B

NEEDLE ROLLER BEARINGS

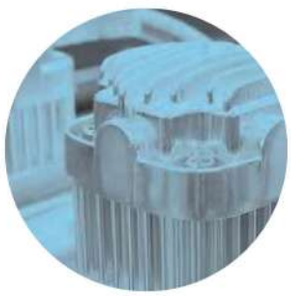
B

NEEDLE ROLLER BEARINGS

RADIAL NEEDLE ROLLER AND CAGE ASSEMBLIES

Overview: Needle roller and cage assemblies feature a complement of needles held in place by a cage with no inner or outer ring. The minimal cross section provides maximum load-carrying capability within the smallest envelope.

- **Catalogue range:** 3 mm – 127 mm (0.1181 in – 5.0000 in) bore.
- **Markets:** Automotive and truck transmissions, agricultural and construction equipment, two-cycle engines, pumps and compressors.
- **Features and Benefits:**
  - Unitized design simplifies handling and installation while allowing for increased lube flow.
  - Split and segmented designs allow mounting at difficult positions on crankshafts and gear shafts.
  - Controlled contour rollers optimize contact stress distribution.
  - Special manufacturing processes help increase roller fatigue resistance and minimize axial drift effects in critical applications.
  - Optimized cage piloting geometry minimizes pressure velocity effects.
  - Steel or polymer cages are available to suit your application requirements.
  - Coatings are available to help avoid corrosion and improve wear resistance.



B

Radial Needle Roller and Cage Assemblies – Metric Nominal Dimensions

Prefix
K needle roller and cage assembly

Roller complement outer diameter
28 = 28 mm

K 24 x 28 x 10 H

Roller complement bore diameter
24 = 24 mm

Cage width
10 = 10 mm

Suffix
H hardened steel cage
TN molded cage of reinforced engineered polymer
ZW double-row
F machined cage
FH machined cage, case hardened
FV machined cage, hardened and tempered

Design symbol
RF, RFN needle roller and cage assembly, polymer cage
RS, R, RP, RV, V, VS needle roller and cage assembly, steel cage

Roller complement outer diameter
35 = 35 mm

30 W R U 35 32

W R U 30 35 32

W R U 30 / 32

Double-row symbol
W double-row
blank single-row

Cage symbol
U half-caged assembly
blank full-round caged assembly

Roller complement bore diameter
30 = 30 mm

Cage width
32 = 32 mm

Inch Nominal Dimensions

Prefix
WJ needle roller and sigma type cage assembly
WJC needle roller and non-sigma type cage assembly

Cage width
16 = $^{16}/_{16}$ = 1 in

WJ - 20 26 16

Roller complement bore diameter
20 = $^{20}/_{16}$ = 1 $^{1}/_{4}$ in

Roller complement outer diameter
26 = $^{26}/_{16}$ = 1 $^{5}/_{8}$ in

B

Radial Needle Roller and Cage Assemblies for Connecting Rod Applications – Nominal Dimensions

Prefix
K needle roller and cage assembly

Roller complement outer diameter
28 = 28 mm

K **24** x **28** x **10** **BE**

Roller complement bore diameter
24 = 24 mm

Cage width
10 = 10 mm

Suffix
BE hardened steel cage (assemblies for crank pin end applications)
SE hardened steel cage (assemblies for wrist pin end applications)

Design symbol
BE, GS, VS...P full-round cage (assemblies for crank pin end applications)
BEU, VEU, VU...P half cages (assemblies for crank pin end applications)
RE, R...P full-round cage (assemblies for wrist pin end applications)
UR...P half cages (assemblies for wrist pin end applications)

Roller complement outer diameter
25 = 25 mm

20 **R** **25** **10** **P**

R **20** **25** **10**

R **20** / **10** **P**

Roller complement bore diameter
20 = 20 mm

Cage width
10 = 10 mm

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B

Radial Needle Roller and Cage Assemblies

Page

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- R, RF, RFN, RP, RS, RV, V, VS, WR, WRF, WRP, WRS Series B-1-30

Radial Needle Roller and Cage Assemblies for Connecting Rod Applications – Metric Series B-1-42

Assemblies for Crank Pin End Applications – Metric Series
- K BE Series B-1-47
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Assemblies for Wrist Pin End Applications – Metric Series
- K SE Series B-1-51
- R P, RE, UR P Series B-1-53

Radial Needle Roller and Cage Assemblies – Inch Series B-1-55

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RADIAL NEEDLE ROLLER AND CAGE ASSEMBLIES

METRIC SERIES

Metric series radial needle roller and cage assemblies are available in a variety of sizes and designs. This catalog includes the most popular, standardized designs.

REFERENCE STANDARDS ARE:

- **ISO 3030** – needle roller bearings – radial needle roller and cage assemblies – boundary dimensions and tolerances.
- **DIN 5405 Part 1** – rolling bearings – needle roller bearings – radial needle roller and cage assemblies.
- **ANSI/ABMA 18.1** – needle roller bearings – radial, metric design.
- **JIS B 1536** – roller bearings – boundary dimensions and tolerances of needle roller bearings.

Before selecting specific metric series radial needle roller and cage assemblies, the engineering section should be reviewed.

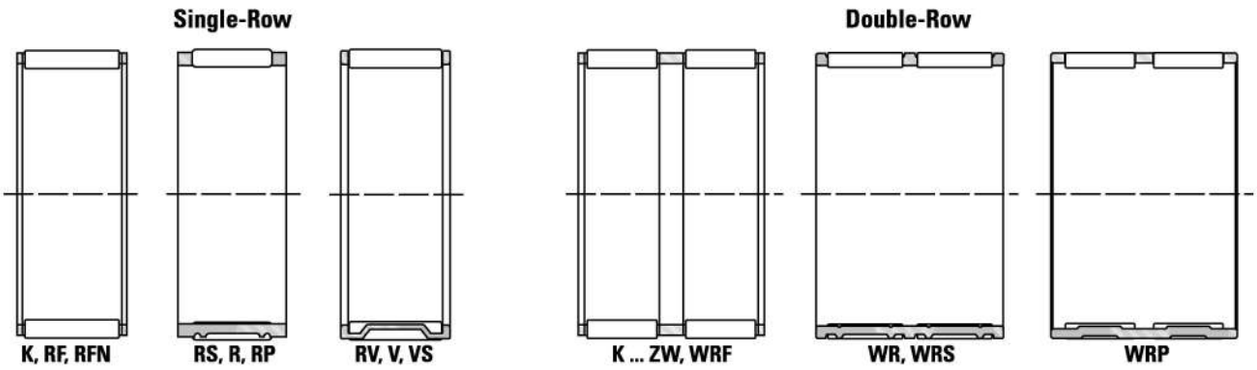

Fig. B1-1. Types of Metric Series Radial Needle Roller and Cage Assemblies

CONSTRUCTION

Radial needle roller and cage assemblies have a steel cage that provides both inward and outward retention for the needle rollers. The designs provide maximum cage strength consistent with the inherent high load-ratings of needle roller bearings. Accurate guidance of the needle rollers by the cage bars allows for operation at high speeds. Needle roller and cage assemblies have either one or two rows of needle rollers.

Also listed are metric series needle roller and cage assemblies using molded, one-piece glass-reinforced engineered polymer cages. These operate well at temperatures up to 120° C (250° F) over extended periods. However, care should be exercised when these assemblies are lubricated with oils containing additives as service life may be reduced if the operating temperature exceeds 100° C (212° F). At such high temperatures oil can deteriorate with time and it is suggested that oil change intervals are observed.

Needle rollers with relieved ends used in these assemblies are made of high-carbon chrome steel, through-hardened, ground and lapped to close tolerances for diameter and roundness. See the engineering section for further discussion of relieved end rollers.

DIMENSIONAL ACCURACY

NEEDLE ROLLER GROUPS (GAGES)

Applicable: K, K .. ZW series

Metric series radial needle roller and cage assemblies are supplied with needle roller complements subdivided into groups (gages) shown in Table B1-1. This is in accordance with Grade G2 specified in ISO 3096 standard (see needle rollers, page B8-13). The group limits of the needle rollers are indicated on the package. Labels of identifying colors show the group limits of the needle rollers. The needle roller and cage assemblies of one shipment usually contain needle rollers with group limits of between 0.000 to -0.002 mm (0.0000 to -0.00008 in) and -0.005 to -0.007 mm (-0.0002 to -0.0003 in) [colors red, blue and white]. For additional information on needle roller and cage assemblies with needle rollers of different group limits contact your representative.

Applicable: RF, RFN, RS, R, RP, RV, V, VS, WRF, WR, WRS, WRP series

The purchased group is 0.000 to -0.006 mm.

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Table B1-1. Needle roller group limits (Grade G2)

Group tolerance		Marking gage
mm in	mm in	
0.000 0.0000	**-0.002** -0.00008	P0M2
-0.001 -0.00004	**-0.003** -0.00012	M1M3
-0.002 -0.00008	**-0.004** -0.0002	M2M4
-0.003 -0.00012	**-0.005** -0.0002	M3M5
-0.004 -0.0002	**-0.006** -0.0002	M4M6
-0.005 -0.0002	**-0.007** -0.0003	M5M7
-0.006 -0.0002	**-0.008** -0.0003	M6M8
-0.007 -0.0003	-0.009 -0.0004	M7M9
-0.008 -0.0003	**-0.010** -0.0004	M8M10
-0.009 -0.0004	**-0.011** -0.0004	M9M11

In the marking of the gages, P identifies zero (0) or plus (+), M identifies minus (-).

MOUNTING DIMENSIONS

DESIGN OF RACEWAYS

Radial needle roller and cage assemblies use the housing bore as the outer raceway and the shaft as the inner raceway. To realize full bearing load rating and life, the housing bore and the shaft raceways must have the correct geometric and metallurgical characteristics. The housing should be of sufficient cross section to maintain adequate roundness and running clearance under load. Additional design details for housings and shafts used as outer and inner raceways can be found in the engineering section. The only limit to precision of the radial clearance of a mounted assembly is the capability of the user to hold close tolerances on the inner and outer raceways. The suggested shaft tolerances listed in Table B1-2 are based on housing bore tolerance G6 and apply to metric series needle roller bearing and cage assemblies.

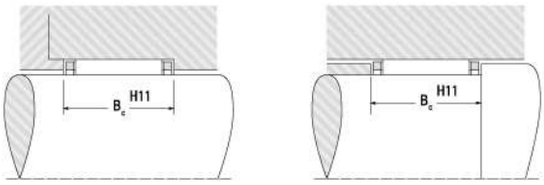
Table B1-2. Suggested shaft tolerances for housing bores machined to G6

Condition	Tolerance zone class		
	Axis		Housing hole
Radial clearance	Fw ≤ 50 mm	Fw > 50 mm	
Smaller than normal	j5	h5	G6
Normal	h5	g5	
Larger than normal	g6	f6	

AXIAL GUIDANCE REQUIREMENTS

Radial needle roller and cage assembly must be axially guided by shoulders or other suitable means. The end guiding surfaces should be hardened to minimize wear and must provide sufficient axial clearance to prevent end-locking of the assembly. Length tolerance H11 is suggested.

If end guidance is provided by a housing shoulder at one end and by a shaft shoulder at the other end, the shaft must be axially positioned to prevent end-locking of needle roller and cage assembly. The housing and shaft shoulder heights should be 70 percent to 90 percent of the needle roller diameter to provide proper axial guidance.



Guidance in the housing **Guidance in the shaft**

Fig. B1-2. Axial guidance requirements

MOUNTING IN SETS

Radial needle roller and cage assemblies that are mounted side by side must have needle rollers of the same group limits to ensure uniform load distribution.

LUBRICATION

Oil is the preferred lubricant for most applications. In critical applications involving high speeds, ample oil flow must be provided. Where assemblies are subjected to high centrifugal forces – such as in epicyclic gearing, or inertia forces, as in the small end of a connecting rod – the contact pressure between the cage and the raceway guiding surface becomes critical. The allowable contact pressure depends on a combination of the induced force and the relative velocity between the cage and raceway and the rate of lubricant flow. Consult your representative when cages will be subjected to high induced forces.

SPECIAL DESIGNS

Radial needle roller and cage assemblies made to special dimensions or configurations – such as those which are split to assemble around a one-piece crankshaft – can be made available on special order. Special coated or plated cages to enhance life, under conditions of marginal lubrication and high induced forces, also can be made available.

