil | | |
| | | | | | | | C | C ₀ | | | | |
| 3 | BK0306 | 3 | 6.5 | 6 | 5.2 | 0.30 | 1.20 | 0.78 | 30000 | 46000 | 0.001 | |
| | HK0306 | 3 | 6.5 | 6 | – | 0.30 | 1.60 | 1.14 | 30000 | 46000 | 0.001 | |
| 4 | BK0408 | 4 | 8 | 8 | 6.4 | 0.40 | 1.83 | 1.32 | 25000 | 39000 | 0.002 | |
| | HK0408 | 4 | 8 | 8 | – | 0.40 | 1.88 | 1.38 | 25000 | 39000 | 0.002 | |
| 5 | BK0509 | 5 | 9 | 9 | 7.4 | 0.40 | 2.52 | 2.07 | 23000 | 36000 | 0.002 | |
| | HK0509 | 5 | 9 | 9 | – | 0.40 | 2.52 | 2.07 | 23000 | 36000 | 0.002 | |
| 6 | BK0608 | 6 | 10 | 8 | 6.4 | 0.40 | 2.34 | 1.95 | 22000 | 33000 | 0.002 | |
| | HK0608 | 6 | 10 | 8 | – | 0.40 | 2.34 | 1.95 | 22000 | 33000 | 0.002 | |
| | BK0609 | 6 | 10 | 9 | 7.4 | 0.40 | 3.14 | 2.85 | 22000 | 33000 | 0.003 | |
| | HK0609 | 6 | 10 | 9 | – | 0.40 | 3.14 | 2.85 | 22000 | 33000 | 0.002 | |
| 7 | BK0709 | 7 | 11 | 9 | 7.4 | 0.40 | 3.24 | 3.10 | 21000 | 32000 | 0.003 | |
| | HK0709 | 7 | 11 | 9 | – | 0.40 | 3.23 | 3.05 | 21000 | 32000 | 0.003 | |
| 8 | BK0808 | 8 | 12 | 8 | 6.4 | 0.40 | 2.90 | 2.73 | 20000 | 31000 | 0.003 | |
| | HK0808 | 8 | 12 | 8 | – | 0.40 | 2.90 | 2.73 | 20000 | 31000 | 0.003 | |
| | BK0810 | 8 | 12 | 10 | 8.4 | 0.40 | 3.93 | 4.14 | 20000 | 31000 | 0.004 | JR5x8x12 |
| | HK0810 | 8 | 12 | 10 | – | 0.40 | 3.95 | 4.07 | 20000 | 31000 | 0.004 | JR5x8x12 |
| 9 | BK0910 | 9 | 13 | 10 | 8.4 | 0.40 | 4.57 | 5.07 | 19000 | 30000 | 0.004 | JR6x9x12 |
| | HK0910 | 9 | 13 | 10 | – | 0.40 | 4.57 | 5.07 | 19000 | 30000 | 0.004 | JR6x9x12 |
| | BK0912 | 9 | 13 | 12 | 10.4 | 0.40 | 5.65 | 6.65 | 19000 | 30000 | 0.005 | JR6x9x12 |
| | HK0912 | 9 | 13 | 12 | – | 0.40 | 5.65 | 6.65 | 19000 | 30000 | 0.005 | JR6x9x12 |
| 10 | BK1010 | 10 | 14 | 10 | 8.4 | 0.40 | 4.78 | 5.51 | 19000 | 29000 | 0.004 | JR7x10x10.5 |
| | HK1010 | 10 | 14 | 10 | – | 0.40 | 4.78 | 5.51 | 19000 | 29000 | 0.004 | JR7x10x10.5 |
| | BK1012 | 10 | 14 | 12 | 10.4 | 0.40 | 5.90 | 7.23 | 19000 | 29000 | 0.006 | JR7x10x12 |
| | HK1012 | 10 | 14 | 12 | – | 0.40 | 5.90 | 7.23 | 19000 | 29000 | 0.005 | JR7x10x12 |
| | BK1015 | 10 | 14 | 15 | 13.4 | 0.40 | 7.49 | 9.81 | 19000 | 29000 | 0.006 | JR7x10x16 |
| | HK1015 | 10 | 14 | 15 | – | 0.40 | 7.49 | 9.81 | 19000 | 29000 | 0.006 | JR7x10x16 |



