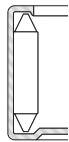


NEEDLE BUSHES



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.

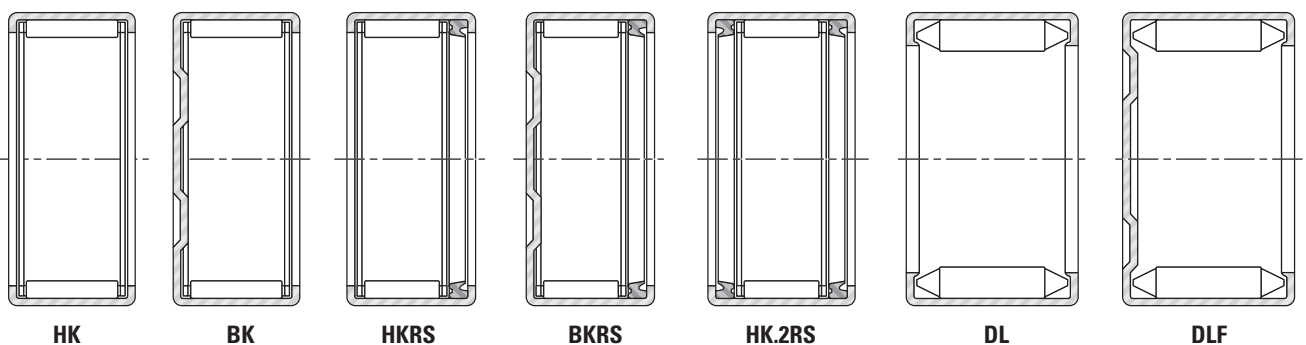
These bearings which occupy very little radial space are particularly economical to use and possess a high load capacity, relative to their size. They should be selected in preference to other bearings when conditions of mounting and operation permit.

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.

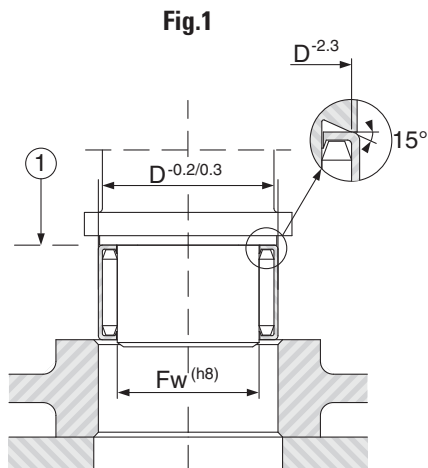
A mounting with interference of needle bushes in the housing obviates any lateral sealing device. The side of the bush not marked must remain moved away from any shoulder, seal, cover, spacer or edge of another bush. If for machining required there is a housing with shoulders, the latter must be sufficiently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

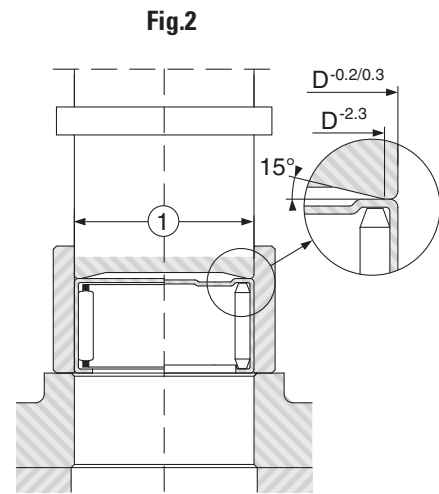
Thus it is advisable to use a small press fitted with a suitable mandrel to apply uniform force to the bush centred in the housing (fig. 1).

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).

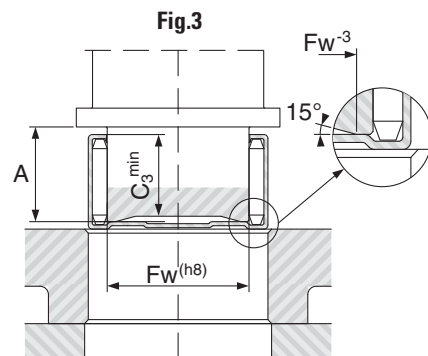
If this is not possible, the force may be applied to the inside face of the closed end in the case of bushes type **DLF** (fig. 3) (this must not be done in the case of bushes type **BK**).