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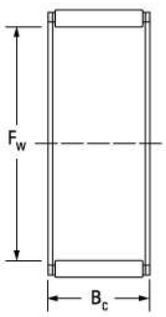
NEEDLE ROLLER BEARINGS

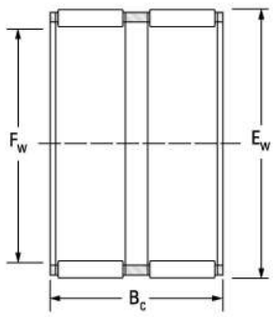
SINGLE-ROW, DOUBLE-ROW ASSEMBLIES

METRIC SERIES
K, K ZW SERIES

B



K

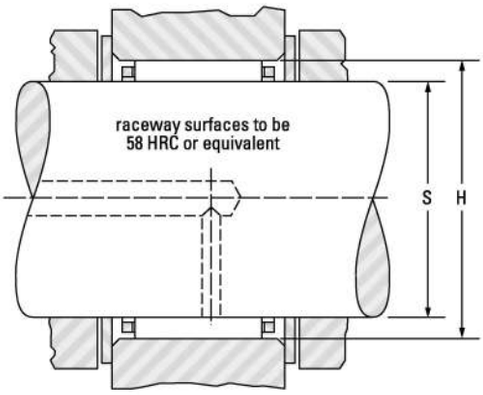


K ZW

Shaft Dia.	F_w	E_w	B_c -0.20 -0.008 -0.55 -0.022	Assembly Designation	Load Ratings Dynamic C	Load Ratings Static C_0	Fatigue Load Limit C_u	Cage material(1) P/S	Speed Ratings Grease	Speed Ratings Oil	Approx. Wt.	Mounting Dimensions S Max.	Mounting Dimensions S Min.	Mounting Dimensions H Max.	Mounting Dimensions H Min.
mm in	mm in	mm in	mm in		kN lbf		kN		min^{-1}		kg lbs	mm in	mm in	mm in	mm in
3 0.1181	3 0.1181	5 0.1969	7 0.2756	K3X5X7TN	1.56 351	1.29 290	0.200	P	48000	74000	0.0002 0.0004	3.000 0.1181	2.996 0.1180	5.004 0.1970	5.012 0.1973
4 0.1575	4 0.1575	7 0.2756	7 0.276	K4X7X7TN	1.83 411	1.32 297	0.200	P	34000	52000	0.0005 0.001	4.000 0.1575	3.995 0.1573	7.014 0.2761	7.005 0.2758
5 0.1969	5 0.1969	8 0.315	8 0.315	K5X8X8TN	2.18 490	1.71 384	0.260	P	31000	47000	0.0007 0.002	5.000 0.1969	4.995 0.1967	8.014 0.3155	8.005 0.3152
	5 0.1969	8 0.315	10 0.394	K5X8X10TN	3.04 683	2.63 591	0.400	P	31000	47000	0.0008 0.002	5.000 0.1969	4.995 0.1967	8.014 0.3155	8.005 0.3152
	5 0.1969	9 0.3543	13 0.512	K5X9X13TN	4.29 964	3.55 798	0.540	P	26000	40000	0.002 0.004	5.000 0.1969	4.995 0.1967	9.014 0.3549	9.005 0.3545
6 0.2362	6 0.2362	9 0.3543	8 0.315	K6X9X8H	3.19 717	2.90 652	0.420	S	29000	44000	0.0008 0.002	6.000 0.2362	5.995 0.2360	9.014 0.3549	9.005 0.3545
	6 0.2362	9 0.3543	8 0.315	K6X9X8TN	2.47 555	2.07 465	0.310	P	29000	44000	0.001 0.002	6.000 0.2362	5.995 0.2360	9.014 0.3549	9.005 0.3545
	6 0.2362	9 0.3543	10 0.394	K6X9X10TN	3.07 690	2.74 616	0.420	P	29000	44000	0.001 0.002	6.000 0.2362	5.995 0.2360	9.014 0.3549	9.005 0.3545
7 0.2756	7 0.2756	10 0.3937	8 0.315	K7X10X8TN	2.74 616	2.44 549	0.370	P	28000	42000	0.001 0.002	7.000 0.2756	6.994 0.2754	10.014 0.3943	10.005 0.3939
	7 0.2756	10 0.3937	10 0.394	K7X10X10TN	3.40 764	3.22 724	0.490	P	28000	42000	0.001 0.002	7.000 0.2756	6.994 0.2754	10.014 0.3943	10.005 0.3939
	7 0.2756	11 0.4331	15 0.591	K7X11X15TN	6.44 1450	6.24 1400	0.940	P	23000	35000	0.003 0.007	7.000 0.2756	6.994 0.2754	11.017 0.4337	11.006 0.4333
8 0.3150	8 0.315	11 0.4331	8 0.315	K8X11X8FV	3.23 726	3.11 699	0.470	S	26000	41000	0.002 0.004	8.000 0.3150	7.994 0.3147	11.017 0.4337	11.006 0.4333
	8 0.315	11 0.4331	8 0.315	K8X11X8TN	2.34 526	2.05 461	0.300	P	26000	41000	0.001 0.002	8.000 0.3150	7.994 0.3147	11.017 0.4337	11.006 0.4333
	8 0.315	11 0.4331	10 0.394	K8X11X10H	4.57 1030	4.89 1100	0.740	S	26000	41000	0.002 0.004	8.000 0.3150	7.994 0.3147	11.017 0.4337	11.006 0.4333
	8 0.315	11 0.4331	10 0.394	K8X11X10FV	4.01 901	4.11 924	0.630	S	26000	41000	0.002 0.004	8.000 0.3150	7.994 0.3147	11.017 0.4337	11.006 0.4333
	8 0.315	11 0.4331	10 0.394	K8x11x10TN	3.84 864	3.91 880	0.600	P	26000	41000	0.001 0.002	8.000 0.3150	7.994 0.3147	11.006 0.4333	11.017 0.4337
	8 0.315	11 0.4331	13 0.512	K8x11x13TN	5.18 1170	5.75 1290	0.870	P	26000	41000	0.002 0.004	8.000 0.3150	7.994 0.3147	11.006 0.4333	11.017 0.4337

(1) Cage material: P: polymer cage, S: steel cage

Radial Needle Roller and Cage Assemblies



Shaft Dia.	F_w	E_w	B_c -0.20 -0.008 -0.55 -0.022	Assembly Designation	Load Ratings Dynamic C	Load Ratings Static C_0	Fatigue Load Limit C_u	Cage material(1) P/S	Speed Ratings Grease	Speed Ratings Oil	Approx. Wt.	Mounting Dimensions S Max.	Mounting Dimensions S Min.	Mounting Dimensions H Max.	Mounting Dimensions H Min.
mm in	mm in	mm in	mm in		kN lbf		kN		min-1		kg lbs	mm in	mm in	mm in	mm in
8 0.3150	8 0.315	11 0.4331	13 0.512	K8X11X13H	5.22 1170	5.78 1300	0.880	S	26000	41000	0.003 0.007	8.000 0.3150	7.994 0.3147	11.017 0.4337	11.006 0.4333
9 0.3543	9 0.3543	12 0.4724	10 0.394	K9X12X10FH	4.27 960	4.60 1030	0.700	S	26000	40000	0.003 0.007	9.000 0.3543	8.994 0.3541	12.017 0.4731	12.006 0.4727
	9 0.3543	12 0.4724	10 0.394	K9X12X10FV	4.27 960	4.60 1030	0.700	S	26000	40000	0.002 0.004	9.000 0.3543	8.994 0.3541	12.017 0.4731	12.006 0.4727
	9 0.3543	12 0.4724	13 0.512	K9X12X13FH	5.57 1250	6.47 1450	0.980	S	26000	40000	0.003 0.007	9.000 0.3543	8.994 0.3541	12.017 0.4731	12.006 0.4727
	9 0.3543	12 0.4724	13 0.512	K9X12X13FV	5.57 1250	6.47 1450	0.980	S	26000	40000	0.003 0.007	9.000 0.3543	8.994 0.3541	12.017 0.4731	12.006 0.4727
	9 0.3543	13 0.5118	8 0.315	K9X13X8H	3.96 890	3.50 787	0.530	S	21000	32000	0.003 0.007	9.000 0.3543	8.994 0.3541	13.017 0.5125	13.006 0.5120
10 0.3937	10 0.3937	13 0.5118	10 0.394	K10X13X10H	5.40 1210	6.43 1450	0.980	S	25000	39000	0.002 0.004	10.000 0.3937	9.994 0.3935	13.017 0.5125	13.006 0.5120
	10 0.3937	13 0.5118	10 0.394	K10X13X10TN	4.29 964	4.77 1070	0.730	P	25000	39000	0.002 0.004	10.000 0.3937	9.994 0.3935	13.017 0.5125	13.006 0.5120
	10 0.3937	13 0.5118	13 0.512	K10X13X13	5.90 1330	7.16 1610	1.10	S	25000	39000	0.003 0.007	10.000 0.3937	9.994 0.3935	13.017 0.5125	13.006 0.5120
	10 0.3937	13 0.5118	16 0.63	K10X13X16	7.43 1670	9.64 2170	1.50	S	25000	39000	0.004 0.009	10.000 0.3937	9.994 0.3935	13.017 0.5125	13.006 0.5120
	10 0.3937	14 0.5512	10 0.394	K10X14X10H	6.12 1380	6.29 1410	0.960	S	20000	31000	0.003 0.007	10.000 0.3937	9.994 0.3935	14.017 0.5519	14.006 0.5514
	10 0.3937	14 0.5512	13 0.512	K10X14X13H	7.88 1770	8.71 1960	1.35	S	20000	31000	0.004 0.009	10.000 0.3937	9.994 0.3935	14.017 0.5519	14.006 0.5514
	10 0.3937	16 0.6299	12 0.472	K10X16X12F	8.39 1890	7.47 1680	1.15	S	15000	24000	0.006 0.013	10.000 0.3937	9.994 0.3935	16.017 0.6306	16.006 0.6302
	10 0.3937	16 0.6299	12 0.472	K10X16X12TN	7.50 1690	6.40 1440	0.970	P	15000	24000	0.005 0.011	10.000 0.3937	9.994 0.3935	16.017 0.6306	16.006 0.6302
12 0.4724	12 0.4724	15 0.5906	10 0.394	K12X15X10H	5.85 1320	7.51 1690	1.15	S	24000	37000	0.003 0.007	12.000 0.4724	11.992 0.4721	15.017 0.5912	15.006 0.5908
	12 0.4724	15 0.5906	13 0.512	K12X15X13H	6.78 1520	9.03 2030	1.40	S	24000	37000	0.004 0.009	12.000 0.4724	11.992 0.4721	15.017 0.5912	15.006 0.5908
	12 0.4724	16 0.6299	13 0.512	K12X16X13H	7.49 1680	8.51 1910	1.60	S	19000	30000	0.006 0.013	12.000 0.4724	11.992 0.4721	16.017 0.6306	16.006 0.6302

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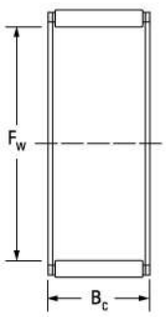
NEEDLE ROLLER BEARINGS

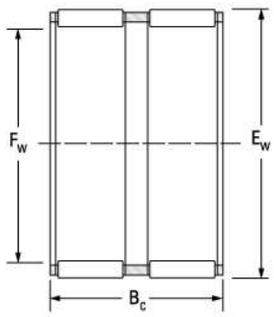
SINGLE-ROW, DOUBLE-ROW ASSEMBLIES

METRIC SERIES
K, K ZW SERIES

B



K

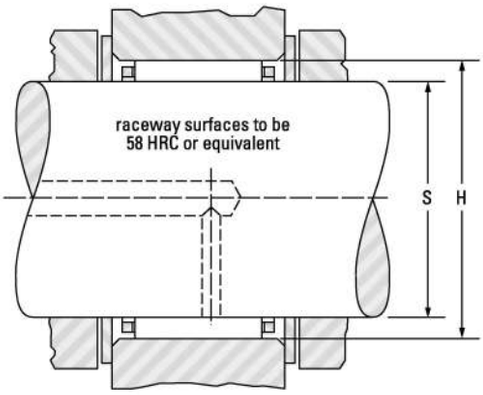


K ZW

Shaft Dia.	F_w	E_w	B_c -0.20 -0.008 -0.55 -0.022	Assembly Designation	Load Ratings Dynamic C	Load Ratings Static C_0	Fatigue Load Limit C_u	Cage material(1) P/S	Speed Ratings Grease	Speed Ratings Oil	Approx. Wt.	Mounting Dimensions S Max.	Mounting Dimensions S Min.	Mounting Dimensions H Max.	Mounting Dimensions H Min.
mm in	mm in	mm in	mm in		kN lbf		kN		min^{-1}		kg lbs	mm in	mm in	mm in	mm in
12 0.4724	12 0.4724	17 0.6693	13 0.512	K12X17X13	8.93 2010	9.29 2090	1.20	S	16000	25000	0.008 0.018	12.000 0.4724	11.992 0.4721	17.017 0.6700	17.006 0.6695
	12 0.4724	18 0.7087	12 0.472	K12X18X12H	9.76 2190	9.40 2110	1.40	S	14000	22000	0.009 0.020	12.000 0.4724	11.992 0.4721	18.017 0.7093	18.006 0.7089
13 0.5118	13 0.5118	17 0.6693	10 0.394	K13X17X10	7.22 1620	8.33 1870	1.25	S	19000	29000	0.004 0.009	13.000 0.5118	12.992 0.5115	17.017 0.6700	17.006 0.6695
	13 0.5118	18 0.7087	15 0.591	K13X18X15F	10.8 2430	12.1 2720	1.85	S	16000	25000	0.008 0.01	13.000 0.5118	12.992 0.5115	18.017 0.7093	18.006 0.7089
14 0.5512	14 0.5512	18 0.7087	8 0.315	K14X18X8	5.39 1210	5.82 1310	0.880	S	19000	29000	0.004 0.009	14.000 0.5512	13.992 0.5509	18.017 0.7093	18.006 0.7089
	14 0.5512	18 0.7087	10 0.394	K14X18X10	7.17 1 610	8.41 1890	1.30	S	19000	29000	0.005 0.011	14.000 0.5512	13.992 0.5509	18.017 0.7093	18.006 0.7089
	14 0.5512	18 0.7087	13 0.512	K14X18X13	9.73 2190	12.5 2810	1.90	S	19000	29000	0.006 0.013	14.000 0.5512	13.992 0.5509	18.017 0.7093	18.006 0.7089
	14 0.5512	18 0.7087	15 0.591	K14X18X15	10.5 2360	13.8 3100	2.15	S	19000	29000	0.007 0.015	14.000 0.5512	13.992 0.5509	18.017 0.7093	18.006 0.7089
	14 0.5512	18 0.7087	17 0.669	K14X18X17H	12.4 2790	17.1 3840	2.65	S	19000	29000	0.008 0.018	14.000 0.5512	13.992 0.5509	18.017 0.7093	18.006 0.7089
	14 0.5512	19 0.748	13 0.512	K14X19X13H	10.2 2290	11.4 2560	1.75	S	16000	24000	0.008 0.018	14.000 0.5512	13.992 0.5509	19.020 0.7488	19.007 0.7483
	14 0.5512	19 0.748	18 0.709	K14X19X18F	13.2 2970	16.0 3600	2.50	S	16000	24000	0.011 0.024	14.000 0.5512	13.992 0.5509	19.020 0.7488	19.007 0.7483
	14 0.5512	20 0.7874	12 0.472	K14X20X12	10.5 2360	10.6 2380	1.60	S	14000	21000	0.009 0.020	14.000 0.5512	13.992 0.5509	20.020 0.7882	20.007 0.7877
15 0.5906	15 0.5906	18 0.7087	14 0.551	K15X18X14TN	7.92 1780	11.9 2680	1.80	P	13000	23000	0.003 0.007	15.000 0.5906	14.992 0.5902	18.017 0.7093	18.006 0.7089
	15 0.5906	18 0.7087	16 0.63	K15X18X16F	8.36 1880	12.6 2830	1.95	S	13000	23000	0.005 0.011	15.000 0.5906	14.992 0.5902	18.017 0.7093	18.006 0.7089
	15 0.5906	18 0.7087	17 0.669	K15X18X17	8.08 1820	12.1 2720	1.85	S	23000	36000	0.005 0.011	15.000 0.5906	14.992 0.5902	18.017 0.7093	18.006 0.7089
	15 0.5906	19 0.748	10 0.394	K15X19X10	7.87 1770	9.69 2180	1.45	S	18000	28000	0.005 0.011	15.000 0.5906	14.992 0.5902	19.020 0.7488	19.007 0.7483
	15 0.5906	19 0.748	13 0.512	K15X19X13	9.66 2170	12.6 2830	1.90	S	18000	28000	0.007 0.015	15.000 0.5906	14.992 0.5902	19.020 0.7488	19.007 0.7483