Caged needle bushes

open series HK

closed end series BK

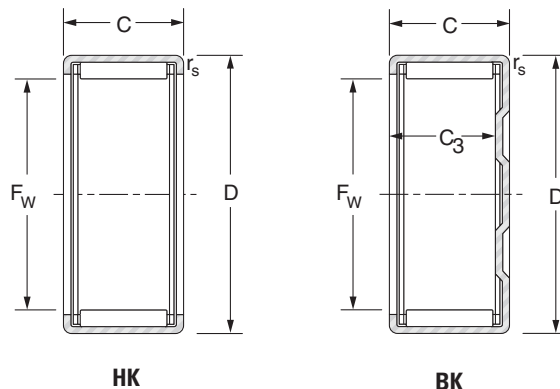


| Shaft ∅ mm | Designation | F _w mm | D mm | C mm | C ₃ min. mm | r _s min. mm | Load Ratings kN | | Speed limit min ⁻¹ | | Weight kg | Internal ring |
|------------------|-------------|----------------------|---------|---------|---------------------------|---------------------------|-----------------|----------------|----------------------------------|-------|--------------|---------------|
| | | | | | | | Dynamic | Static | Grease | Oil | | |
| | | | | | | | C | C ₀ | | | | |
| 12 | BK1210 | 12 | 16 | 10 | 8.4 | 0.4 | 4.96 | 6.08 | 18000 | 28000 | 0.006 | JR8x12x10.5 |
| | HK1210 | 12 | 16 | 10 | – | 0.4 | 4.96 | 6.08 | 18000 | 28000 | 0.006 | JR8x12x10.5 |
| | BK1212 | 12 | 18 | 12 | 9.3 | 1 | 6.61 | 7.29 | 14000 | 22000 | 0.012 | JR8x12x12.5 |
| | HK1212 | 12 | 18 | 12 | – | 1 | 6.61 | 7.29 | 14000 | 22000 | 0.01 | JR8x12x12.5 |
| 13 | BK1312 | 13 | 19 | 12 | 9.3 | 1 | 6.92 | 7.89 | 14000 | 22000 | 0.012 | JR10x13x12.5 |
| | HK1312 | 13 | 19 | 12 | – | 1 | 6.92 | 7.89 | 14000 | 22000 | 0.01 | JR10x13x12.5 |
| 14 | BK1412 | 14 | 20 | 12 | 9.3 | 1 | 7.21 | 8.50 | 14000 | 21000 | 0.014 | JR10x14x12 |
| | HK1412 | 14 | 20 | 12 | – | 1 | 7.21 | 8.50 | 14000 | 21000 | 0.011 | JR10x14x12 |
| 15 | BK1512 | 15 | 21 | 12 | 9.3 | 1 | 7.16 | 8.57 | 14000 | 21000 | 0.015 | JR12x15x12.5 |
| | HK1512 | 15 | 21 | 12 | – | 1 | 7.49 | 9.11 | 14000 | 21000 | 0.012 | JR12x15x12.5 |
| | BK1516 | 15 | 21 | 16 | 13.3 | 1 | 10.70 | 14.4 | 14000 | 21000 | 0.019 | JR12x15x16.5 |
| | HK1516 | 15 | 21 | 16 | – | 1 | 10.70 | 14.4 | 14000 | 21000 | 0.018 | JR12x15x16.5 |
| | BK1522 | 15 | 21 | 22 | 19.3 | 1 | 13.50 | 19.4 | 14000 | 21000 | 0.022 | JR12x15x22.5 |
| | HK1522 | 15 | 21 | 22 | – | 1 | 13.50 | 19.4 | 14000 | 21000 | 0.024 | JR12x15x22.5 |
| 16 | BK1612 | 16 | 22 | 12 | 9.3 | 1 | 7.76 | 9.72 | 14000 | 21000 | 0.016 | JR12x16x12 |
| | HK1612 | 16 | 22 | 12 | – | 1 | 7.76 | 9.72 | 14000 | 21000 | 0.012 | JR12x16x12 |
| | BK1616 | 16 | 22 | 16 | 13.3 | 1 | 11.1 | 15.3 | 14000 | 21000 | 0.02 | JR12x16x16 |
| | HK1616 | 16 | 22 | 16 | – | 1 | 11.1 | 15.3 | 14000 | 21000 | 0.016 | JR12x16x16 |
| | BK1622 | 16 | 22 | 22 | 19.3 | 1 | 13.4 | 19.5 | 14000 | 21000 | 0.028 | JR12x16x22 |
| | HK1622 | 16 | 22 | 22 | – | 1 | 13.4 | 19.5 | 14000 | 21000 | 0.022 | JR12x16x22 |
| 17 | BK1712 | 17 | 23 | 12 | 9.3 | 1 | 8.12 | 10.4 | 13000 | 20000 | 0.018 | |
| | HK1712 | 17 | 23 | 12 | – | 1 | 8.12 | 10.4 | 13000 | 20000 | 0.013 | |
| 18 | BK1812 | 18 | 24 | 12 | 9.3 | 1 | 8.41 | 11.11 | 12000 | 18000 | 0.017 | |
| | HK1812 | 18 | 24 | 12 | – | 1 | 8.41 | 11.11 | 12000 | 18000 | 0.015 | |
| | BK1816 | 18 | 24 | 16 | 13.3 | 1 | 11.6 | 16.8 | 12000 | 18000 | 0.022 | JR15x18x16.5 |
| | HK1816 | 18 | 24 | 16 | – | 1 | 11.6 | 16.8 | 12000 | 18000 | 0.018 | JR15x18x16.5 |

Caged needle bushes

open series HK

closed end series BK

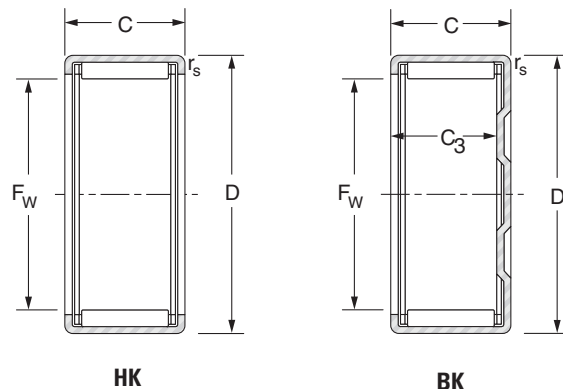


| Shaft Ø mm | Designation | Fw mm | D mm | C mm | C ₃ min. mm | r _s min. mm | Load Ratings kN | | Speed limit min ⁻¹ | | Weight kg | Internal ring |
|------------------|-------------|----------|---------|---------|---------------------------|---------------------------|-----------------|----------------|----------------------------------|-------|--------------|---------------|
| | | | | | | | Dynamic | Static | Grease | Oil | | |
| | | | | | | | C | C ₀ | | | | |
| 20 | BK2012 | 20 | 26 | 12 | 9.3 | 1 | 8.97 | 12.5 | 11000 | 16000 | 0.017 | JR15x20x12 |
| | HK2012 | 20 | 26 | 12 | — | 1 | 8.97 | 12.5 | 11000 | 16000 | 0.015 | JR15x20x12 |
| | BK2016 | 20 | 26 | 16 | 13.3 | 1 | 12.40 | 18.90 | 11000 | 16000 | 0.024 | JR17x20x16.5 |
| | HK2016 | 20 | 26 | 16 | — | 1 | 12.40 | 18.90 | 11000 | 16000 | 0.022 | JR17x20x16.5 |
| | BK2020 | 20 | 26 | 20 | 17.3 | 1 | 15.50 | 25.30 | 11000 | 16000 | 0.027 | JR17x20x20.5 |
| | HK2020 | 20 | 26 | 20 | — | 1 | 15.90 | 26.20 | 11000 | 16000 | 0.025 | JR17x20x20.5 |
| | BK2030 | 20 | 26 | 30 | 27.3 | 1 | 21.20 | 37.80 | 11000 | 16000 | 0.043 | JR17x20x30.5 |
| | HK2030 | 20 | 26 | 30 | — | 1 | 21.20 | 37.80 | 11000 | 16000 | 0.041 | JR17x20x30.5 |
| 22 | BK2210 | 22 | 28 | 10 | 9.3 | 1 | 7.06 | 9.49 | 9600 | 15000 | 0.013 | |
| | HK2210 | 22 | 28 | 10 | — | 1 | 7.06 | 9.49 | 9600 | 15000 | 0.013 | |
| | BK2212 | 22 | 28 | 12 | 9.3 | 1 | 9.81 | 14.50 | 9600 | 15000 | 0.02 | JR17x22x13 |
| | HK2212 | 22 | 28 | 12 | — | 1 | 9.81 | 14.50 | 9600 | 15000 | 0.015 | JR17x22x13 |
| | BK2216 | 22 | 28 | 16 | 13.3 | 1 | 13.10 | 20.90 | 9600 | 15000 | 0.027 | JR17x22x16 |
| | HK2216 | 22 | 28 | 16 | — | 1 | 13.10 | 20.90 | 9600 | 15000 | 0.022 | JR17x22x16 |
| | BK2220 | 22 | 28 | 20 | 17.3 | 1 | 15.30 | 25.50 | 9600 | 15000 | 0.028 | JR17x22x23 |
| | HK2220 | 22 | 28 | 20 | — | 1 | 15.30 | 25.50 | 9600 | 15000 | 0.026 | JR17x22x23 |
| 25 | BK2512 | 25 | 32 | 12 | 9.3 | 1 | 10.90 | 14.70 | 8500 | 13000 | 0.025 | |
| | HK2512 | 25 | 32 | 12 | — | 1 | 10.90 | 14.70 | 8500 | 13000 | 0.021 | |
| | BK2516 | 25 | 32 | 16 | 13.3 | 1 | 15.60 | 23.50 | 8500 | 13000 | 0.031 | JR20x25x17 |
| | HK2516 | 25 | 32 | 16 | — | 1 | 15.60 | 23.50 | 8500 | 13000 | 0.028 | JR20x25x17 |
| | BK2520 | 25 | 32 | 20 | 17.3 | 1 | 20.60 | 33.40 | 8500 | 13000 | 0.043 | JR20x25x20.5 |
| | HK2520 | 25 | 32 | 20 | — | 1 | 20.60 | 33.40 | 8500 | 13000 | 0.040 | JR20x25x20.5 |
| | BK2526 | 25 | 32 | 26 | 23.3 | 1 | 25.70 | 44.40 | 8500 | 13000 | 0.051 | JR20x25x26.5 |
| | HK2526 | 25 | 32 | 26 | — | 1 | 25.70 | 44.40 | 8500 | 13000 | 0.046 | JR20x25x26.5 |
| | BK2538 | 25 | 32 | 38 | 35.3 | 1 | 35.30 | 66.90 | 8500 | 13000 | 0.077 | JR20x25x38.5 |
| HK2538 | 25 | 32 | 38 | — | 1 | 35.30 | 66.90 | 8500 | 13000 | 0.068 | JR20x25x38.5 | |
| 28 | BK2816 | 28 | 35 | 16 | 13.3 | 1 | 15.9 | 24.9 | 7500 | 12000 | 0.038 | JR22x28x17 |
| | HK2816 | 28 | 35 | 16 | — | 1 | 15.9 | 24.9 | 7500 | 12000 | 0.032 | JR22x28x17 |
| | BK2820 | 28 | 35 | 20 | 17.3 | 1 | 20.9 | 35.3 | 7500 | 12000 | 0.047 | JR22x28x20.5 |
| | HK2820 | 28 | 35 | 20 | — | 1 | 20.9 | 35.3 | 7500 | 12000 | 0.040 | JR22x28x20.5 |