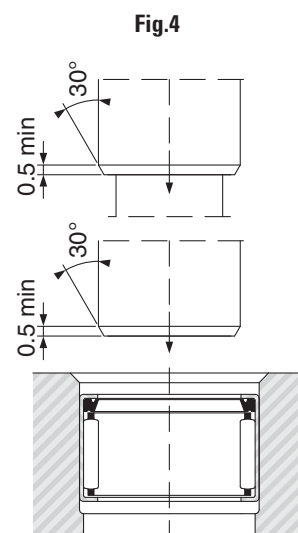
(1) Marked face



(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

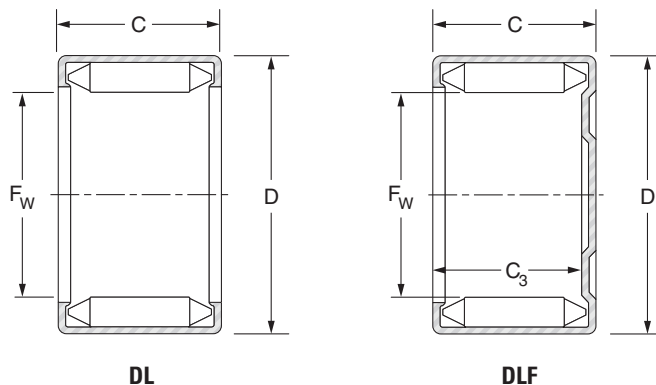
* The ring gage sizes are in accordance with ISO N6 lower limit.



Needle bushes, full complement, retained

open series DL

closed end series DLF

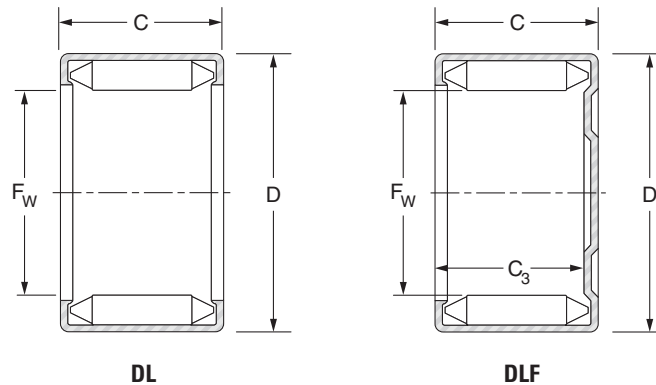


Shaft ∅ mm	Designation	Fw mm	D mm	C mm	C ₃ min. mm	Load Ratings kN		Speed limit min ⁻¹		Weight kg	Internal ring
						Dynamic	Static	Grease	Oil		
						C	C ₀				
6	DL 6 10	6	12	10	–	2.90	3.80	33000	50000	0.004	
	DLF 6 10	6	12	10	7.7	2.90	3.80	33000	50000	0.004	
8	DL 8 10	8	14	10	–	4.50	6.50	24000	37500	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

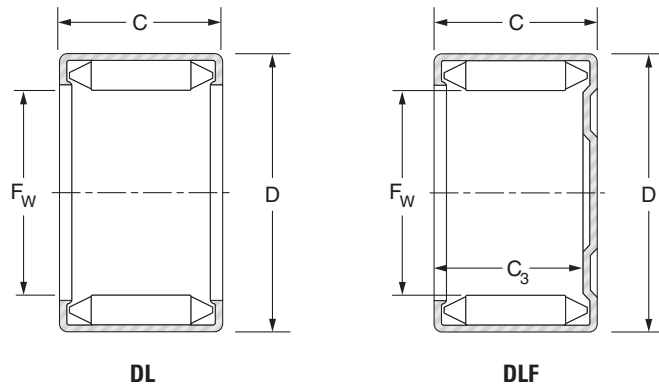


Shaft Ø mm	Designation	Fw mm	D mm	C mm	C ₃ min. mm	Load Ratings kN		Speed limit min ⁻¹		Weight kg	Internal ring
						Dynamic	Static	Grease	Oil		
						C	C ₀				
20	DL 20 12	20	26	12	–	10.2	19.5	10000	15000	0.015	JR15x20x12
	DLF 20 12	20	26	12	9.7	10.2	19.5	10000	15000	0.017	JR15x20x12
	DL 20 16	20	26	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