(1) Cage material: P: polymer cage, S: steel cage

Radial Needle Roller and Cage Assemblies



Shaft Dia.	F_w	E_w	B_c -0.20 -0.008 -0.55 -0.022	Assembly Designation	Load Ratings Dynamic C	Load Ratings Static C_0	Fatigue Load Limit C_u	Cage material(1) P/S	Speed Ratings Grease	Speed Ratings Oil	Approx. Wt.	Mounting Dimensions S Max.	Mounting Dimensions S Min.	Mounting Dimensions H Max.	Mounting Dimensions H Min.
mm in	mm in	mm in	mm in		kN lbf		kN		min-1		kg lbs	mm in	mm in	mm in	mm in
15 0.5906	15 0.5906	19 0.748	17 0.669	K15X19X17H	12.3 2770	17.2 3870	2.65	S	18000	28000	0.009 0.020	15.000 0.5906	14.992 0.5902	19.020 0.7488	19.007 0.7483
	15 0.5906	19 0.748	22 0.866	K15X19X22ZW	12.2 2740	17.0 3820	2.60	S	18000	28000	0.010 0.022	15.000 0.5906	14.992 0.5902	19.020 0.7488	19.007 0.7483
	15 0.5906	20 0.7874	13 0.512	K15X20X13H	9.93 2230	11.3 2540	1.80	S	16000	24000	0.008 0.018	15.000 0.5906	14.992 0.5902	20.020 0.7882	20.007 0.7877
	15 0.5906	21 0.8268	15 0.591	K15X21X15	13.4 3010	14.8 3330	2.30	S	14000	21000	0.013 0.029	15.000 0.5906	14.992 0.5902	21.020 0.8276	21.007 0.8270
	15 0.5906	21 0.8268	21 0.827	K15X21X21H	18.0 4050	21.7 4880	3.40	S	14000	21000	0.018 0.040	15.000 0.5906	14.992 0.5902	21.020 0.8276	21.007 0.8270
16 0.6299	16 0.6299	20 0.7874	8 0.315	K16X20X8F	6.37 1430	7.51 1690	1.15	S	18000	28000	0.005 0.011	16.000 0.6299	15.992 0.6296	20.020 0.7882	20.007 0.7877
	16 0.6299	20 0.7874	10 0.394	K16X20X10H	7.82 1760	9.76 2190	1.50	S	18000	28000	0.006 0.013	16.000 0.6299	15.992 0.6296	20.020 0.7882	20.007 0.7877
	16 0.6299	20 0.7874	13 0.512	K16X20X13	10.1 2270	13.5 3030	2.05	S	18000	28000	0.007 0.015	16.000 0.6299	15.992 0.6296	20.020 0.7882	20.007 0.7877
	16 0.6299	20 0.7874	14 0.551	K16X20X14	10.8 2430	14.8 3330	2.25	S	18000	28000	0.007 0.015	16.000 0.6299	15.992 0.6296	20.020 0.7882	20.007 0.7877
	16 0.6299	20 0.7874	17 0.669	K16X20X17H	12.9 2900	18.5 4160	2.85	S	18000	28000	0.008 0.018	16.000 0.6299	15.992 0.6296	20.020 0.7882	20.007 0.7877
	16 0.6299	20 0.7874	20 0.787	K16X20X20	13.4 3010	19.5 4380	3.05	S	18000	28000	0.011 0.024	16.000 0.6299	15.992 0.6296	20.020 0.7882	20.007 0.7877
	16 0.6299	22 0.8661	12 0.472	K16X22X12	11.2 2520	11.9 2680	1.80	S	19000	29000	0.010 0.022	16.000 0.6299	15.992 0.6296	22.020 0.8669	22.007 0.8664
	16 0.6299	22 0.8661	16 0.63	K16X22X16H	14.9 3350	17.2 3870	2.70	S	19000	29000	0.014 0.031	16.000 0.6299	15.992 0.6296	22.020 0.8669	22.007 0.8664
	16 0.6299	22 0.8661	20 0.787	K16X22X20	18.6 4180	22.9 5150	3.60	S	19000	29000	0.017 0.037	16.000 0.6299	15.992 0.6296	22.020 0.8669	22.007 0.8664
	16 0.6299	24 0.9449	20 0.787	K16X24X20	20.2 4540	21.4 4810	3.45	S	20000	30000	0.025 0.055	16.000 0.6299	15.992 0.6296	24.020 0.9457	24.007 0.9452
17 0.6693	17 0.6693	20 0.7874	10 0.394	K17X20X10	5.96 1340	8.53 1920	1.30	S	16000	25000	0.004 0.009	17.000 0.6693	16.992 0.6690	20.020 0.7882	20.007 0.7877
	17 0.6693	21 0.8268	10 0.394	K17X21X10	8.12 1830	10.4 2340	1.60	S	17000	26000	0.006 0.013	17.000 0.6693	16.992 0.6690	21.020 0.8276	21.007 0.8270

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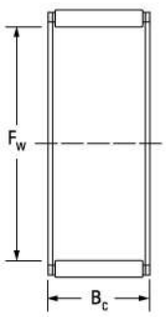
NEEDLE ROLLER BEARINGS

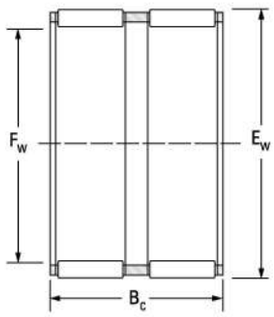
SINGLE-ROW, DOUBLE-ROW ASSEMBLIES

METRIC SERIES
K, K ZW SERIES

B



K

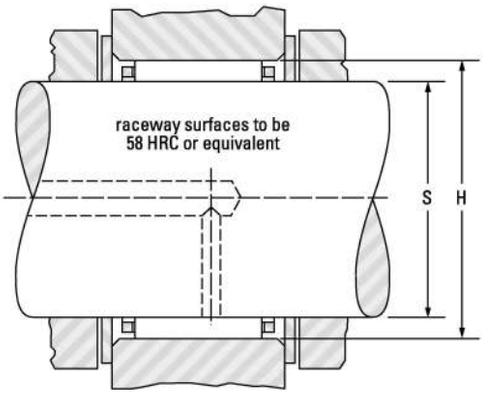


K ZW

Shaft Dia.	F_w	E_w	B_c -0.20 -0.008 -0.55 -0.022	Assembly Designation	Load Ratings Dynamic C	Load Ratings Static C_0	Fatigue Load Limit C_u	Cage material(1) P/S	Speed Ratings Grease	Speed Ratings Oil	Approx. Wt.	Mounting Dimensions S Max.	Mounting Dimensions S Min.	Mounting Dimensions H Max.	Mounting Dimensions H Min.
mm in	mm in	mm in	mm in		kN lbf		kN		min^{-1}		kg lbs	mm in	mm in	mm in	mm in
17 0.6693	17 0.6693	21 0.8268	12.8 0.504	K17X21X13H	10.5 2360	14.5 3260	2.20	S	17000	26000	0.008 0.018	17.000 0.6693	16.992 0.6690	21.020 0.8276	21.007 0.8270
	17 0.6693	21 0.8268	15 0.591	K17X21X15	11.4 2560	16.1 3620	2.50	S	17000	26000	0.008 0.018	17.000 0.6693	16.992 0.6690	21.020 0.8276	21.007 0.8270
	17 0.6693	21 0.8268	17 0.669	K17X21X17H	13.4 3010	19.8 4450	3.05	S	17000	26000	0.011 0.024	17.000 0.6693	16.992 0.6690	21.020 0.8276	21.007 0.8270
	17 0.6693	22 0.8661	20 0.787	K17X22X20FH	17.0 3820	23.3 5240	3.65	S	17000	27000	0.015 0.033	17.000 0.6693	16.992 0.6690	22.020 0.8669	22.007 0.8664
	17 0.6693	23 0.9055	15 0.591	K17X23X15F	14.1 3170	16.3 3660	2.55	S	18000	27000	0.010 0.022	17.000 0.6693	16.992 0.6690	23.020 0.9063	23.007 0.9058
18 0.7087	18 0.7087	22 0.8661	8 0.315	K18X22X8F	6.32 1420	7.70 1730	1.15	S	16000	24000	0.005 0.011	18.000 0.7087	17.992 0.7083	22.020 0.8669	22.007 0.8664
	18 0.7087	22 0.8661	10 0.394	K18X22X10H	8.41 1890	11.1 2500	1.70	S	16000	24000	0.006 0.013	18.000 0.7087	17.992 0.7083	22.020 0.8669	22.007 0.8664
	18 0.7087	22 0.8661	13 0.512	K18X22X13H	10.8 2430	15.4 3460	2.35	S	16000	24000	0.008 0.018	18.000 0.7087	17.992 0.7083	22.020 0.8669	22.007 0.8664
	18 0.7087	22 0.8661	14 0.551	K18X22X14	11.6 2610	16.8 3780	2.55	S	16000	24000	0.009 0.020	18.000 0.7087	17.992 0.7083	22.020 0.8669	22.007 0.8664
	18 0.7087	22 0.8661	14 0.551	K18X22X14FV	11.3 2540	16.3 3660	2.45	S	16000	24000	0.009 0.020	18.000 0.7087	17.992 0.7083	22.020 0.8669	22.007 0.8664
	18 0.7087	22 0.8661	17 0.669	K18X22X17H	13.3 2990	19.9 4470	3.10	S	16000	24000	0.009 0.020	18.000 0.7087	17.992 0.7083	22.020 0.8669	22.007 0.8664
	18 0.7087	22 0.8661	20 0.787	K18X22X20F	15.0 3370	23.4 5260	3.65	S	16000	24000	0.011 0.024	18.000 0.7087	17.992 0.7083	22.020 0.8669	22.007 0.8664
	18 0.7087	24 0.9449	12 0.472	K18X24X12	11.8 2650	13.1 2940	1.95	S	17000	25000	0.011 0.024	18.000 0.7087	17.992 0.7083	24.020 0.9457	24.007 0.9452
	18 0.7087	24 0.9449	20 0.787	K18X24X20H	19.4 4360	24.9 5600	3.90	S	16000	25000	0.019 0.042	18.000 0.7087	17.992 0.7083	24.020 0.9457	24.007 0.9452
	18 0.7087	25 0.9843	22 0.866	K18X25X22H	23.3 5240	28.6 6430	4.50	S	17000	26000	0.025 0.055	18.000 0.7087	17.992 0.7083	25.020 0.9850	25.007 0.9845
	18 0.7087	26 1.0236	12 0.472	K18X26X12FV	13.8 3100	13.5 3030	2.10	S	11000	17000	0.020 0.044	18.000 0.7087	17.992 0.7083	26.020 1.0244	26.007 1.0239
	18 0.7087	26 1.0236	20 0.787	K18X26X20F	21.7 4880	24.1 5420	3.85	S	17000	26000	0.027 0.060	18.000 0.7087	17.992 0.7083	26.020 1.0244	26.007 1.0239