Caged needle bushes

open series HK

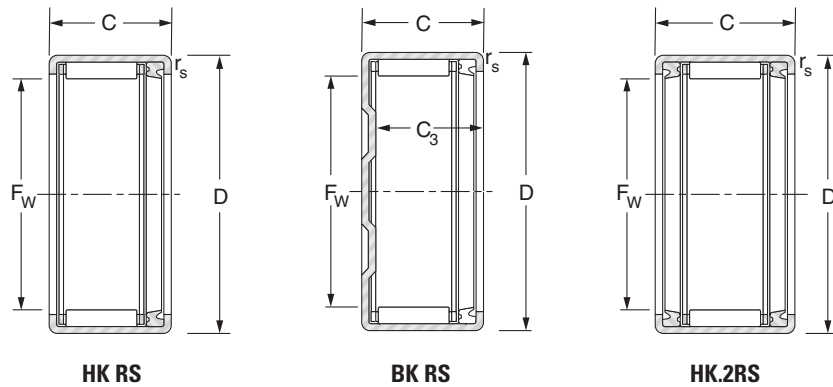
closed end series BK



| Shaft ∅ mm | Designation | Fw mm | D mm | C mm | C ₃ min. mm | r _s min. mm | Load Ratings kN | | Speed limit min ⁻¹ | | Weight kg | Internal ring |
|------------------|-------------|----------|---------|---------|---------------------------|---------------------------|-----------------|----------------|----------------------------------|-------|--------------|---------------|
| | | | | | | | Dynamic | Static | Grease | Oil | | |
| | | | | | | | C | C ₀ | | | | |
| 30 | BK3012 | 30 | 37 | 12 | 9.3 | 1 | 11.6 | 16.8 | 7000 | 11000 | 0.031 | |
| | HK3012 | 30 | 37 | 12 | — | 1 | 12.0 | 17.7 | 7000 | 11000 | 0.024 | |
| | BK3016 | 30 | 37 | 16 | 13.30 | 1 | 16.8 | 27.3 | 7000 | 11000 | 0.041 | JR25x30x17 |
| | HK3016 | 30 | 37 | 16 | — | 1 | 16.8 | 27.3 | 7000 | 11000 | 0.032 | JR25x30x17 |
| | BK3020 | 30 | 37 | 20 | 17.3 | 1 | 22.4 | 39.6 | 7000 | 11000 | 0.053 | JR25x30x20.5 |
| | HK3020 | 30 | 37 | 20 | — | 1 | 22.4 | 39.6 | 7000 | 11000 | 0.042 | JR25x30x20.5 |
| | BK3026 | 30 | 37 | 26 | 23.3 | 1 | 27.4 | 51.2 | 7000 | 11000 | 0.067 | JR25x30x26.5 |
| | HK3026 | 30 | 37 | 26 | — | 1 | 27.4 | 51.2 | 7000 | 11000 | 0.054 | JR25x30x26.5 |
| | BK3038 | 30 | 37 | 38 | 35.3 | 1 | 38.4 | 79.2 | 7000 | 11000 | 0.093 | JR25x30x38.5 |
| | HK3038 | 30 | 37 | 38 | — | 1 | 38.4 | 79.2 | 7000 | 11000 | 0.075 | JR25x30x38.5 |
| 35 | HK3512 | 35 | 42 | 12 | — | 1 | 13.0 | 20.6 | 5900 | 9100 | 0.028 | |
| | HK3516 | 35 | 42 | 16 | — | 1 | 17.4 | 29.9 | 5900 | 9100 | 0.037 | JR30x35x17 |
| | BK3520 | 35 | 42 | 20 | 17.3 | 1 | 24.5 | 46.8 | 5900 | 9100 | 0.065 | JR30x35x20.5 |
| | HK3520 | 35 | 42 | 20 | — | 1 | 24.5 | 46.8 | 5900 | 9100 | 0.049 | JR30x35x20.5 |
| 40 | HK4012 | 40 | 47 | 12 | — | 1 | 14.7 | 25.3 | 5200 | 7900 | 0.033 | |
| | HK4016 | 40 | 47 | 16 | — | 1 | 18.9 | 34.8 | 5200 | 7900 | 0.042 | JR35x40x17 |
| | BK4020 | 40 | 47 | 20 | 17.3 | 1 | 25.1 | 50.4 | 5200 | 7900 | 0.070 | JR35x40x20.5 |
| | HK4020 | 40 | 47 | 20 | — | 1 | 25.1 | 50.4 | 5200 | 7900 | 0.060 | JR35x40x20.5 |
| 45 | HK4512 | 45 | 52 | 12 | — | 1 | 14.1 | 24.8 | 4600 | 7000 | 0.036 | |
| | HK4516 | 45 | 52 | 16 | — | 1 | 19.8 | 38.5 | 4600 | 7000 | 0.048 | JR40x45x17 |
| | BK4520 | 45 | 52 | 20 | 17.3 | 1 | 26.3 | 55.4 | 4600 | 7000 | 0.079 | JR40x45x20.5 |
| | HK4520 | 45 | 52 | 20 | — | 1 | 27.2 | 58.2 | 4600 | 7000 | 0.059 | JR40x45x20.5 |
| 50 | HK5012 | 50 | 58 | 12 | — | 1 | 17.0 | 28.7 | 4100 | 6300 | 0.045 | |
| | HK5020 | 50 | 58 | 20 | — | 1 | 30.9 | 62.2 | 4100 | 6300 | 0.072 | JR45x50x20 |
| | HK5025 | 50 | 58 | 25 | — | 1 | 35.5 | 74.1 | 4100 | 6300 | 0.092 | JR45x50x25.5 |
| 55 | HK5520 | 55 | 63 | 20 | — | 1 | 31.0 | 64.4 | 3700 | 5700 | 0.079 | JR45x55x20 |
| 60 | HK6012 | 60 | 68 | 12 | — | 1 | 17.2 | 31.2 | 3400 | 5200 | 0.060 | |
| | HK6020 | 60 | 68 | 20 | — | 1 | 35.6 | 79.5 | 3400 | 5200 | 0.090 | JR50x60x20 |