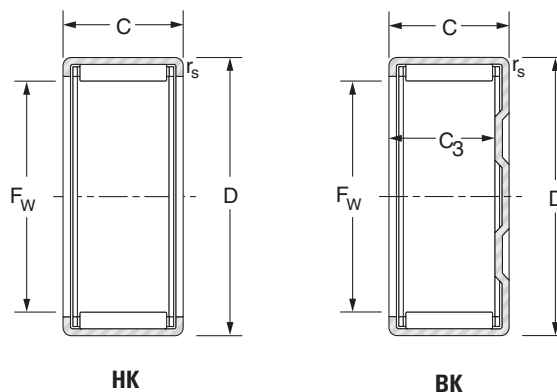


Shaft ∅ mm	Designation	Fw mm	D mm	C mm	C ₃ min. mm	Load Ratings kN		Speed limit min ⁻¹		Weight kg	Internal ring
						Dynamic	Static	Grease	Oil		
						C	C ₀				
44	DL 44 16	44	52	16	–	23.80	57.00	4400	6800	0.056	
	DLF 44 16	44	52	16	13.7	23.80	57.00	4400	6800	0.066	
47	DL 47 16	47	55	16	–	25.00	61.00	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



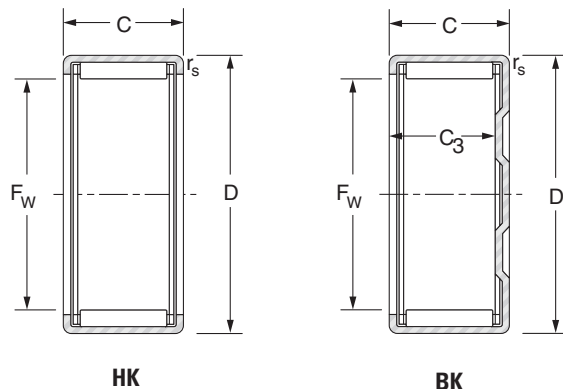
Shaft Ø mm	Designation	F _w mm	D mm	C mm	C ₃ min. mm	r _s min. mm	Load Ratings kN		Speed limit min ⁻¹		Weight kg	Internal ring
							Dynamic	Static	Grease	Oil		
							C	C ₀				
3	BK0306	3	6.5	6	5.2	0.30	1.20	0.78	30000	46000	0.001	
	HK0306	3	6.5	6	–	0.30	1.60	1.14	30000	46000	0.001	
4	BK0408	4	8	8	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

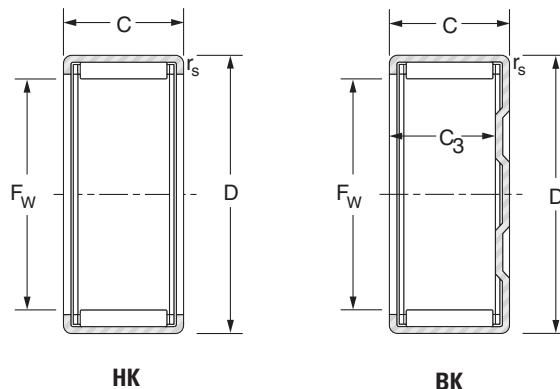


Shaft ∅ mm	Designation	Fw mm	D mm	C mm	C ₃ min. mm	r _s min. mm	Load Ratings kN		Speed limit min ⁻¹		Weight kg	Internal ring
							Dynamic	Static	Grease	Oil		
							C	C ₀				
12	BK1210	12	16	10	8.4	0.4	4.96	6.08	18000	28000	0.006	JR8x12x10.5
	HK1210	12	16	10	–	0.4	4.96	6.08	18000	28000	0.006	JR8x12x10.5
	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



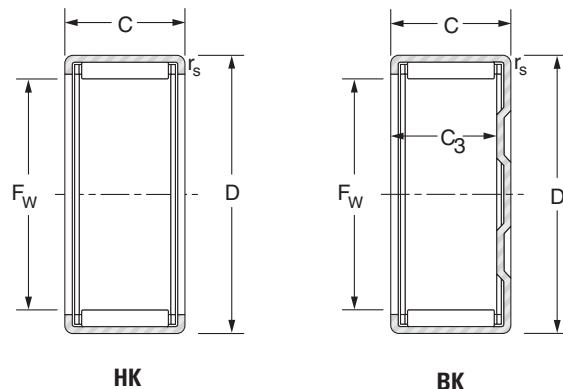
Shaft Ø mm	Designation	Fw mm	D mm	C mm	C ₃ min. mm	r _s min. mm	Load Ratings kN		Speed limit min ⁻¹		Weight kg	Internal ring
							Dynamic	Static	Grease	Oil		
							C	C ₀				
20	BK2012	20	26	12	9.3	1	8.97	12.5	11000	16000	0.017	JR15x20x12
	HK2012	20	26	12	—	1	8.97	12.5	11000	16000	0.015	JR15x20x12
	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