(1) Cage material: P: polymer cage, S: steel cage

Radial Needle Roller and Cage Assemblies



Shaft Dia.	F_w	E_w	B_c -0.20 -0.008 -0.55 -0.022	Assembly Designation	Load Ratings Dynamic C	Load Ratings Static C_0	Fatigue Load Limit C_u	Cage material(1) P/S	Speed Ratings Grease	Speed Ratings Oil	Approx. Wt.	Mounting Dimensions S Max.	Mounting Dimensions S Min.	Mounting Dimensions H Max.	Mounting Dimensions H Min.
mm in	mm in	mm in	mm in		kN lbf		kN		min-1		kg lbs	mm in	mm in	mm in	mm in
19 0.7480	19 0.748	23 0.9055	13 0.512	K19X23X13	10.8 2430	15.5 3480	2.35	S	15000	23000	0.008 0.018	19.000 0.7480	18.991 0.7477	23.020 0.9063	23.007 0.9058
	19 0.748	23 0.9055	17 0.669	K19X23X17	13.4 3010	20.6 4630	3.20	S	15000	23000	0.011 0.024	19.000 0.7480	18.991 0.7477	23.020 0.9063	23.007 0.9058
20 0.7874	20 0.7874	24 0.9449	8 0.315	K20X24X8F	7.31 1640	9.60 2160	1.50	S	14000	22000	0.005 0.011	20.000 0.7874	19.991 0.7870	24.020 0.9457	24.007 0.9452
	20 0.7874	24 0.9449	10 0.394	K20X24X10H	8.97 2020	12.5 2810	2.05	S	14000	22000	0.006 0.013	20.000 0.7874	19.991 0.7870	24.020 0.9457	24.007 0.9452
	20 0.7874	24 0.9449	12 0.472	K20X24X12	10.7 2410	15.7 3530	2.40	S	14000	22000	0.008 0.018	20.000 0.7874	19.991 0.7870	24.020 0.9457	24.007 0.9452
	20 0.7874	24 0.9449	13 0.512	K20X24X13H	11.5 2590	17.3 3890	1.30	S	14000	22000	0.009 0.020	20.000 0.7874	19.991 0.7870	24.020 0.9457	24.007 0.9452
	20 0.7874	24 0.9449	14 0.551	K20X24X14	12.4 2790	18.9 4250	2.85	S	14000	22000	0.009 0.020	20.000 0.7874	19.991 0.7870	24.020 0.9457	24.007 0.9452
	20 0.7874	24 0.9449	17 0.669	K20X24X17H	14.8 3330	23.7 5330	3.65	S	14000	22000	0.011 0.024	20.000 0.7874	19.991 0.7870	24.020 0.9457	24.007 0.9452
	20 0.7874	26 1.0236	12 0.472	K20X26X12	13.0 2920	15.3 3440	2.30	S	15000	23000	0.012 0.026	20.000 0.7874	19.991 0.7870	26.020 1.0244	26.007 1.0239
	20 0.7874	26 1.0236	13 0.512	K20X26X13H	13.4 3010	15.9 3570	2.35	S	15000	23000	0.014 0.031	20.000 0.7874	19.991 0.7870	26.020 1.0244	26.007 1.0239
	20 0.7874	26 1.0236	17 0.669	K20X26X17H	19.3 4340	25.5 5730	4.00	S	15000	23000	0.017 0.037	20.000 0.7874	19.991 0.7870	26.020 1.0244	26.007 1.0239
	20 0.7874	26 1.0236	20 0.787	K20X26X20	20.3 4560	27.2 6110	4.25	S	15000	23000	0.020 0.044	20.000 0.7874	19.991 0.7870	26.020 1.0244	26.007 1.0239
	20 0.7874	28 1.1024	20 0.787	K20X28X20H	24.6 5530	29.0 6520	2.70	S	15000	23000	0.028 0.062	20.000 0.7874	19.991 0.7870	28.020 1.1031	28.007 1.1026
	20 0.7874	28 1.1024	25 0.984	K20X28X25H	29.7 6680	37.0 8320	5.80	S	15000	23000	0.036 0.079	20.000 0.7874	19.991 0.7870	28.020 1.1031	28.007 1.1026
	20 0.7874	30 1.1811	30 1.181	K20X30X30H	38.9 8750	45.8 10300	7.20	S	16000	24000	0.055 0.121	20.000 0.7874	19.991 0.7870	30.020 1.1819	30.007 1.1814
	20 0.7874	32 1.2598	36 1.417	K20X32X36H	49.9 11220	57.0 12810	9.15	S	16000	25000	0.082 0.181	20.000 0.7874	19.991 0.7870	32.025 1.2608	32.009 1.2602
21 0.8268	21 0.8268	25 0.9843	17 0.669	K21X25X17H	14.3 3210	23.1 5190	3.60	S	14000	21000	0.013 0.029	21.000 0.8268	20.991 0.8264	25.020 0.9850	25.007 0.9845

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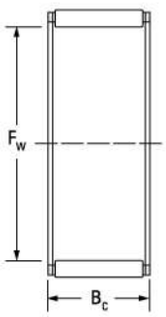
NEEDLE ROLLER BEARINGS

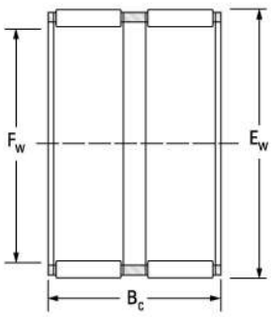
SINGLE-ROW, DOUBLE-ROW ASSEMBLIES

METRIC SERIES
K, K ZW SERIES

B



K

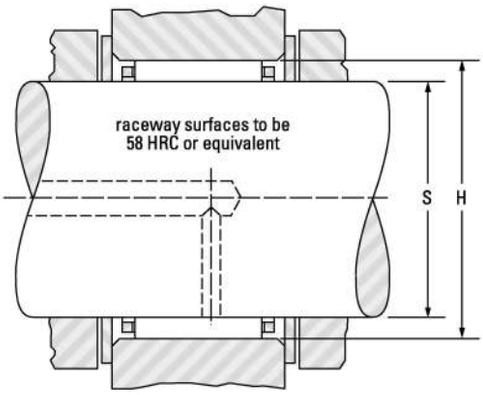


K ZW

Shaft Dia.	F_w	E_w	B_c -0.20 -0.008 -0.55 -0.022	Assembly Designation	Load Ratings Dynamic C	Load Ratings Static C_0	Fatigue Load Limit C_u	Cage material(1) P/S	Speed Ratings Grease	Speed Ratings Oil	Approx. Wt.	Mounting Dimensions S Max.	Mounting Dimensions S Min.	Mounting Dimensions H Max.	Mounting Dimensions H Min.
mm in	mm in	mm in	mm in		kN lbf		kN		min^{-1}		kg lbs	mm in	mm in	mm in	mm in
22 0.8661	22 0.8661	26 1.0236	10 0.394	K22X26X10H	9.81 2210	14.5 3 260	2.20	S	13000	20000	0.007 0.015	22.000 0.8661	21.991 0.8658	26.020 1.0244	26.007 1.0239
	22 0.8661	26 1.0236	13 0.512	K22X26X13H	11.8 2650	18.3 4110	2.95	S	13000	20000	0.012 0.026	22.000 0.8661	21.991 0.8658	26.020 1.0244	26.007 1.0239
	22 0.8661	26 1.0236	17 0.669	K22X26X17H	15.6 3510	26.3 5910	4.05	S	13000	20000	0.012 0.026	22.000 0.8661	21.991 0.8658	26.020 1.0244	26.007 1.0239
	22 0.8661	26 1.0236	18 0.709	K22X26X18H	15.3 3440	25.5 5730	4.00	S	13000	20000	0.017 0.037	22.000 0.8661	21.991 0.8658	26.020 1.0244	26.007 1.0239
	22 0.8661	28 1.1024	13 0.512	K22X28X13	13.9 3120	17.1 3840	2.60	S	13000	20000	0.015 0.033	22.000 0.8661	21.991 0.8658	28.020 1.1031	28.007 1.1026
	22 0.8661	28 1.1024	17 0.669	K22X28X17H	18.2 4090	24.2 5440	3.80	S	13000	20000	0.020 0.044	22.000 0.8661	21.991 0.8658	28.020 1.1031	28.007 1.1026
	22 0.8661	30 1.1811	15 0.591	K22X30X15H	19.7 4430	22.3 5010	3.45	S	14000	21000	0.023 0.051	22.000 0.8661	21.991 0.8658	30.020 1.1819	30.007 1.1814
	22 0.8661	30 1.1811	20 0.787	K22X30X20FV	24.4 5490	29.4 6610	4.70	S	14000	21000	0.031 0.068	22.000 0.8661	21.991 0.8658	30.020 1.1819	30.007 1.1814
	22 0.8661	32 1.2598	24 0.945	K22X32X24F	33.1 7440	37.9 8520	6.05	S	14000	22000	0.046 0.101	22.000 0.8661	21.991 0.8658	32.025 1.2608	32.009 1.2602
	22 0.8661	32 1.2598	30 1.181	K22X32X30H	41.8 9400	51.3 11530	8.05	S	14000	22000	0.057 0.126	22.000 0.8661	21.991 0.8658	32.025 1.2608	32.009 1.2602
23 0.9055	23 0.9055	28 1.1024	24 0.945	K23X28X24F	22.4 5040	36.2 8140	5.70	S	12000	19000	0.023 0.051	23.000 0.9055	22.991 0.9052	28.020 1.1031	28.007 1.1026
	23 0.9055	35 1.378	16 0.63	K23X35X16H	25.9 5820	25.1 5640	3.90	S	14000	21000	0.040 0.088	23.000 0.9055	22.991 0.9052	35.025 1.3789	35.009 1.3783
24 0.9449	24 0.9449	28 1.1024	10 0.394	K24X28X10H	9.67 2170	14.6 3280	2.20	S	12000	18000	0.027 0.060	24.000 0.9449	23.991 0.9445	28.020 1.1031	28.007 1.1026
	24 0.9449	28 1.1024	13 0.512	K24X28X13H	12.5 2810	20.2 4540	3.05	S	12000	18000	0.010 0.022	24.000 0.9449	23.991 0.9445	28.020 1.1031	28.007 1.1026
	24 0.9449	28 1.1024	16 0.63	K24X28X16F	12.6 2830	20.4 4590	3.10	S	12000	18000	0.012 0.026	24.000 0.9449	23.991 0.9445	28.020 1.1031	28.007 1.1026
	24 0.9449	28 1.1024	17 0.669	K24X28X17H	15.4 3460	26.4 5930	4.10	S	12000	18000	0.013 0.029	24.000 0.9449	23.991 0.9445	28.020 1.1031	28.007 1.1026
	24 0.9449	30 1.1811	10 0.394	K24X30X10TN	11.3 2540	13.5 3030	2.05	P	12000	19000	0.008 0.018	24.000 0.9449	23.991 0.9445	30.020 1.1819	30.007 1.1814

(1) Cage material: P: polymer cage, S: steel cage

Radial Needle Roller and Cage Assemblies



Shaft Dia.	F_w	E_w	B_c -0.20 -0.008 -0.55 -0.022	Assembly Designation	Load Ratings Dynamic C	Load Ratings Static C_0	Fatigue Load Limit C_u	Cage material(1) P/S	Speed Ratings Grease	Speed Ratings Oil	Approx. Wt.	Mounting Dimensions S Max.	Mounting Dimensions S Min.	Mounting Dimensions H Max.	Mounting Dimensions H Min.
mm in	mm in	mm in	mm in		kN lbf		kN		min-1		kg lbs	mm in	mm in	mm in	mm in
24 0.9449	24 0.9449	30 1.1811	17 0.669	K24X30X17H	19.8 4450	27.7 6230	4.35	S	12000	19000	0.020 0.044	24.000 0.9449	23.991 0.9445	30.020 1.1819	30.007 1.1814
	24 0.9449	30 1.1811	22 0.866	K24X30X22	25.0 5620	37.3 8390	5.80	S	12000	19000	0.024 0.053	24.000 0.9449	23.991 0.9445	30.020 1.1819	30.007 1.1814
	24 0.9449	36 1.4173	23 0.906	K24X36X23H	37.1 8340	40.1 9010	6.40	S	13000	20000	0.070 0.154	24.000 0.9449	23.991 0.9445	36.025 1.4183	36.009 1.4177
25 0.9843	25 0.9843	29 1.1417	10 0.394	K25X29X10H	9.61 2160	14.6 3280	2.25	S	11000	17000	0.008 0.018	25.000 0.9843	24.991 0.9839	29.020 1.1425	29.007 1.1420
	25 0.9843	29 1.1417	13 0.512	K25X29X13H	12.8 2880	21.1 4740	3.20	S	11000	17000	0.010 0.022	25.000 0.9843	24.991 0.9839	29.020 1.1425	29.007 1.1420
	25 0.9843	29 1.1417	17 0.669	K25X29X17H	15.1 3390	26.2 5890	4.10	S	11000	17000	0.016 0.035	25.000 0.9843	24.991 0.9839	29.020 1.1425	29.007 1.1420
	25 0.9843	30 1.1811	13 0.512	K25X30X13	14.6 3280	21.4 4810	3.25	S	11000	17000	0.012 0.026	25.000 0.9843	24.991 0.9839	30.020 1.1819	30.007 1.1814
	25 0.9843	30 1.1811	17 0.669	K25X30X17H	18.8 4230	29.8 6700	4.60	S	11000	17000	0.016 0.035	25.000 0.9843	24.991 0.9839	30.020 1.1819	30.007 1.1814
	25 0.9843	30 1.1811	18 0.709	K25X30X18	20.6 4630	33.4 7510	5.30	S	11000	17000	0.017 0.037	25.000 0.9843	24.991 0.9839	30.020 1.1819	30.007 1.1814
	25 0.9843	30 1.1811	20 0.787	K25X30X20H	21.9 4920	36.1 8120	5.65	S	11000	17000	0.019 0.042	25.000 0.9843	24.991 0.9839	30.020 1.1819	30.007 1.1814
	25 0.9843	30 1.1811	24 0.945	K25X30X24H	24.8 5580	42.4 9530	6.60	S	11000	17000	0.024 0.053	25.000 0.9843	24.991 0.9839	30.020 1.1819	30.007 1.1814
	25 0.9843	30 1.1811	26 1.024	K25X30X26ZW	23.0 5170	38.6 8680	5.90	S	11000	17000	0.027 0.060	25.000 0.9843	24.991 0.9839	30.020 1.1819	30.007 1.1814
	25 0.9843	31 1.2205	14 0.551	K25X31X14H	16.8 3780	22.7 5100	3.45	S	12000	18000	0.017 0.037	25.000 0.9843	24.991 0.9839	31.025 1.2215	31.009 1.2208
	25 0.9843	31 1.2205	17 0.669	K25X31X17H	19.7 4430	27.8 6250	4.35	S	12000	18000	0.020 0.044	25.000 0.9843	24.991 0.9839	31.025 1.2215	31.009 1.2208
	25 0.9843	31 1.2205	21 0.827	K25X31X21H	25.1 5640	38.0 8540	5.95	S	12000	18000	0.026 0.057	25.000 0.9843	24.991 0.9839	31.025 1.2215	31.009 1.2208
	25 0.9843	31 1.2205	24 0.945	K25X31X24FH	25.3 5690	38.5 8660	6.05	S	12000	18000	0.031 0.068	25.000 0.9843	24.991 0.9839	31.025 1.2215	31.009 1.2208
	25 0.9843	32 1.2598	16 0.63	K25X32X16	19.8 4450	25.3 5690	4.00	S	12000	18000	0.027 0.060	25.000 0.9843	24.991 0.9839	32.025 1.2608	32.009 1.2602