Caged needle bushes with seal

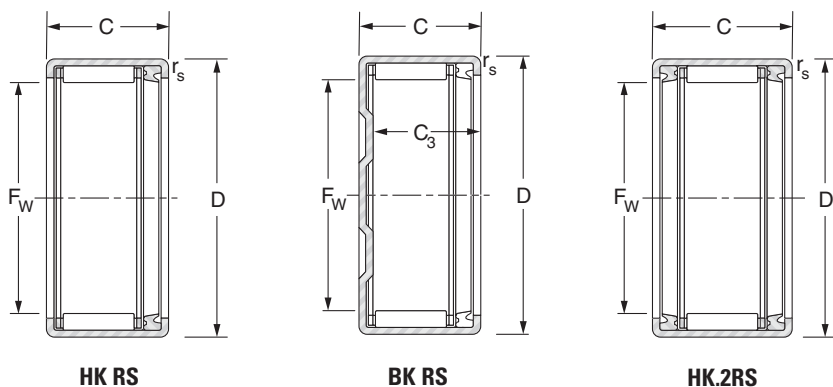
series HK...RS, BK...RS, HK...2RS



| Shaft mm | Designation | Fw mm | D mm | C mm | C ₃ min. mm | r _s min. mm | Load Ratings kN | | Speed limit min ⁻¹ Grease | Weight kg | Internal ring |
|----------|-------------|-------|------|------|------------------------|------------------------|-----------------|-----------------------|---|-----------|---------------|
| | | | | | | | Dynamic C | Static C ₀ | | | |
| 8 | HK0810RS | 8 | 12 | 10 | – | 0.4 | 2.90 | 2.73 | 20000 | 0.004 | |
| 10 | HK1012RS | 10 | 14 | 12 | – | 0.4 | 4.78 | 5.51 | 19000 | 0.006 | |
| 12 | HK1214RS | 12 | 18 | 14 | – | 1 | 6.61 | 7.29 | 14000 | 0.013 | |
| | HK1216.2RS | 12 | 18 | 16 | – | 1 | 6.87 | 7.65 | 14000 | 0.016 | |
| 14 | BK1414RS | 14 | 20 | 14 | 11.6 | 1 | 7.17 | 8.41 | 14000 | 0.014 | |
| | HK1414RS | 14 | 20 | 14 | – | 1 | 7.17 | 8.41 | 14000 | 0.015 | JR10x14x16 |
| | HK1416.2RS | 14 | 20 | 16 | – | 1 | 7.17 | 8.41 | 14000 | 0.014 | JR10x14x20 |
| 15 | BK1514RS | 15 | 21 | 14 | 11.3 | 1 | 7.87 | 9.69 | 13000 | 0.017 | JR12x15x16.5 |
| | HK1514RS | 15 | 21 | 14 | – | 1 | 7.87 | 9.69 | 13000 | 0.016 | JR12x15x16.5 |
| | HK1516.2RS | 15 | 21 | 16 | – | 1 | 7.87 | 9.69 | 13000 | 0.019 | JR12x15x16.5 |
| 16 | HK1614RS | 16 | 22 | 14 | – | 1 | 7.82 | 9.76 | 12000 | 0.014 | JR12x16x16 |
| | HK1616.2RS | 16 | 22 | 16 | – | 1 | 7.82 | 9.76 | 12000 | 0.015 | JR12x16x20 |
| 18 | HK1814RS | 18 | 24 | 14 | – | 1 | 8.41 | 11.10 | 11000 | 0.018 | JR15x18x16.5 |
| | HK1816.2RS | 18 | 24 | 16 | – | 1 | 8.41 | 11.10 | 11000 | 0.017 | JR15x18x16.5 |
| 20 | HK2016.2RS | 20 | 26 | 16 | – | 1 | 8.97 | 12.50 | 9700 | 0.023 | JR17x20x16.5 |
| | HK2018RS | 20 | 26 | 18 | – | 1 | 12.40 | 18.90 | 9700 | 0.025 | JR17x20x20.5 |
| | HK2020.2RS | 20 | 26 | 20 | – | 1 | 12.40 | 18.90 | 9700 | 0.028 | JR17x20x20.5 |
| 22 | HK2216.2RS | 22 | 28 | 16 | – | 1 | 9.81 | 14.50 | 8800 | 0.025 | |
| | HK2218RS | 22 | 28 | 18 | – | 1 | 13.10 | 20.90 | 8800 | 0.027 | JR17x22x23 |
| | HK2220.2RS | 22 | 28 | 20 | – | 1 | 13.10 | 20.90 | 8800 | 0.026 | JR17x22x23 |
| 25 | HK2516.2RS | 25 | 32 | 16 | – | 1 | 11.10 | 15.10 | 7800 | 0.030 | JR20x25x17 |
| | HK2518RS | 25 | 32 | 18 | – | 1 | 16.20 | 24.60 | 7800 | 0.034 | JR20x25x20.5 |
| | HK2520.2RS | 25 | 32 | 20 | – | 1 | 16.20 | 24.60 | 7800 | 0.033 | JR20x25x20.5 |
| | HK2522RS | 25 | 32 | 22 | – | 1 | 20.60 | 33.40 | 7800 | 0.042 | JR20x25x26 |
| | HK2524.2RS | 25 | 32 | 24 | – | 1 | 20.6 | 33.4 | 7800 | 0.047 | JR20x25x26 |

Caged needle bushes with seal

series HK...RS, BK...RS, HK...2RS



| Shaft mm | Designation | Fw mm | D mm | C mm | C ₃ min. mm | r _s min. mm | Load Ratings kN | | Speed limit min ⁻¹ | Weight kg | Internal ring |
|----------|-------------|-------|------|------|------------------------|------------------------|-----------------|----------------|-------------------------------|-----------|---------------|
| | | | | | | | Dynamic | Static | | | |
| | | | | | | | C | C ₀ | Grease | | |
| 28 | HK2820.2RS | 28 | 35 | 20 | – | 1 | 15.9 | 24.9 | 6900 | 0.042 | JR22x28x20.5 |
| 30 | HK3016.2RS | 30 | 37 | 16 | – | 1 | 11.6 | 16.8 | 6500 | 0.030 | JR25x30x17 |
| | HK3018RS | 30 | 37 | 18 | – | 1 | 16.8 | 27.3 | 6500 | 0.042 | JR25x30x20.5 |
| | HK3020.2RS | 30 | 37 | 20 | – | 1 | 16.8 | 27.3 | 6500 | 0.040 | JR25x30x20.5 |
| | HK3022RS | 30 | 37 | 22 | – | 1 | 22.4 | 39.6 | 6500 | 0.051 | JR25x30x26 |
| | HK3024.2RS | 30 | 37 | 24 | – | 1 | 22.4 | 39.6 | 6500 | 0.057 | JR25x30x26 |
| 35 | HK3516.2RS | 35 | 42 | 16 | – | 1 | 14.2 | 23.2 | 5500 | 0.047 | JR30x35x17 |
| | HK3518RS | 35 | 42 | 18 | – | 1 | 17.4 | 29.9 | 5500 | 0.054 | JR30x35x20.5 |
| | HK3520.2RS | 35 | 42 | 20 | – | 1 | 17.4 | 29.9 | 5500 | 0.044 | JR30x35x20.5 |
| 40 | HK4016.2RS | 40 | 47 | 16 | – | 1 | 13.4 | 22.4 | 4900 | 0.037 | JR35x40x20 |
| | HK4018RS | 40 | 47 | 18 | – | 1 | 18.9 | 34.8 | 4900 | 0.057 | JR35x40x20.5 |
| | HK4020.2RS | 40 | 47 | 20 | – | 1 | 18.9 | 34.8 | 4900 | 0.053 | JR35x40x20.5 |
| 45 | HK4518RS | 45 | 52 | 18 | – | 1 | 19.8 | 38.5 | 4300 | 0.064 | JR40x45x20.5 |
| | HK4520.2RS | 45 | 52 | 20 | – | 1 | 19.8 | 38.5 | 4300 | 0.055 | JR40x45x20.5 |
| 50 | HK5022RS | 50 | 58 | 22 | – | 1 | 28.8 | 56.6 | 3900 | 0.097 | JR45x50x25.5 |
| | HK5024.2RS | 50 | 58 | 24 | – | 1 | 28.8 | 56.6 | 3900 | 0.083 | JR45x50x25.5 |