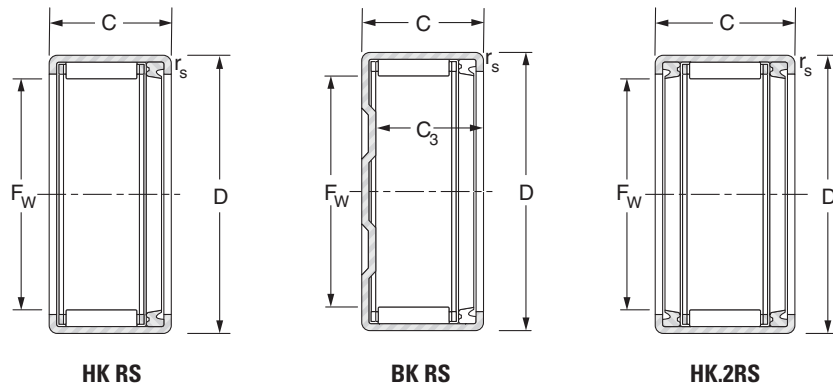
closed end series BK



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

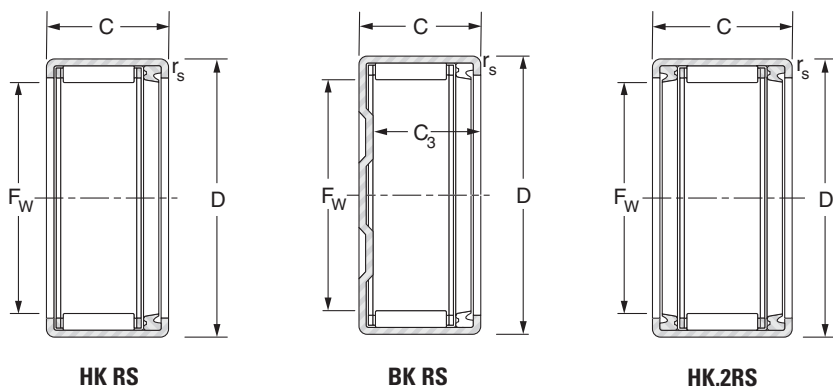
series HK...RS, BK...RS, HK...2RS



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.

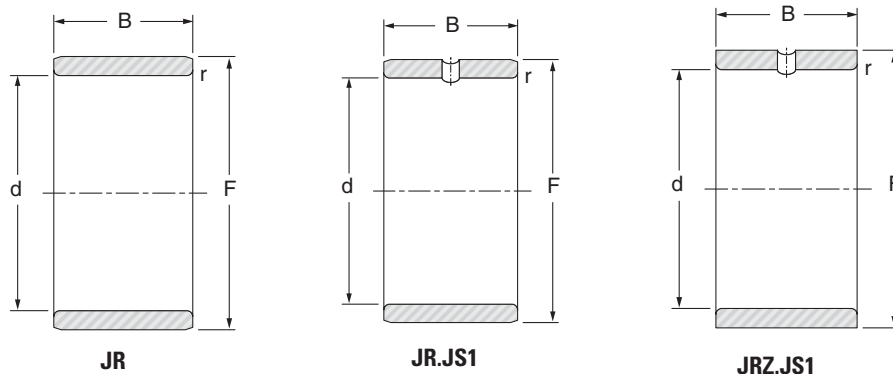
MOUNTING OF LIP CONTACT SEALS

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.

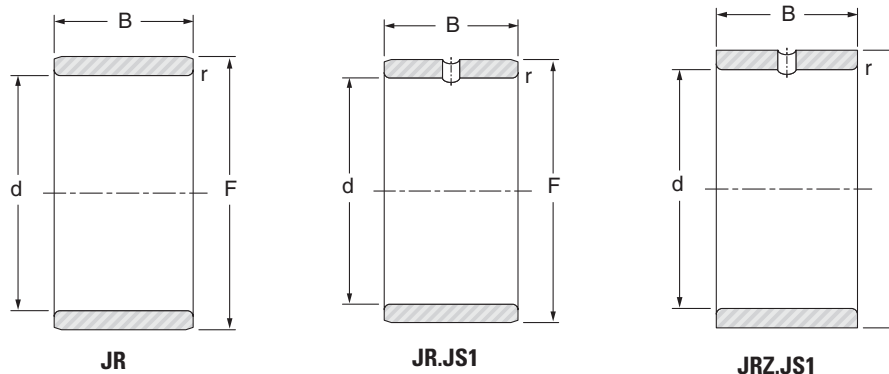
The end of the shaft should be chamfered or rounded to prevent lip damage and to ease installation. It is also recommended to apply a coating of a suitable lubricant on the shaft before mounting the seal.