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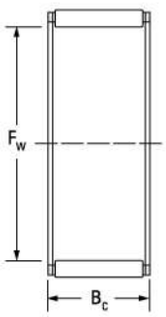
NEEDLE ROLLER BEARINGS

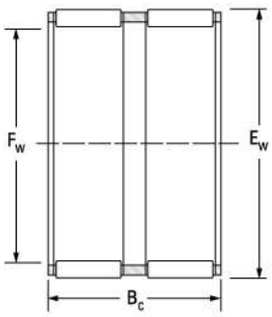
SINGLE-ROW, DOUBLE-ROW ASSEMBLIES

METRIC SERIES
K, K ZW SERIES

B



K

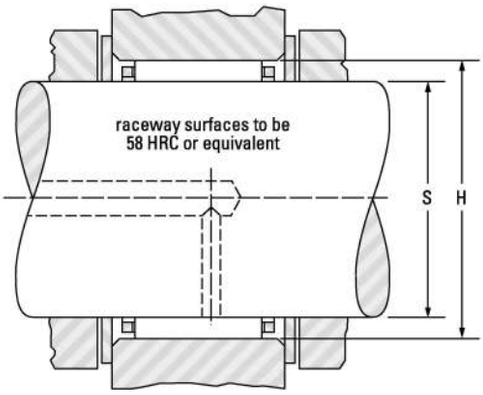


K ZW

Shaft Dia.	F_w	E_w	B_c -0.20 -0.008 -0.55 -0.022	Assembly Designation	Load Ratings Dynamic C	Load Ratings Static C_0	Fatigue Load Limit C_u	Cage material(1) P/S	Speed Ratings Grease	Speed Ratings Oil	Approx. Wt.	Mounting Dimensions S Max.	S Min.	H Max.	H Min.
mm in	mm in	mm in	mm in		kN lbf		kN		min^{-1}		kg lbs	mm in	mm in	mm in	mm in
25 0.9843	25 0.9843	33 1.2992	20 0.787	K25X33X20H	28.8 6470	37.6 8450	5.95	S	12000	18000	0.035 0.077	25.000 0.9843	24.991 0.9839	33.025 1.3002	33.009 1.2996
	25 0.9843	33 1.2992	24 0.945	K25X33X24H	32.3 7260	43.5 9780	6.85	S	12000	18000	0.038 0.084	25.000 0.9843	24.991 0.9839	33.025 1.3002	33.009 1.2996
	25 0.9843	33 1.2992	25 0.984	K25X33X25H	33.0 7420	44.6 10030	7.00	S	12000	18000	0.041 0.090	25.000 0.9843	24.991 0.9839	33.025 1.3002	33.009 1.2996
	25 0.9843	35 1.378	23.7 0.933	K25X35X23,7H	35.9 8070	42.3 9510	6.90	S	12000	19000	0.050 0.110	25.000 0.9843	24.991 0.9839	35.025 1.3789	35.009 1.3783
	25 0.9843	35 1.378	25 0.984	K25X35X25H	37.8 8500	46.2 10390	7.25	S	12000	19000	0.054 0.119	25.000 0.9843	24.991 0.9839	35.025 1.3789	35.009 1.3783
	25 0.9843	35 1.378	30 1.181	K25X35X30H	44.6 10030	57.2 12860	9.00	S	12000	19000	0.060 0.132	25.000 0.9843	24.991 0.9839	35.025 1.3789	35.009 1.3783
	25 0.9843	35 1.378	36 1.417	K25X35X36H	52.4 11780	70.4 15830	11.0	S	12000	19000	0.074 0.163	25.000 0.9843	24.991 0.9839	35.025 1.3789	35.009 1.3783
	25 0.9843	37 1.4567	20 0.787	K25X37X20H	32.5 7310	34.1 7670	5.45	S	12000	19000	0.055 0.121	25.000 0.9843	24.991 0.9839	37.025 1.4577	37.009 1.4570
26 1.0236	26 1.0236	30 1.1811	10 0.394	K26X30X10F	9.46 2130	14.5 3260	2.20	S	11000	16000	0.007 0.015	26.000 1.0236	25.991 1.0233	30.020 1.1819	30.007 1.1814
	26 1.0236	30 1.1811	13 0.512	K26X30X13	12.3 2770	20.4 4590	3.10	S	10000	16000	0.011 0.024	26.000 1.0236	25.991 1.0233	30.020 1.1819	30.007 1.1814
	26 1.0236	30 1.1811	17 0.669	K26X30X17	15.0 3370	26.3 5910	3.10	S	10000	16000	0.014 0.031	26.000 1.0236	25.991 1.0233	30.020 1.1819	30.007 1.1814
	26 1.0236	30 1.1811	22 0.866	K26X30X22ZW	16.7 3750	30.2 6790	4.60	S	10000	16000	0.018 0.040	26.000 1.0236	25.991 1.0233	30.020 1.1819	30.007 1.1814
28 1.1024	28 1.1024	32 1.2598	21 0.827	K28X32X21F	18.7 4200	35.7 8030	5.55	S	9900	15000	0.018 0.040	28.000 1.1024	27.991 1.1020	32.025 1.2608	32.009 1.2602
	28 1.1024	33 1.2992	13 0.512	K28X33X13F	14.1 3170	21.4 4810	3.25	S	10000	15000	0.015 0.033	28.000 1.1024	27.991 1.1020	33.025 1.3002	33.009 1.2996
	28 1.1024	33 1.2992	17 0.669	K28X33X17H	19.8 4450	33.0 7420	5.10	S	10000	15000	0.018 0.040	28.000 1.1024	27.991 1.1020	33.025 1.3002	33.009 1.2996
	28 1.1024	33 1.2992	27 1.063	K28X33X27	29.0 6520	53.8 12090	8.30	S	10000	15000	0.027 0.060	28.000 1.1024	27.991 1.1020	33.025 1.3002	33.009 1.2996
	28 1.1024	34 1.3386	17 0.669	K28X34X17	21.1 4740	31.5 7080	6.30	S	10000	16000	0.022 0.049	28.000 1.1024	27.991 1.1020	34.025 1.3396	34.009 1.3389

(1) Cage material: P: polymer cage, S: steel cage

Radial Needle Roller and Cage Assemblies



Shaft Dia.	F_w	E_w	B_c -0.20 -0.008 -0.55 -0.022	Assembly Designation	Load Ratings Dynamic C	Load Ratings Static C_0	Fatigue Load Limit C_u	Cage material(1) P/S	Speed Ratings Grease	Speed Ratings Oil	Approx. Wt.	Mounting Dimensions S Max.	Mounting Dimensions S Min.	Mounting Dimensions H Max.	Mounting Dimensions H Min.
mm in	mm in	mm in	mm in		kN lbf		kN		min-1		kg lbs	mm in	mm in	mm in	mm in
28 1.1024	28 1.1024	34 1.3386	20 0.787	K28X34X20H	24.4 5490	37.8 8500	7.65	S	10000	16000	0.025 0.055	28.000 1.1024	27.991 1.1020	34.025 1.3396	34.009 1.3389
	28 1.1024	35 1.378	15 0.591	K28X35X15H	19.5 4380	25.6 5760	3.95	S	10000	16000	0.025 0.055	28.000 1.1024	27.991 1.1020	35.025 1.3789	35.009 1.3783
	28 1.1024	35 1.378	16 0.63	K28X35X16H	21.5 4830	29.1 6540	4.60	S	10000	16000	0.026 0.057	28.000 1.1024	27.991 1.1020	35.025 1.3789	35.009 1.3783
	28 1.1024	35 1.378	27 1.063	K28X35X27H	35.2 7910	54.7 12300	8.50	S	10000	16000	0.042 0.093	28.000 1.1024	27.991 1.1020	35.025 1.3789	35.009 1.3783
	28 1.1024	36 1.4173	20 0.787	K28X36X20FV	27.8 6250	37.0 8320	5.95	S	10000	16000	0.039 0.086	28.000 1.1024	27.991 1.1020	36.025 1.4183	36.009 1.4177
	28 1.1024	38 1.4961	25 1.004	K28X38X25,5	40.9 9190	52.7 11850	8.25	S	11000	16000	0.059 0.130	28.000 1.1024	27.991 1.1020	38.025 1.4970	38.009 1.4964
	28 1.1024	40 1.5748	18 0.709	K28X40X18H	33.6 7550	36.5 8210	5.90	S	11000	17000	0.060 0.132	28.000 1.1024	27.991 1.1020	40.025 1.5758	40.009 1.5752
	28 1.1024	40 1.5748	25 0.984	K28X40X25H	45.5 10230	54.0 12140	8.55	S	11000	17000	0.072 0.159	28.000 1.1024	27.991 1.1020	40.025 1.5758	40.009 1.5752
	28 1.1024	40 1.5748	30 1.181	K28X40X30H	54.3 12210	67.8 15240	10.7	S	11000	17000	0.100 0.220	28.000 1.1024	27.991 1.1020	40.025 1.5758	40.009 1.5752
	28 1.1024	41 1.6142	25 0.984	K28X41X25H	49.2 11060	57.1 12840	9.05	S	11000	17000	0.082 0.181	28.000 1.1024	27.991 1.1020	41.025 1.6152	41.009 1.6145
29 1.1417	29 1.1417	34 1.3386	27 1.063	K29X34X27F	28.9 6500	54.0 12140	8.40	S	9700	15000	0.033 0.073	29.000 1.1417	28.991 1.1414	34.025 1.3396	34.009 1.3389
30 1.1811	30 1.1811	34 1.3386	13 0.512	K30X34X13	13.5 3030	24.1 5420	3.65	S	9200	14000	0.011 0.024	30.000 1.1811	29.991 1.1807	34.025 1.3396	34.009 1.3389
	30 1.1811	35 1.378	13 0.512	K30X35X13H	15.6 3510	24.9 5600	3.80	S	9300	14000	0.017 0.037	30.000 1.1811	29.991 1.1807	35.025 1.3789	35.009 1.3783
	30 1.1811	35 1.378	17 0.669	K30X35X17H	20.2 4540	34.6 7780	5.35	S	9300	14000	0.022 0.049	30.000 1.1811	29.991 1.1807	35.025 1.3789	35.009 1.3783
	30 1.1811	35 1.378	20 0.787	K30X35X20H	23.5 5280	41.9 9420	6.55	S	9300	14000	0.023 0.051	30.000 1.1811	29.991 1.1807	35.025 1.3789	35.009 1.3783
	30 1.1811	35 1.378	22.8 0.898	K30X35X23F	25.6 5760	46.8 10520	7.40	S	9300	14000	0.028 0.062	30.000 1.1811	29.991 1.1807	35.025 1.3789	35.009 1.3783
	30 1.1811	35 1.378	27 1.063	K30X35X27H	30.6 6880	59.0 13260	9.10	S	9300	14000	0.032 0.071	30.000 1.1811	29.991 1.1807	35.025 1.3789	35.009 1.3783

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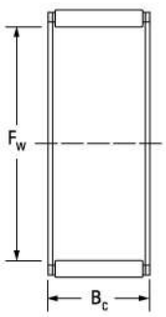
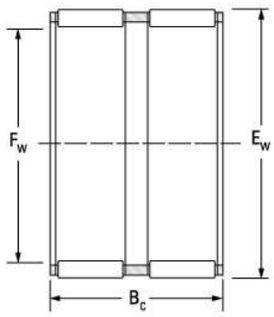
NEEDLE ROLLER BEARINGS