Internal rings for needle bushes

When it is impractical to meet the shaft raceway design requirements (hardness, surface finish, case depth, etc.) outlined in the engineering section of this catalogue, standard inner rings may be used.

Inner rings are made of rolling bearing steel and after hardening, their bores, raceways and end surfaces are ground. Inner rings may be used to provide inner raceway surfaces for radial needle roller and cage assemblies, needle roller bearings and needle bushes. The extended inner rings are suitable for use with bearings containing lip contact seals and for applications in which axial movement may be present.

CONSTRUCTION

Inner rings are available in four basic designs and differ only by the chamfers at the ends of the raceway surfaces, the lubricant access holes and the raceway profile. Inner rings of series **JR** have chamfers to assist in bearing installation but are without lubricating holes. Inner rings of series **JR.JS1** have bearing installation chamfers and lubricating holes (bore diameters 5 to 50 mm). Inner rings of series **JRZ.JS1** are without installation chamfers, allowing for maximum possible raceway contact.

DIMENSIONAL ACCURACY

The tolerances of size, form, and runout for inner rings meet the requirements of ISO normal tolerance class for radial bearings (see tables at the end of the catalogue). Most inner rings are produced with outside diameter raceway tolerance in accordance with h5 which, in most cases, is suitable for combining the needle roller bearings to give the normal clearance class, and for use with needle bushes.

Other raceway tolerances may also be found on inner rings for combining with needle roller bearings to give one of the clearance requirement.

MOUNTING OF INNER RINGS

Inner rings may be mounted on the shaft with either a loose transition fit or an interference fit.

These fits used in conjunction with the proper fit of the bearing outer ring, will provide the correct operating clearances for most applications.

Regardless of the fit of the inner ring on the shaft, the inner ring should be axially located by shaft shoulders or other positive means. The shaft shoulder diameter adjacent to the inner ring must not exceed the inner ring outside diameter.

When inner rings are to be used with the needle roller bearings, appropriate shaft tolerances should be selected from table 3 on page 94 in the needle bearing section. When inner rings are to be used with needle bushes the suggested shaft tolerances are given in the "Radial play" paragraph on page 57 of the "Needle bushes" section of this catalogue.

SEALING RINGS

Sealing rings series **DH**, tabulated on pages 191 to 193 are of a small cross section suitable for use with needle bushes. They provide a cost effective and compact construction in applications using grease lubrication.

CONSTRUCTION

Sealing rings series **DH** comprise of a steel angle casing on the outside and a molded nitrile rubber sealing element containing the sealing lip.

These seals have an operating temperature range of -20°C to + 120°C.

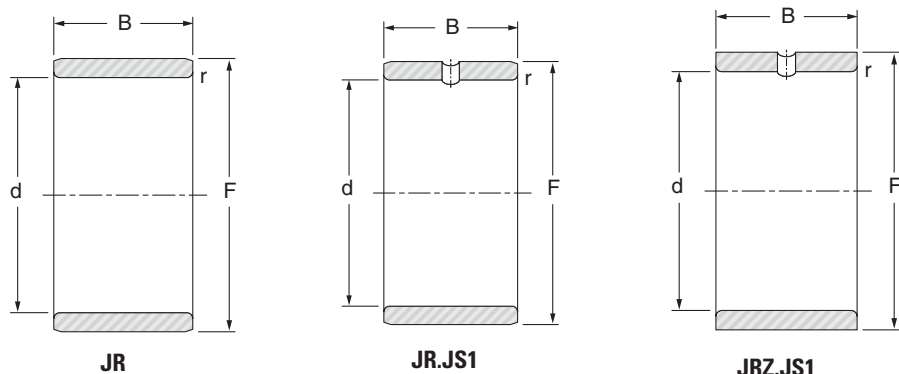
MOUNTING OF LIP CONTACT SEALS

It is generally sufficient to press the seal into its predetermined position. Axial locating devices are not required for the seals in normal circumstances.

The shaft surface on which the seal is to run must be hardened and preferably plunge ground to a smooth finish, free from burrs, nicks or scratches which may damage the sealing lip.

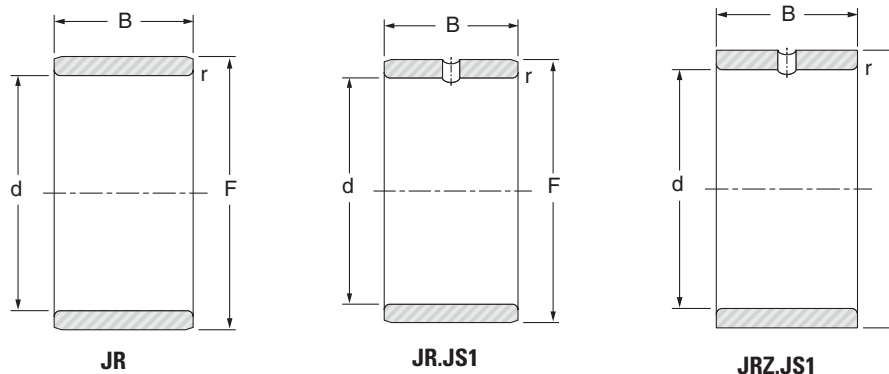
The end of the shaft should be chamfered or rounded to prevent lip damage and to ease installation. It is also recommended to apply a coating of a suitable lubricant on the shaft before mounting the seal.