Internal rings for needle bushes



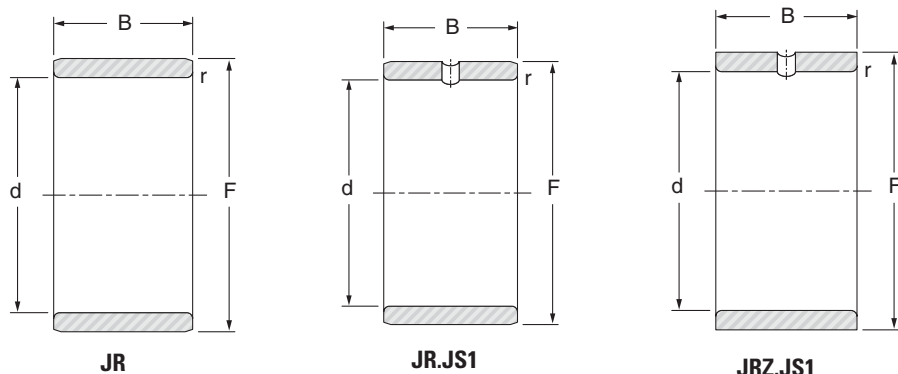
Shaft Ø mm	Designation	d mm	F mm	B mm	r _s min. mm	Weight kg
5	JR5x8x8JS1	5	8	8	0.3	0.002
	JR5x8x12	5	8	12	0.3	0.003
	JR5x8x16	5	8	16	0.3	0.004
6	JR6x9x8JS1	6	9	8	0.3	0.002
	JR6x9x12	6	9	12	0.3	0.003
	JR6x9x16	6	9	16	0.3	0.004
	JR6x10x10	6	10	10	0.3	0.004
	JR6x10x10JS1	6	10	10	0.3	0.004
	JRZ6x10x12JS1	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



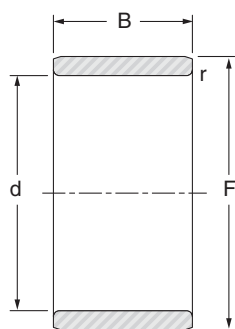
Shaft ∅ mm	Designation	d mm	F mm	B mm	r _s min. mm	Weight kg
12	JR12x15x12.5	12	15	12.5	0.3	0.006
	JR12x15x16	12	15	16	0.3	0.008
	JR12x15x16.5	12	15	16.5	0.3	0.008
	JR12x15x18.5	12	15	18.5	0.3	0.009
	JR12x15x22.5	12	15	22.5	0.3	0.011
	JR12x16x12	12	16	12	0.3	0.008
	JR12x16x12JS1	12	16	12	0.3	0.008
	JR12x16x13	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

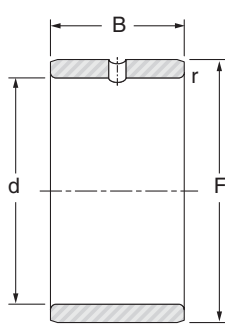


Shaft ∅ mm	Designation	d mm	F mm	B mm	r _s min. mm	Weight kg
17	JR17x20x16.5	17	20	16.5	0.3	0.011
	JR17x20x20	17	20	20	0.3	0.014
	JR17x20x20.5	17	20	20.5	0.3	0.014
	JR17x20x30.5	17	20	30.5	0.3	0.021
	JR17x21x16	17	21	16	0.3	0.015
	JR17x21x20	17	21	20	0.3	0.019
	JR17x22x13	17	22	13	0.3	0.015
	JR17x22x16	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