SINGLE-ROW, DOUBLE-ROW ASSEMBLIES

METRIC SERIES
K, K ZW SERIES



K

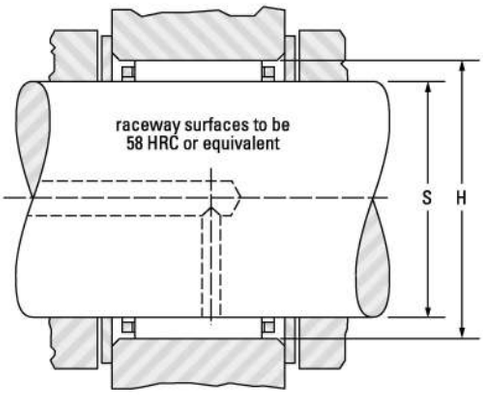


K ZW

Shaft Dia.	F_w	E_w	B_c -0.20 -0.008 -0.55 -0.022	Assembly Designation	Load Ratings Dynamic C	Load Ratings Static C_0	Fatigue Load Limit C_u	Cage material(1) P/S	Speed Ratings Grease	Speed Ratings Oil	Approx. Wt.	Mounting Dimensions S Max.	Mounting Dimensions S Min.	Mounting Dimensions H Max.	Mounting Dimensions H Min.
mm in	mm in	mm in	mm in		kN lbf		kN		min^{-1}		kg lbs	mm in	mm in	mm in	mm in
30 1.1811	30 1.1811	35 1.378	27 1.063	K30X35X27HZW	19.9 4470	33.6 7550	5.10	S	9300	14000	0.033 0.073	30.000 1.1811	29.991 1.1807	35.025 1.3789	35.009 1.3783
	30 1.1811	36 1.4173	14 0.551	K30X36X14	18.0 4050	26.2 5890	4.00	S	9500	15000	0.020 0.044	30.000 1.1811	29.991 1.1807	36.025 1.4183	36.009 1.4177
	30 1.1811	37 1.4567	17.8 0.701	K30X37X18	24.3 5460	34.8 7820	6.00	S	9600	15000	0.033 0.073	30.000 1.1811	29.991 1.1807	37.025 1.4577	37.009 1.4570
	30 1.1811	40 1.5748	30 1.181	K30X40X30H	49.2 11060	67.8 15240	10.6	S	9900	15000	0.077 0.170	30.000 1.1811	29.991 1.1807	40.025 1.5758	40.009 1.5752
	30 1.1811	42 1.6535	30 1.181	K30X42X30H	54.2 12180	68.6 15420	10.8	S	10000	16000	0.096 0.212	30.000 1.1811	29.991 1.1807	42.025 1.6545	42.009 1.6539
	30 1.1811	44 1.7323	26 1.024	K30X44X26H	52.4 11780	59.9 13470	9.55	S	10000	16000	0.095 0.209	30.000 1.1811	29.991 1.1807	44.025 1.7333	44.009 1.7326
32 1.2598	32 1.2598	36 1.4173	15 0.591	K32X36X15F	11.6 2610	20.2 4540	3.10	S	8600	13000	0.015 0.033	32.000 1.2598	31.989 1.2594	36.025 1.4183	36.009 1.4177
	32 1.2598	37 1.4567	13 0.512	K32X37X13	15.2 3420	24.4 5490	4.00	S	8700	13000	0.018 0.040	32.000 1.2598	31.989 1.2594	37.025 1.4577	37.009 1.4570
	32 1.2598	37 1.4567	17 0.669	K32X37X17H	20.0 4500	34.8 7820	5.40	S	8700	13000	0.020 0.044	32.000 1.2598	31.989 1.2594	37.025 1.4577	37.009 1.4570
	32 1.2598	37 1.4567	27 1.063	K32X37X27	29.3 6590	56.8 12770	8.85	S	8700	13000	0.035 0.077	32.000 1.2598	31.989 1.2594	37.025 1.4577	37.009 1.4570
	32 1.2598	38 1.4961	20 0.787	K32X38X20H	27.3 6140	45.7 10270	7.15	S	8800	14000	0.030 0.066	32.000 1.2598	31.989 1.2594	38.025 1.4970	38.009 1.4964
	32 1.2598	38 1.4961	26 1.024	K32X38X26H	33.2 7460	58.8 13220	9.15	S	8800	14000	0.037 0.082	32.000 1.2598	31.989 1.2594	38.025 1.4970	38.009 1.4964
	32 1.2598	39 1.5354	16 0.63	K32X39X16H	23.0 5170	33.0 7420	5.20	S	8900	14000	0.030 0.066	32.000 1.2598	31.989 1.2594	39.025 1.5364	39.009 1.5358
	32 1.2598	39 1.5354	18 0.709	K32X39X18H	25.8 5800	38.2 8590	6.05	S	8900	14000	0.033 0.073	32.000 1.2598	31.989 1.2594	39.025 1.5364	39.009 1.5358
	32 1.2598	40 1.5748	25 0.984	K32X40X25H	37.9 8520	57.2 12860	8.90	S	9000	14000	0.052 0.115	32.000 1.2598	31.989 1.2594	40.025 1.5758	40.009 1.5752
	32 1.2598	40 1.5748	36 1.417	K32X40X36H	52.3 11760	86.4 19420	13.6	S	9000	14000	0.080 0.176	32.000 1.2598	31.989 1.2594	40.025 1.5758	40.009 1.5752
	32 1.2598	42 1.6535	42 1.654	K32X42X42H	69.2 15560	108 24280	17.1	S	9200	14000	0.110 0.243	32.000 1.2598	31.989 1.2594	42.025 1.6545	42.009 1.6539

(1) Cage material: P: polymer cage, S: steel cage

Radial Needle Roller and Cage Assemblies



Shaft Dia.	F_w	E_w	B_c	Assembly Designation	Load Ratings		Fatigue Load Limit C_u	Cage material[1] P/S	Speed Ratings		Approx. Wt.	Mounting Dimensions			
					Dynamic	Static						S		H	
			-0.20 -0.008 -0.55 -0.022		C	C_0			Grease	Oil		Max.	Min.	Max.	Min.
mm in	mm in	mm in	mm in		kN lbf		kN		min^{-1}		kg lbs	mm in	mm in	mm in	mm in
32 1.2598	32 1.2598	46 1.811	18 0.709	K32X46X18H	39.2 8810	41.9 9420	6.80	S	9600	15000	0.075 0.165	32.000 1.2598	31.989 1.2594	46.025 1.8120	46.009 1.8114
	32 1.2598	46 1.811	32 1.26	K32X46X32H	67.0 15060	83.4 18750	13.1	S	9600	15000	0.140 0.309	32.000 1.2598	31.989 1.2594	46.025 1.8120	46.009 1.8114
	32 1.2598	46 1.811	40 1.575	K32X46X40H	81.7 18370	108 24280	12.2	S	9600	15000	0.158 0.348	32.000 1.2598	31.989 1.2594	46.025 1.8120	46.009 1.8114
33 1.2992	33 1.2992	51 2.0079	23 0.906	K33X51X23H	55.9 12570	57.6 12950	9.35	S	9600	15000	0.140 0.309	33.000 1.2992	32.989 1.2988	51.029 2.0090	51.010 2.0083
34 1.3386	34 1.3386	38 1.4961	11 0.433	K34X38X11	12.2 2740	21.9 4920	3.35	S	8100	12000	0.011 0.024	34.000 1.3386	33.989 1.3381	38.025 1.4970	38.009 1.4964
	34 1.3386	44 1.7323	26 1.024	K34X44X26FH	42.9 9640	58.9 13240	9.40	S	8600	13000	0.080 0.176	34.000 1.3386	33.989 1.3381	44.025 1.7333	44.009 1.7326
35 1.3780	35 1.378	40 1.5748	13 0.512	K35X40X13H	16.2 3640	27.2 6110	4.15	S	7900	12000	0.018 0.040	35.000 1.3780	34.989 1.3775	40.025 1.5758	40.009 1.5752
	35 1.378	40 1.5748	17 0.669	K35X40X17H	22.1 4970	40.8 9170	6.35	S	7900	12000	0.025 0.055	35.000 1.3780	34.989 1.3775	40.025 1.5758	40.009 1.5752
	35 1.378	40 1.5748	19 0.748	K35X40X19H	23.2 5220	43.2 9710	6.80	S	7900	12000	0.025 0.055	35.000 1.3780	34.989 1.3775	40.025 1.5758	40.009 1.5752
	35 1.378	40 1.5748	25 0.984	K35X40X25H	28.4 6380	56.2 12630	8.70	S	7900	12000	0.035 0.077	35.000 1.3780	34.989 1.3775	40.025 1.5758	40.009 1.5752
	35 1.378	40 1.5748	27 1.063	K35X40X27H	29.8 6700	59.6 13400	9.20	S	7900	12000	0.037 0.082	35.000 1.3780	34.989 1.3775	40.025 1.5758	40.009 1.5752
	35 1.378	42 1.6535	16 0.63	K35X42X16AH	24.5 5510	36.8 8270	5.80	S	8100	12000	0.031 0.068	35.000 1.3780	34.989 1.3775	42.025 1.6545	42.009 1.6539
	35 1.378	42 1.6535	18 0.709	K35X42X18	27.5 6180	42.6 9580	6.75	S	8100	12000	0.035 0.077	35.000 1.3780	34.989 1.3775	42.025 1.6545	42.009 1.6539
	35 1.378	42 1.6535	20 0.787	K35X42X20H	30.4 6830	48.5 10900	7.65	S	8100	12000	0.037 0.082	35.000 1.3780	34.989 1.3775	42.025 1.6545	42.009 1.6539
	35 1.378	42 1.6535	30 1.181	K35X42X30FH	40.5 9100	70.0 15740	10.9	S	8100	12000	0.061 0.134	35.000 1.3780	34.989 1.3775	42.025 1.6545	42.009 1.6539
	35 1.378	45 1.7717	20 0.787	K35X45X20FH	36.5 8210	49.9 11220	8.00	S	8400	13000	0.059 0.130	35.000 1.3780	34.989 1.3775	45.025 1.7726	45.009 1.7720
	35 1.378	45 1.7717	30 1.181	K35X45X30F	51.2 11510	74.5 16750	11.7	S	8400	13000	0.100 0.220	35.000 1.3780	34.989 1.3775	45.025 1.7726	45.009 1.7720

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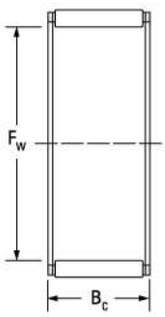
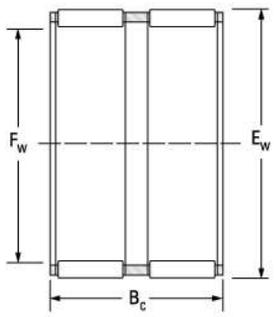
NEEDLE ROLLER BEARINGS