Internal rings for needle bushes



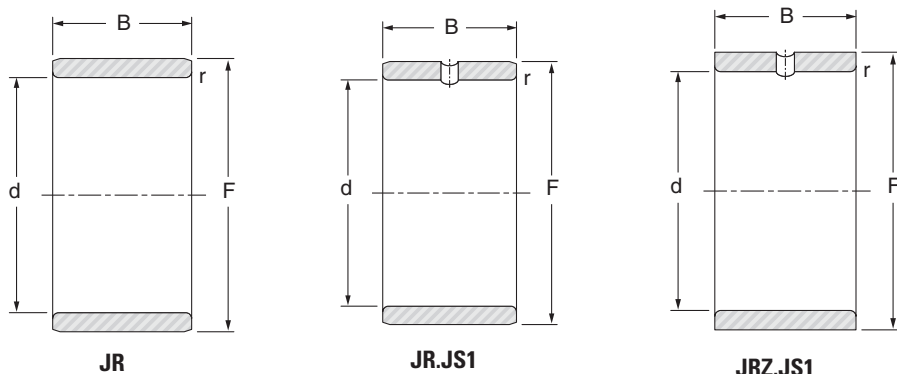
| Shaft ∅ mm | Designation | d mm | F mm | B mm | r _s min. mm | Weight kg |
|------------------|----------------|---------|---------|---------|---------------------------|--------------|
| 5 | JR5x8x8JS1 | 5 | 8 | 8 | 0.3 | 0.002 |
| | JR5x8x12 | 5 | 8 | 12 | 0.3 | 0.003 |
| | JR5x8x16 | 5 | 8 | 16 | 0.3 | 0.004 |
| 6 | JR6x9x8JS1 | 6 | 9 | 8 | 0.3 | 0.002 |
| | JR6x9x12 | 6 | 9 | 12 | 0.3 | 0.003 |
| | JR6x9x16 | 6 | 9 | 16 | 0.3 | 0.004 |
| | JR6x10x10 | 6 | 10 | 10 | 0.3 | 0.004 |
| | JR6x10x10JS1 | 6 | 10 | 10 | 0.3 | 0.004 |
| | JRZ6x10x12JS1 | 6 | 10 | 12 | 0.3 | 0.005 |
| 7 | JR7x10x10.5 | 7 | 10 | 10.5 | 0.3 | 0.003 |
| | JR7x10x12 | 7 | 10 | 12 | 0.3 | 0.004 |
| | JR7x10x16 | 7 | 10 | 16 | 0.3 | 0.005 |
| 8 | JR8x12x10 | 8 | 12 | 10 | 0.3 | 0.005 |
| | JR8x12x10JS1 | 8 | 12 | 10 | 0.3 | 0.005 |
| | JR8x12x10.5 | 8 | 12 | 10.5 | 0.3 | 0.005 |
| | JRZ8x12x12JS1 | 8 | 12 | 12 | 0.3 | 0.006 |
| | JR8x12x12.5 | 8 | 12 | 12.5 | 0.3 | 0.006 |
| | JR8x12x16 | 8 | 12 | 16 | 0.3 | 0.007 |
| 9 | JR9x12x12 | 9 | 12 | 12 | 0.3 | 0.005 |
| | JR9x12x16 | 9 | 12 | 16 | 0.3 | 0.006 |
| 10 | JR10x13x12.5 | 10 | 13 | 12.5 | 0.3 | 0.005 |
| | JR10x14x11JS1 | 10 | 14 | 11 | 0.3 | 0.007 |
| | JR10x14x12 | 10 | 14 | 12 | 0.3 | 0.007 |
| | JR10x14x12JS1 | 10 | 14 | 12 | 0.3 | 0.007 |
| | JR10x14x13 | 10 | 14 | 13 | 0.3 | 0.007 |
| | JRZ10x14x14JS1 | 10 | 14 | 14 | 0.3 | 0.008 |
| | JR10x14x16 | 10 | 14 | 16 | 0.3 | 0.009 |
| | JR10x14x20 | 10 | 14 | 20 | 0.3 | 0.012 |

Internal rings for needle bushes



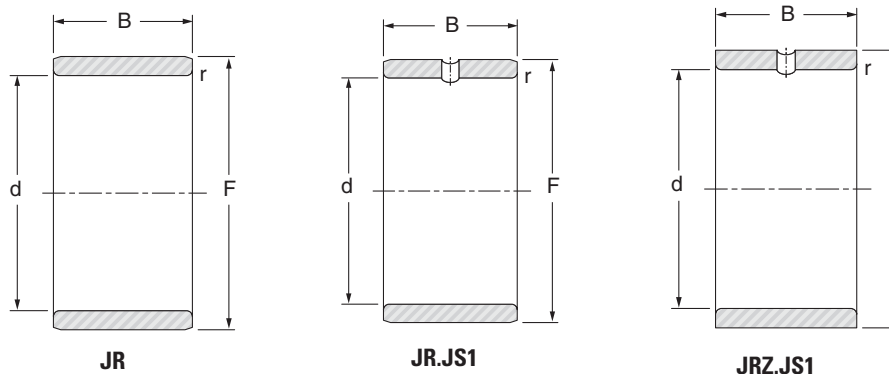
| Shaft ∅ mm | Designation | d mm | F mm | B mm | r _s min. mm | Weight kg |
|------------------|----------------|---------|---------|---------|---------------------------|--------------|
| 12 | JR12x15x12.5 | 12 | 15 | 12.5 | 0.3 | 0.006 |
| | JR12x15x16 | 12 | 15 | 16 | 0.3 | 0.008 |
| | JR12x15x16.5 | 12 | 15 | 16.5 | 0.3 | 0.008 |
| | JR12x15x18.5 | 12 | 15 | 18.5 | 0.3 | 0.009 |
| | JR12x15x22.5 | 12 | 15 | 22.5 | 0.3 | 0.011 |
| | JR12x16x12 | 12 | 16 | 12 | 0.3 | 0.008 |
| | JR12x16x12JS1 | 12 | 16 | 12 | 0.3 | 0.008 |
| | JR12x16x13 | 12 | 16 | 13 | 0.3 | 0.008 |
| | JRZ12x16x14JS1 | 12 | 16 | 14 | 0.3 | 0.010 |
| | JR12x16x16 | 12 | 16 | 16 | 0.3 | 0.011 |
| | JR12x16x20 | 12 | 16 | 20 | 0.3 | 0.014 |
| JR12x16x22 | 12 | 16 | 22 | 0.3 | 0.015 | |
| 14 | JR14x17x17 | 14 | 17 | 17 | 0.3 | 0.009 |
| 15 | JR15x18x16.5 | 15 | 18 | 16.5 | 0.3 | 0.010 |
| | JR15x19x16 | 15 | 19 | 16 | 0.3 | 0.013 |
| | JR15x19x20 | 15 | 19 | 20 | 0.3 | 0.017 |
| | JR15x20x12 | 15 | 20 | 12 | 0.3 | 0.012 |
| | JR15x20x12JS1 | 15 | 20 | 12 | 0.3 | 0.012 |
| | JR15x20x13 | 15 | 20 | 13 | 0.3 | 0.014 |
| | JRZ15x20x14JS1 | 15 | 20 | 14 | 0.3 | 0.015 |
| | JR15x20x16 | 15 | 20 | 16 | 0.3 | 0.017 |
| | JR15x20x20 | 15 | 20 | 20 | 0.35 | 0.021 |
| | JR15x20x23 | 15 | 20 | 23 | 0.3 | 0.025 |
| | JR15x20x26 | 15 | 20 | 26 | 0.3 | 0.028 |