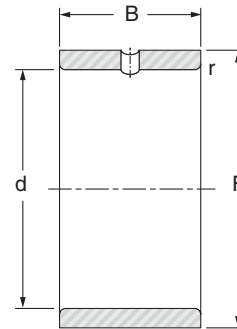
Internal rings for needle bushes



JR



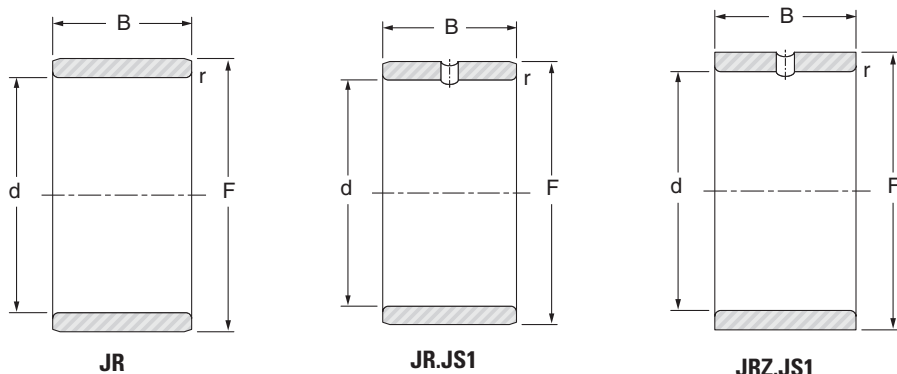
JR.JS1



JRZ.JS1

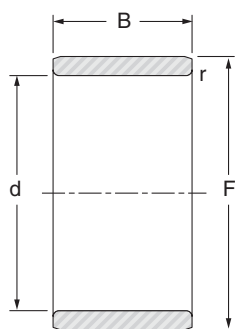
Shaft ∅ mm	Designation	d mm	F mm	B mm	r _s min. mm	Weight kg
22	JR22x26x16	22	26	16	0.3	0.019
	JR22x26x20	22	26	20	0.3	0.023
	JR22x28x17	22	28	17	0.3	0.030
	JR22x28x20.5	22	28	20.5	0.3	0.038
	JR22x28x30	22	28	30	0.3	0.056
25	JR25x29x20	25	29	20	0.3	0.027
	JR25x29x30	25	29	30	0.3	0.040
	JR25x30x16	25	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

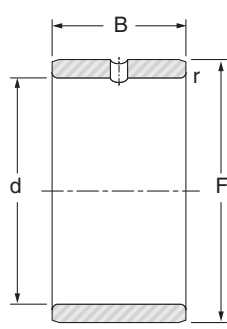


Shaft ∅ mm	Designation	d mm	F mm	B mm	r _s min. mm	Weight kg
30	JR30x35x16	30	35	16	0.3	0.031
	JR30x35x17	30	35	17	0.3	0.033
	JRZ30x35x18JS1	30	35	18	0.3	0.036
	JR30x35x20	30	35	20	0.3	0.039
	JRZ30x35x20JS1	30	35	20	0.3	0.039
	JR30x35x20.5	30	35	20.5	0.3	0.040
	JR30x35x26	30	35	26	0.3	0.054
	JR30x35x30	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

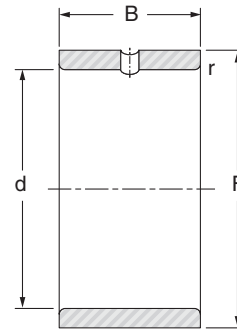
Internal rings for needle bushes



JR



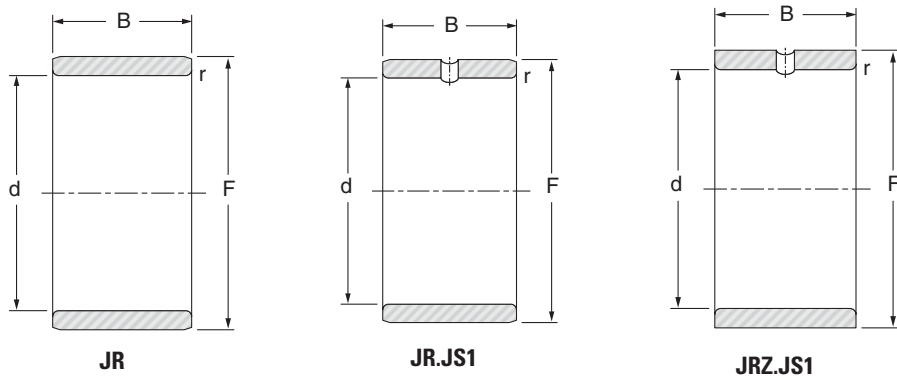
JR.JS1



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