SINGLE-ROW, DOUBLE-ROW ASSEMBLIES

METRIC SERIES
K, K ZW SERIES



K

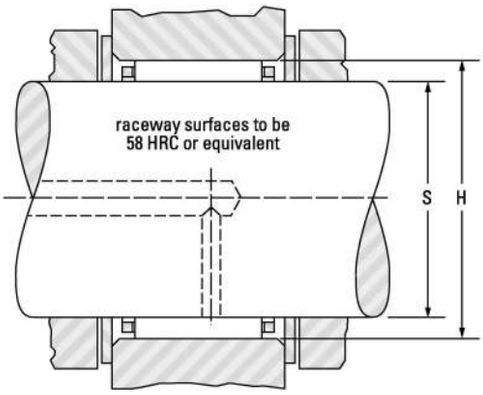


K ZW

Shaft Dia.	F_w	E_w	B_c -0.20 -0.008 -0.55 -0.022	Assembly Designation	Load Ratings Dynamic C	Load Ratings Static C_0	Fatigue Load Limit C_u	Cage material(1) P/S	Speed Ratings Grease	Speed Ratings Oil	Approx. Wt.	Mounting Dimensions S Max.	Mounting Dimensions S Min.	Mounting Dimensions H Max.	Mounting Dimensions H Min.
mm in	mm in	mm in	mm in		kN lbf		kN		min^{-1}		kg lbs	mm in	mm in	mm in	mm in
35 1.3780	35 1.378	45 1.7717	35 1.378	K35X45X35H	62.1 13960	95.5 21470	15.0	S	8400	13000	0.085 0.187	35.000 1.3780	34.989 1.3775	45.025 1.7726	45.009 1.7720
	35 1.378	45 1.7717	41 1.614	K35X45X41	70.8 15920	113 25400	17.7	S	8400	13000	0.120 0.265	35.000 1.3780	34.989 1.3775	45.025 1.7726	45.009 1.7720
	35 1.378	45 1.7717	49 1.929	K35X45X49H	82.5 18550	138 31020	21.4	S	8400	13000	0.143 0.315	35.000 1.3780	34.989 1.3775	45.025 1.7726	45.009 1.7720
	35 1.378	45 1.7717	49 1.929	K35X45X49HZW	71.8 16140	115 25850	18.1	S	8400	13000	0.143 0.315	35.000 1.3780	34.989 1.3775	45.025 1.7726	45.009 1.7720
	35 1.378	50 1.9685	23 0.906	K35X50X23H	53.0 11910	60.3 13550	9.75	S	8700	13000	0.110 0.242	35.000 1.3780	34.989 1.3775	50.025 1.9695	50.009 1.9689
	35 1.378	50 1.9685	40 1.575	K35X50X40F	79.7 17920	102 22930	16.2	S	8700	13000	0.200 0.441	35.000 1.3780	34.989 1.3775	50.025 1.9695	50.009 1.9689
36 1.4173	36 1.4173	40 1.5748	29 1.142	K36X40X29TN	21.2 4770	45.2 10160	7.15	P	7600	12000	0.029 0.064	36.000 1.4173	35.989 1.4169	40.025 1.5758	40.009 1.5752
	36 1.4173	42 1.6535	16 0.63	K36X42X16	22.8 5130	37.7 8480	5.95	S	7800	12000	0.027 0.060	36.000 1.4173	35.989 1.4169	42.025 1.6545	42.009 1.6539
37 1.4567	37 1.4567	42 1.6535	13 0.512	K37X42X13H	16.9 3800	29.4 6610	4.50	S	7500	11000	0.017 0.037	37.000 1.4567	36.989 1.4563	42.025 1.6545	42.009 1.6539
	37 1.4567	42 1.6535	17 0.669	K37X42X17H	21.9 4920	41.0 9220	6.35	S	7500	11000	0.025 0.055	37.000 1.4567	36.989 1.4563	42.025 1.6545	42.009 1.6539
	37 1.4567	42 1.6535	27 1.063	K37X42X27F	32.1 7220	66.9 15040	10.4	S	7500	11000	0.039 0.086	37.000 1.4567	36.989 1.4563	42.025 1.6545	42.009 1.6539
	37 1.4567	44 1.7323	19 0.748	K37X44X19H	29.7 6680	48.0 10790	7.65	S	7600	12000	0.039 0.086	37.000 1.4567	36.989 1.4563	44.025 1.7333	44.009 1.7326
38 1.4961	38 1.4961	41 1.6142	9 0.354	K38X41X9TN	5.93 1330	11.0 2470	1.65	P	7100	11000	0.004 0.009	38.000 1.4961	37.989 1.4956	41.025 1.6152	41.009 1.6145
	38 1.4961	43 1.6929	17 0.669	K38X43X17H	21.8 4900	41.0 9220	6.35	S	7300	11000	0.032 0.071	38.000 1.4961	37.989 1.4956	43.025 1.6939	43.009 1.6933
	38 1.4961	43 1.6929	27 1.063	K38X43X27	31.9 7170	67.0 15060	10.4	S	7300	11000	0.041 0.090	38.000 1.4961	37.989 1.4956	43.025 1.6939	43.009 1.6933
	38 1.4961	46 1.811	19.8 0.78	K38X46X20H	33.3 7490	51.0 11470	8.10	S	7500	12000	0.055 0.121	38.000 1.4961	37.989 1.4956	46.025 1.8120	46.009 1.8114
	38 1.4961	46 1.811	32 1.26	K38X46X32H	55.2 12410	98.1 22050	15.3	S	7500	12000	0.090 0.198	38.000 1.4961	37.989 1.4956	46.025 1.8120	46.009 1.8114

(1) Cage material: P: polymer cage, S: steel cage

Radial Needle Roller and Cage Assemblies



Shaft Dia.	F_w	E_w	B_c -0.20 -0.008 -0.55 -0.022	Assembly Designation	Load Ratings Dynamic C	Load Ratings Static C_0	Fatigue Load Limit C_u	Cage material(1) P/S	Speed Ratings Grease	Speed Ratings Oil	Approx. Wt.	Mounting Dimensions S Max.	Mounting Dimensions S Min.	Mounting Dimensions H Max.	Mounting Dimensions H Min.
mm in	mm in	mm in	mm in		kN lbf		kN		min-1		kg lbs	mm in	mm in	mm in	mm in
38 1.4961	38 1.4961	50 1.9685	25 0.984	K38X50X25	53.0 11910	70.8 15920	11.2	S	7800	12000	0.100 0.220	38.000 1.4961	37.989 1.4956	50.025 1.9695	50.009 1.9689
	38 1.4961	50 1.9685	33 1.299	K38X50X33H	68.3 15350	98.2 22080	15.4	S	7800	12000	0.126 0.278	38.000 1.4961	37.989 1.4956	50.025 1.9695	50.009 1.9689
	38 1.4961	50 1.9685	40 1.575	K38X50X40FH	76.2 17130	113 25400	17.8	S	7800	12000	0.170 0.375	38.000 1.4961	37.989 1.4956	50.025 1.9695	50.009 1.9689
40 1.5748	40 1.5748	45 1.7717	13 0.512	K40X45X13H	17.6 3960	31.7 7130	4.80	S	6900	11000	0.022 0.049	40.000 1.5748	39.989 1.5744	45.025 1.7726	45.009 1.7720
	40 1.5748	45 1.7717	18 0.709	K40X45X18H	25.1 5640	50.4 11330	8.00	S	6900	11000	0.031 0.068	40.000 1.5748	39.989 1.5744	45.025 1.7726	45.009 1.7720
	40 1.5748	45 1.7717	21 0.827	K40X45X21H	23.3 5240	45.2 10160	8.50	S	6900	11000	0.033 0.073	40.000 1.5748	39.989 1.5744	45.025 1.7726	45.009 1.7720
	40 1.5748	45 1.7717	27 1.063	K40X45X27H	32.7 7350	70.2 15780	10.8	S	6900	11000	0.040 0.088	40.000 1.5748	39.989 1.5744	45.025 1.7726	45.009 1.7720
	40 1.5748	45 1.7717	27 1.063	K40X45X27TN	33.3 7490	72.1 16210	11.2	P	6900	11000	0.030 0.066	40.000 1.5748	39.989 1.5744	45.025 1.7726	45.009 1.7720
	40 1.5748	45 1.7717	29 1.142	K40X45X29H	34.7 7800	75.9 17060	11.7	S	6900	11000	0.050 0.110	40.000 1.5748	39.989 1.5744	45.025 1.7726	45.009 1.7720
	40 1.5748	46 1.811	17 0.669	K40X46X17	25.2 5670	44.0 9890	6.95	S	7000	11000	0.033 0.073	40.000 1.5748	39.989 1.5744	46.025 1.8120	46.009 1.8114
	40 1.5748	47 1.8504	18 0.709	K40X47X18	28.0 6290	45.6 10250	7.25	S	7000	11000	0.041 0.090	40.000 1.5748	39.989 1.5744	47.025 1.8514	47.009 1.8507
	40 1.5748	47 1.8504	20 0.787	K40X47X20	31.1 6990	52.1 11710	8.25	S	7000	11000	0.042 0.093	40.000 1.5748	39.989 1.5744	47.025 1.8514	47.009 1.8507
	40 1.5748	48 1.8898	20 0.787	K40X48X20FV1	35.5 7980	56.3 12660	8.45	S	7100	11000	0.052 0.115	40.000 1.5748	39.989 1.5744	48.025 1.8907	48.009 1.8901
	40 1.5748	48 1.8898	20 0.787	K40X48X20H	35.5 7980	56.3 12660	8.95	S	7100	11000	0.050 0.110	40.000 1.5748	39.989 1.5744	48.025 1.8907	48.009 1.8901
	40 1.5748	48 1.8898	35 1.378	K40X48X35H	57.3 12880	104 23380	16.3	S	7100	11000	0.098 0.216	40.000 1.5748	39.989 1.5744	48.025 1.8907	48.009 1.8901
	40 1.5748	50 1.9685	27 1.063	K40X50X27H	53.0 11910	81.0 18210	12.7	S	7200	11000	0.084 0.185	40.000 1.5748	39.989 1.5744	50.025 1.9695	50.009 1.9689
	40 1.5748	55 2.1654	45 1.772	K40X55X45H	103 23160	146 32820	23.0	S	7500	12000	0.221 0.487	40.000 1.5748	39.989 1.5744	55.029 2.1665	55.010 2.1657

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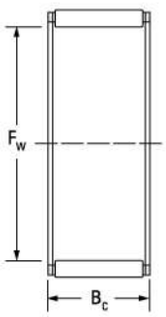
NEEDLE ROLLER BEARINGS

SINGLE-ROW, DOUBLE-ROW ASSEMBLIES

METRIC SERIES
K, K ZW SERIES

B



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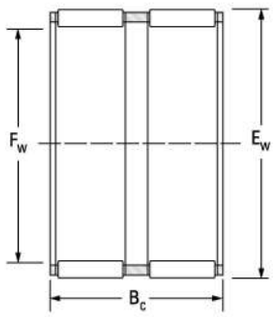
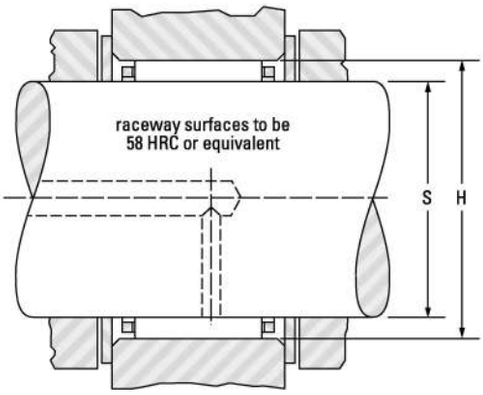


K ZW

Shaft Dia.	F_w	E_w	B_c -0.20 -0.008 -0.55 -0.022	Assembly Designation	Load Ratings Dynamic C	Load Ratings Static C_0	Fatigue Load Limit C_u	Cage material(1) P/S	Speed Ratings Grease	Speed Ratings Oil	Approx. Wt.	Mounting Dimensions S Max.	Mounting Dimensions S Min.	Mounting Dimensions H Max.	Mounting Dimensions H Min.
mm in	mm in	mm in	mm in		kN lbf		kN		min^{-1}		kg lbs	mm in	mm in	mm in	mm in
40 1.5748	40 1.5748	56 2.2047	26 1.024	K40X56X26H	63.7 14320	75.7 17020	12.0	S	7600	12000	0.138 0.304	40.000 1.5748	39.989 1.5744	56.029 2.2059	56.010 2.2051
41 1.6142	41 1.6142	48 1.8898	31 1.22	K41X48X31HZW	38.0 8540	68.1 15310	10.6	S	6800	11000	0.067 0.148	41.000 1.6142	40.989 1.6137	48.025 1.8907	48.009 1.8901
42 1.6535	42 1.6535	47 1.8504	13 0.512	K42X47X13H	18.7 4200	34.9 7850	5.30	S	6500	10000	0.027 0.060	42.000 1.6535	41.989 1.6531	47.025 1.8514	47.009 1.8507
	42 1.6535	47 1.8504	17 0.669	K42X47X17H	22.8 5130	45.2 10160	7.30	S	6500	10000	0.028 0.062	42.000 1.6535	41.989 1.6531	47.025 1.8514	47.009 1.8507
	42 1.6535	47 1.8504	27 1.063	K42X47X27H	33.8 7600	74.7 16790	11.6	S	6500	10000	0.041 0.090	42.000 1.6535	41.989 1.6531	47.025 1.8514	47.009 1.8507
	42 1.6535	48 1.8898	24 0.945	K42X48X24F	33.1 7440	63.9 14370	10.1	S	6600	10000	0.046 0.101	42.000 1.6535	41.989 1.6531	48.025 1.8907	48.009 1.8901
	42 1.6535	50 1.9685	13 0.512	K42X50X13H	20.9 4700	28.9 6500	4.45	S	6700	10000	0.035 0.077	42.000 1.6535	41.989 1.6531	50.025 1.9695	50.009 1.9689
	42 1.6535	50 1.9685	20 0.787	K42X50X20H	35.2 7910	56.6 12720	9.00	S	6700	10000	0.054 0.119	42.000 1.6535	41.989 1.6531	50.025 1.9695	50.009 1.9689
	42 1.6535	50 1.9685	30 1.181	K42X50X30H	51.3 11530	91.9 20660	14.4	S	6700	10000	0.080 0.176	42.000 1.6535	41.989 1.6531	50.025 1.9695	50.009 1.9689
43 1.6929	43 1.6929	48 1.8898	17 0.669	K43X48X17FH	23.0 5170	45.8 10300	6.85	S	6400	9800	0.036 0.079	43.000 1.6929	42.989 1.6925	48.025 1.8907	48.009 1.8901
	43 1.6929	48 1.8898	27 1.063	K43X48X27H	34.8 7820	78.0 17540	12.1	S	6400	9800	0.050 0.110	43.000 1.6929	42.989 1.6925	48.025 1.8907	48.009 1.8901
44 1.7323	44 1.7323	50 1.9685	22 0.866	K44X50X22H	31.6 7100	60.6 13620	9.45	S	6400	9900	0.046 0.101	44.000 1.7323	43.989 1.7319	50.025 1.9695	50.009 1.9689
	44 1.7323	50 1.9685	30 1.201	K44X50X30,5HZW	35.5 7980	70.5 15850	10.7	S	6400	9900	0.068 0.150	44.000 1.7323	43.989 1.7319	50.025 1.9695	50.009 1.9689
45 1.7717	45 1.7717	50 1.9685	13 0.512	K45X50X13H	18.4 4140	35.1 7890	5.35	S	6100	9400	0.022 0.049	45.000 1.7717	44.989 1.7712	50.025 1.9695	50.009 1.9689
	45 1.7717	50 1.9685	15 0.591	K45X50X15H	19.4 4360	37.3 8390	5.75	S	6100	9400	0.028 0.062	45.000 1.7717	44.989 1.7712	50.025 1.9695	50.009 1.9689
	45 1.7717	50 1.9685	17 0.669	K45X50X17H	24.9 5600	51.8 11650	8.05	S	6100	9400	0.030 0.066	45.000 1.7717	44.989 1.7712	50.025 1.9695	50.009 1.9689
	45 1.7717	50 1.9685	20 0.787	K45X50X20F	27.0 6070	57.4 12900	9.00	S	6100	9400	0.040 0.088	45.000 1.7717	44.989 1.7712	50.025 1.9695	50.009 1.9689