Internal rings for needle bushes



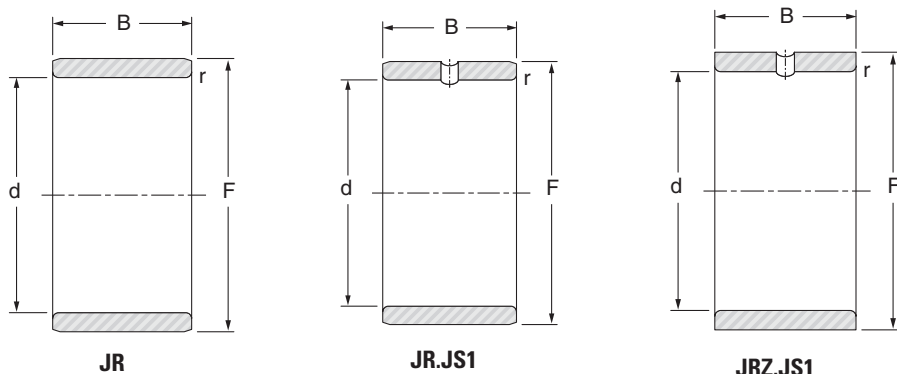
| Shaft ∅ mm | Designation | d mm | F mm | B mm | r _s min. mm | Weight kg |
|------------------|----------------|---------|---------|---------|---------------------------|--------------|
| 17 | JR17x20x16.5 | 17 | 20 | 16.5 | 0.3 | 0.011 |
| | JR17x20x20 | 17 | 20 | 20 | 0.3 | 0.014 |
| | JR17x20x20.5 | 17 | 20 | 20.5 | 0.3 | 0.014 |
| | JR17x20x30.5 | 17 | 20 | 30.5 | 0.3 | 0.021 |
| | JR17x21x16 | 17 | 21 | 16 | 0.3 | 0.015 |
| | JR17x21x20 | 17 | 21 | 20 | 0.3 | 0.019 |
| | JR17x22x13 | 17 | 22 | 13 | 0.3 | 0.015 |
| | JR17x22x16 | 17 | 22 | 16 | 0.3 | 0.019 |
| | JR17x22x16JS1 | 17 | 22 | 16 | 0.3 | 0.019 |
| | JRZ17x22x16JS1 | 17 | 22 | 16 | 0.3 | 0.019 |
| | JR17x22x20 | 17 | 22 | 20 | 0.35 | 0.023 |
| | JR17x22x23 | 17 | 22 | 23 | 0.3 | 0.028 |
| | JR17x22x26 | 17 | 22 | 26 | 0.3 | 0.031 |
| | JR17x22x32 | 17 | 22 | 32 | 0.3 | 0.038 |
| 20 | JR20x24x16 | 20 | 24 | 16 | 0.3 | 0.018 |
| | JR20x24x20 | 20 | 24 | 20 | 0.3 | 0.022 |
| | JR20x25x16 | 20 | 25 | 16 | 0.3 | 0.022 |
| | JR20x25x16JS1 | 20 | 25 | 16 | 0.3 | 0.022 |
| | JR20x25x17 | 20 | 25 | 17 | 0.3 | 0.023 |
| | JRZ20x25x18JS1 | 20 | 25 | 18 | 0.3 | 0.025 |
| | JR20x25x20 | 20 | 25 | 20 | 0.3 | 0.028 |
| | JR20x25x20.5 | 20 | 25 | 20.5 | 0.3 | 0.029 |
| | JR20x25x26 | 20 | 25 | 26 | 0.3 | 0.036 |
| | JR20x25x26.5 | 20 | 25 | 26.5 | 0.3 | 0.037 |
| | JR20x25x30 | 20 | 25 | 30 | 0.3 | 0.042 |
| | JR20x25x32 | 20 | 25 | 32 | 0.3 | 0.044 |
| | JR20x25x38.5 | 20 | 25 | 38.5 | 0.3 | 0.054 |

Internal rings for needle bushes



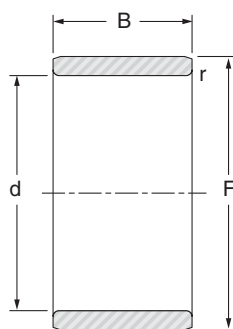
| Shaft ∅ mm | Designation | d mm | F mm | B mm | r _s min. mm | Weight kg |
|------------------|---------------|---------|---------|---------|---------------------------|--------------|
| 22 | JR22x26x16 | 22 | 26 | 16 | 0.3 | 0.019 |
| | JR22x26x20 | 22 | 26 | 20 | 0.3 | 0.023 |
| | JR22x28x17 | 22 | 28 | 17 | 0.3 | 0.030 |
| | JR22x28x20.5 | 22 | 28 | 20.5 | 0.3 | 0.038 |
| | JR22x28x30 | 22 | 28 | 30 | 0.3 | 0.056 |
| 25 | JR25x29x20 | 25 | 29 | 20 | 0.3 | 0.027 |
| | JR25x29x30 | 25 | 29 | 30 | 0.3 | 0.040 |
| | JR25x30x16 | 25 | 30 | 16 | 0.3 | 0.027 |
| | JR25x30x16JS1 | 25 | 30 | 16 | 0.3 | 0.027 |
| | JR25x30x17 | 25 | 30 | 17 | 0.3 | 0.028 |
| | JR25x30x18JS1 | 25 | 30 | 18 | 0.3 | 0.031 |
| | JR25x30x20 | 25 | 30 | 20 | 0.3 | 0.034 |
| | JR25x30x20.5 | 25 | 30 | 20.5 | 0.3 | 0.035 |
| | JR25x30x26 | 25 | 30 | 26 | 0.3 | 0.044 |
| | JR25x30x26.5 | 25 | 30 | 26.5 | 0.3 | 0.045 |
| | JR25x30x30 | 25 | 30 | 30 | 0.3 | 0.051 |
| | JR25x30x32 | 25 | 30 | 32 | 0.3 | 0.054 |
| JR25x30x38.5 | 25 | 30 | 38.5 | 0.3 | 0.066 | |
| 28 | JR28x32x17 | 28 | 32 | 17 | 0.3 | 0.028 |
| | JR28x32x20 | 28 | 32 | 20 | 0.3 | 0.030 |
| | JR28x32x30 | 28 | 32 | 30 | 0.3 | 0.044 |

Internal rings for needle bushes

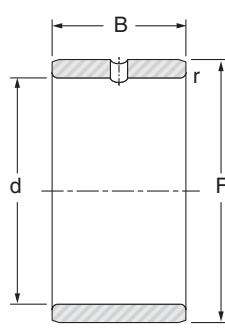


| Shaft ∅ mm | Designation | d mm | F mm | B mm | r _s min. mm | Weight kg |
|------------------|----------------|---------|---------|---------|---------------------------|--------------|
| 30 | JR30x35x16 | 30 | 35 | 16 | 0.3 | 0.031 |
| | JR30x35x17 | 30 | 35 | 17 | 0.3 | 0.033 |
| | JRZ30x35x18JS1 | 30 | 35 | 18 | 0.3 | 0.036 |
| | JR30x35x20 | 30 | 35 | 20 | 0.3 | 0.039 |
| | JRZ30x35x20JS1 | 30 | 35 | 20 | 0.3 | 0.039 |
| | JR30x35x20.5 | 30 | 35 | 20.5 | 0.3 | 0.040 |
| | JR30x35x26 | 30 | 35 | 26 | 0.3 | 0.054 |
| | JR30x35x30 | 30 | 35 | 30 | 0.3 | 0.057 |
| | JR30x35x32 | 30 | 35 | 32 | 0.3 | 0.062 |
| | JR30x38x20JS1 | 30 | 38 | 20 | 0.6 | 0.067 |
| 32 | JR32x37x20 | 32 | 37 | 20 | 0.3 | 0.043 |
| | JR32x37x30 | 32 | 37 | 30 | 0.3 | 0.064 |
| | JR32x40x20 | 32 | 40 | 20 | 0.6 | 0.069 |
| | JR32x40x36 | 32 | 40 | 36 | 0.6 | 0.128 |
| 35 | JR35x40x17 | 35 | 40 | 17 | 0.3 | 0.040 |
| | JR35x40x20 | 35 | 40 | 20 | 0.3 | 0.046 |
| | JR35x40x20.5 | 35 | 40 | 20.5 | 0.3 | 0.049 |
| | JR35x40x22 | 35 | 40 | 22 | 0.3 | 0.052 |
| | JR35x40x30 | 35 | 40 | 30 | 0.3 | 0.071 |
| | JR35x40x34 | 35 | 40 | 34 | 0.3 | 0.080 |
| | JR35x40x40 | 35 | 40 | 40 | 0.3 | 0.094 |
| | JR35x42x20 | 35 | 42 | 20 | 0.6 | 0.065 |
| | JR35x42x20JS1 | 35 | 42 | 20 | 0.6 | 0.065 |
| | JRZ35x42x23JS1 | 35 | 42 | 23 | 0.6 | 0.074 |
| | JR35x42x36 | 35 | 42 | 36 | 0.6 | 0.122 |
| | JR35x44x22 | 35 | 44 | 22 | 0.6 | 0.097 |

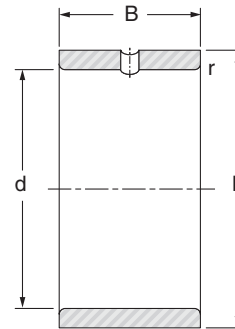
Internal rings for needle bushes



JR



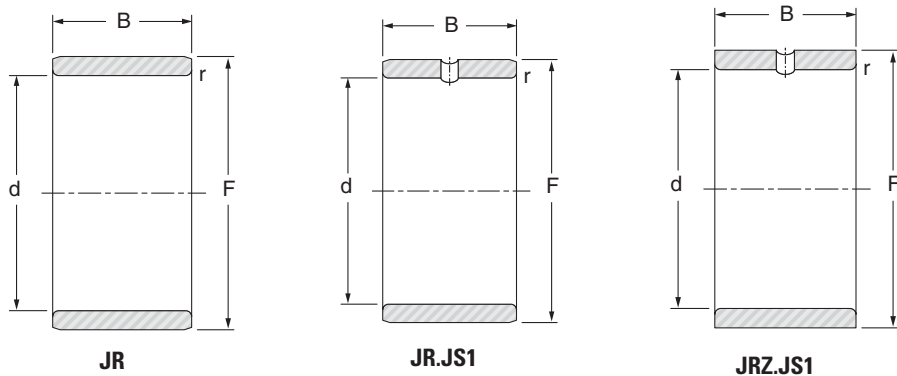
JR.JS1



JRZ.JS1

| Shaft ∅ mm | Designation | d mm | F mm | B mm | r _s min. mm | Weight kg |
|------------------|----------------|---------|---------|---------|---------------------------|--------------|
| 37 | JR37x42x20 | 37 | 42 | 20 | 0.35 | 0.046 |
| 38 | JR38x43x20 | 38 | 43 | 20 | 0.3 | 0.050 |
| | JR38x43x30 | 38 | 43 | 30 | 0.3 | 0.075 |
| 40 | JR40x45x17 | 40 | 45 | 17 | 0.3 | 0.044 |
| | JR40x45x20 | 40 | 45 | 20 | 0.3 | 0.052 |
| | JR40x45x20.5 | 40 | 45 | 20.5 | 0.3 | 0.054 |
| | JR40x45x25 | 40 | 45 | 25 | 0.35 | 0.062 |
| | JR40x45x30 | 40 | 45 | 30 | 0.3 | 0.078 |
| | JR40x45x34 | 40 | 45 | 34 | 0.3 | 0.089 |
| | JR40x45x40 | 40 | 45 | 40 | 0.3 | 0.115 |
| | JR40x48x22 | 40 | 48 | 22 | 0.6 | 0.094 |
| | JRZ40x48x23JS1 | 40 | 48 | 23 | 0.6 | 0.100 |
| | JR40x48x40 | 40 | 48 | 40 | 0.6 | 0.173 |
| | JR40x50x20 | 40 | 50 | 20 | 1 | 0.110 |
| 42 | JR42x47x20 | 42 | 47 | 20 | 0.3 | 0.055 |
| | JR42x47x30 | 42 | 47 | 30 | 0.3 | 0.083 |
| 45 | JR45x50x20 | 45 | 50 | 20 | 0.3 | 0.058 |
| | JR45x50x25 | 45 | 50 | 25 | 0.6 | 0.073 |
| | JR45x50x25.5 | 45 | 50 | 25.5 | 0.3 | 0.075 |
| | JR45x50x35 | 45 | 50 | 35 | 0.6 | 0.103 |
| | JR45x50x40 | 45 | 50 | 40 | 0.3 | 0.117 |
| | JR45x52x22 | 45 | 52 | 22 | 0.6 | 0.090 |
| | JR45x52x23 | 45 | 52 | 23 | 0.6 | 0.096 |
| | JRZ45x52x23JS1 | 45 | 52 | 23 | 0.6 | 0.096 |
| | JR45x52x40 | 45 | 52 | 40 | 0.6 | 0.167 |
| | JR45x55x20 | 45 | 55 | 20 | 1 | 0.133 |
| | JR45x55x20JS1 | 45 | 55 | 20 | 1 | 0.133 |
| | JR45x55x22 | 45 | 55 | 22 | 1 | 0.135 |
| | JR45x55x40 | 45 | 55 | 40 | 1 | 0.247 |

Internal rings for needle bushes



| Shaft ∅ mm | Designation | d mm | F mm | B mm | r _s min. mm | Weight kg |
|------------------|----------------|---------|---------|---------|---------------------------|--------------|
| 50 | JR50x55x20 | 50 | 55 | 20 | 0.3 | 0.065 |
| | JR50x55x25 | 50 | 55 | 25 | 0.6 | 0.081 |
| | JR50x55x35 | 50 | 55 | 35 | 0.6 | 0.113 |
| | JR50x55x40 | 50 | 55 | 40 | 0.3 | 0.130 |
| | JR50x58x22 | 50 | 58 | 22 | 0.6 | 0.117 |
| | JRZ50x58x23JS1 | 50 | 58 | 23 | 0.6 | 0.122 |
| | JR50x58x40 | 50 | 58 | 40 | 0.6 | 0.213 |
| | JR50x60x20 | 50 | 60 | 20 | 1 | 0.155 |
| | JR50x60x20JS1 | 50 | 60 | 20 | 1 | 0.155 |
| | JR50x60x25 | 50 | 60 | 25 | 1 | 0.170 |
| | JR50x60x40 | 50 | 60 | 40 | 1 | 0.310 |
| 55 | JR55x60x25 | 55 | 60 | 25 | 0.6 | 0.088 |
| | JR55x60x35 | 55 | 60 | 35 | 0.6 | 0.124 |