(1) Cage material: P: polymer cage, S: steel cage

Radial Needle Roller and Cage Assemblies



Shaft Dia.	F_w	E_w	B_c -0.20 -0.008 -0.55 -0.022	Assembly Designation	Load Ratings Dynamic C	Load Ratings Static C_0	Fatigue Load Limit C_u	Cage material(1) P/S	Speed Ratings Grease	Speed Ratings Oil	Approx. Wt.	Mounting Dimensions S Max.	Mounting Dimensions S Min.	Mounting Dimensions H Max.	Mounting Dimensions H Min.
mm in	mm in	mm in	mm in		kN lbf		kN		min-1		kg lbs	mm in	mm in	mm in	mm in
45 1.7717	45 1.7717	50 1.9685	21 0.827	K45X50X21CH	24.6 5530	50.4 11330	7.85	S	6100	9400	0.036 0.079	45.000 1.7717	44.989 1.7712	50.025 1.9695	50.009 1.9689
	45 1.7717	50 1.9685	27 1.063	K45X50X27FH	34.2 7690	77.4 17400	12.0	S	6100	9400	0.043 0.095	45.000 1.7717	44.989 1.7712	50.025 1.9695	50.009 1.9689
	45 1.7717	50 1.9685	27 1.063	K45X50X27TN	31.8 7150	70.7 15890	11.0	P	6100	9400	0.048 0.106	45.000 1.7717	44.989 1.7712	50.025 1.9695	50.009 1.9689
	45 1.7717	52 2.0472	18 0.709	K45X52X18H	30.1 6770	52.0 11690	8.25	S	6200	9500	0.045 0.099	45.000 1.7717	44.989 1.7712	52.029 2.0484	52.010 2.0476
	45 1.7717	52 2.0472	21 0.827	K45X52X21F	35.0 7870	63.2 14210	9.90	S	6200	9500	0.055 0.121	45.000 1.7717	44.989 1.7712	52.029 2.0484	52.010 2.0476
	45 1.7717	53 2.0866	20 0.787	K45X53X20H	36.0 8090	59.5 13380	9.45	S	6200	9600	0.054 0.119	45.000 1.7717	44.989 1.7712	53.029 2.0878	53.010 2.0870
	45 1.7717	53 2.0866	24.8 0.976	K45X53X25H	45.9 10320	81.5 18320	12.7	S	6200	9600	0.072 0.159	45.000 1.7717	44.989 1.7712	53.029 2.0878	53.010 2.0870
	45 1.7717	53 2.0866	25 0.984	K45X53X25F	42.5 9550	73.7 16570	11.7	S	6200	9600	0.075 0.165	45.000 1.7717	44.989 1.7712	53.029 2.0878	53.010 2.0870
	45 1.7717	53 2.0866	28 1.102	K45X53X28H	49.3 11080	89.2 20050	13.9	S	6200	9600	0.078 0.172	45.000 1.7717	44.989 1.7712	53.029 2.0878	53.010 2.0870
	45 1.7717	55 2.1654	20 0.787	K45X55X20H	42.0 9440	62.2 13980	10.0	S	6400	9800	0.074 0.163	45.000 1.7717	44.989 1.7712	55.029 2.1665	55.010 2.1657
	45 1.7717	59 2.3228	18 0.709	K45X59X18H	47.8 10750	58.9 13240	9.60	S	6600	10000	0.107 0.236	45.000 1.7717	44.989 1.7712	59.029 2.3240	59.010 2.3232
	45 1.7717	59 2.3228	18 0.709	K45X59X18TN	45.7 10270	55.4 12450	9.00	P	6600	10000	0.097 0.214	45.000 1.7717	44.989 1.7712	59.029 2.3240	59.010 2.3232
	45 1.7717	59 2.3228	36 1.417	K45X59X36H	82.4 18520	118 26530	18.6	S	6600	10000	0.181 0.399	45.000 1.7717	44.989 1.7712	59.029 2.3240	59.010 2.3232
	45 1.7717	60 2.3622	30 1.181	K45X60X30H	75.5 16970	101 22710	16.0	S	6600	10000	0.171 0.377	45.000 1.7717	44.989 1.7712	60.029 2.3633	60.010 2.3626
	45 1.7717	60 2.3622	45 1.772	K45X60X45H	108 24280	160 35970	25.2	S	6600	10000	0.280 0.617	45.000 1.7717	44.989 1.7712	60.029 2.3633	60.010 2.3626
46 1.8110	46 1.811	53 2.0866	36 1.417	K46X53X36HZW	48.6 10930	96.7 21740	15.3	S	6100	9300	0.100 0.220	46.000 1.8110	45.989 1.8106	53.029 2.0878	53.010 2.0870
47 1.8504	47 1.8504	52 2.0472	15 0.591	K47X52X15FH	20.1 4520	39.8 8950	6.15	S	5800	8900	0.030 0.066	47.000 1.8504	46.989 1.8500	52.029 2.0484	52.010 2.0476

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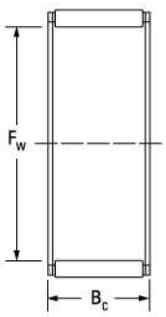
NEEDLE ROLLER BEARINGS

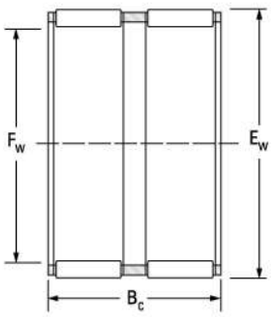
SINGLE-ROW, DOUBLE-ROW ASSEMBLIES

METRIC SERIES
K, K ZW SERIES

B



K

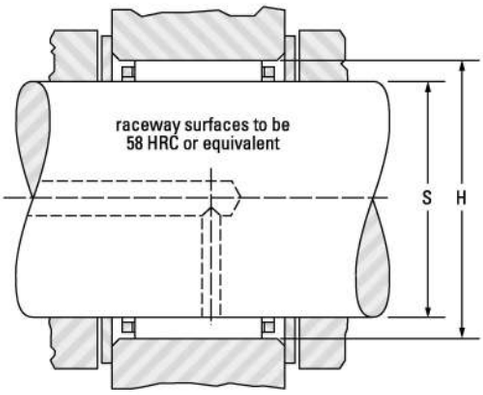


K ZW

Shaft Dia.	F_w	E_w	B_c -0.20 -0.008 -0.55 -0.022	Assembly Designation	Load Ratings Dynamic C	Load Ratings Static C_0	Fatigue Load Limit C_u	Cage material(1) P/S	Speed Ratings Grease	Speed Ratings Oil	Approx. Wt.	Mounting Dimensions S Max.	Mounting Dimensions S Min.	Mounting Dimensions H Max.	Mounting Dimensions H Min.
mm in	mm in	mm in	mm in		kN lbf		kN		min^{-1}		kg lbs	mm in	mm in	mm in	mm in
47 1.8504	47 1.8504	52 2.0472	17 0.669	K47X52X17H	24.2 5440	50.4 11330	7.85	S	5800	8900	0.032 0.071	47.000 1.8504	46.989 1.8500	52.029 2.0484	52.010 2.0476
	47 1.8504	52 2.0472	27 1.063	K47X52X27H	36.6 8230	85.9 19310	13.3	S	5800	8900	0.045 0.099	47.000 1.8504	46.989 1.8500	52.029 2.0484	52.010 2.0476
	47 1.8504	55 2.1654	28 1.102	K47X55X28FV1	48.9 10990	89.5 20120	14.0	S	6000	9200	0.092 0.203	47.000 1.8504	46.989 1.8500	55.029 2.1665	55.010 2.1657
48 1.8898	48 1.8898	53 2.0866	17 0.669	K48X53X17H	25.7 5780	54.9 12340	8.55	S	5700	8700	0.032 0.071	48.000 1.8898	47.989 1.8893	53.029 2.0878	53.010 2.0870
	48 1.8898	54 2.126	19 0.748	K48X54X19H	30.9 6950	61.2 13760	9.85	S	5700	8800	0.042 0.093	48.000 1.8898	47.989 1.8893	54.029 2.1271	54.010 2.1264
49 1.9291	49 1.9291	55 2.1654	32 1.26	K49X55X32HZW	40.2 9040	86.4 19420	13.4	S	5600	8600	0.080 0.176	49.000 1.9291	48.989 1.9287	55.029 2.1665	55.010 2.1657
	49 1.9291	65 2.5591	38 1.496	K49X65X38H	100 22480	142 31920	22.7	S	6100	9300	0.244 0.538	49.000 1.9291	48.989 1.9287	65.029 2.5602	65.010 2.5594
50 1.9685	50 1.9685	55 2.1654	17 0.669	K50X55X17H	25.5 5730	55.0 12360	8.55	S	5400	8400	0.032 0.071	50.000 1.9685	49.989 1.9681	55.029 2.1665	55.010 2.1657
	50 1.9685	55 2.1654	20 0.787	K50X55X20H	30.2 6790	68.5 15400	10.7	S	5400	8400	0.038 0.084	50.000 1.9685	49.989 1.9681	55.029 2.1665	55.010 2.1657
	50 1.9685	55 2.1654	30 1.181	K50X55X30	38.2 8590	92.4 20770	14.4	S	5400	8400	0.057 0.120	50.000 1.9685	49.989 1.9681	55.029 2.1665	55.010 2.1657
	50 1.9685	55 2.1654	30 1.181	K50X55X30FV1	38.2 8590	92.4 20770	14.4	S	5400	8400	0.057 0.126	50.000 1.9685	49.989 1.9681	55.029 2.1665	55.010 2.1657
	50 1.9685	56 2.2047	23 0.906	K50X56X23	35.5 7980	74.1 16660	11.7	S	5500	8500	0.051 0.112	50.000 1.9685	49.989 1.9681	56.029 2.2059	56.010 2.2051
	50 1.9685	57 2.2441	18 0.709	K50X57X18FH	31.3 7040	56.4 12680	8.95	S	5500	8500	0.050 0.110	50.000 1.9685	49.989 1.9681	57.029 2.2452	57.010 2.2445
	50 1.9685	58 2.2835	20 0.787	K50X58X20H	38.8 8720	67.8 15240	10.8	S	5600	8600	0.065 0.143	50.000 1.9685	49.989 1.9681	58.029 2.2846	58.010 2.2839
	50 1.9685	58 2.2835	25 0.984	K50X58X25H	46.5 10450	85.6 19240	13.4	S	5600	8600	0.081 0.179	50.000 1.9685	49.989 1.9681	58.029 2.2846	58.010 2.2839
	50 1.9685	58 2.2835	35 1.378	K50X58X35H	64.9 14590	131 29450	20.6	S	5600	8600	0.105 0.231	50.000 1.9685	49.989 1.9681	58.029 2.2846	58.010 2.2839
	50 1.9685	62 2.4409	30 1.181	K50X62X30H	64.6 14520	98.1 22050	15.5	S	5800	8900	0.136 0.300	50.000 1.9685	49.989 1.9681	62.029 2.4421	62.010 2.4413

(1) Cage material: P: polymer cage, S: steel cage

Radial Needle Roller and Cage Assemblies



Shaft Dia.	F_w	E_w	B_c -0.20 -0.008 -0.55 -0.022	Assembly Designation	Load Ratings Dynamic C	Load Ratings Static C_0	Fatigue Load Limit C_u	Cage material(1) P/S	Speed Ratings Grease	Speed Ratings Oil	Approx. Wt.	Mounting Dimensions S Max.	Mounting Dimensions S Min.	Mounting Dimensions H Max.	Mounting Dimensions H Min.
mm in	mm in	mm in	mm in		kN lbf		kN		min-1		kg lbs	mm in	mm in	mm in	mm in
50 1.9685	50 1.9685	66 2.5984	30 1.181	K50X66X30H	80.9 18190	109 24500	17.4	S	5900	9100	0.192 0.423	50.000 1.9685	49.989 1.9681	66.029 2.5996	66.010 2.5988
	50 1.9685	70 2.7559	32 1.26	K50X70X32H	103 23160	129 29000	20.6	S	6100	9300	0.224 0.494	50.000 1.9685	49.989 1.9681	70.029 2.7570	70.010 2.7563
52 2.0472	52 2.0472	57 2.2441	12 0.472	K52X57X12	18.4 4140	36.7 8250	5.60	S	5200	8000	0.022 0.049	52.000 2.0472	51.987 2.0467	57.029 2.2452	57.010 2.2445
	52 2.0472	57 2.2441	17 0.669	K52X57X17H	21.4 4810	44.3 9960	6.90	S	5200	8000	0.035 0.077	52.000 2.0472	51.987 2.0467	57.029 2.2452	57.010 2.2445
	52 2.0472	60 2.3622	24 0.945	K52X60X24	47.1 10600	88.3 19900	13.9	S	5400	8200	0.078 0.172	52.000 2.0472	51.987 2.0467	60.029 2.3633	60.010 2.3626
55 2.1654	55 2.1654	60 2.3622	17 0.669	K55X60X17	26.0 5850	58.3 13100	9.10	S	4900	7600	0.037 0.082	55.000 2.1654	54.987 2.1648	60.029 2.3633	60.010 2.3626
	55 2.1654	60 2.3622	20 0.787	K55X60X20H	30.7 6900	72.4 16300	11.3	S	4900	7600	0.042 0.093	55.000 2.1654	54.987 2.1648	60.029 2.3633	60.010 2.3626
	55 2.1654	60 2.3622	27 1.063	K55X60X27H	40.1 9010	102 22900	15.7	S	4900	7600	0.055 0.121	55.000 2.1654	54.987 2.1648	60.029 2.3633	60.010 2.3626
	55 2.1654	60 2.3622	30 1.181	K55X60X30FH	40.6 9130	103 23200	16.1	S	4900	7600	0.068 0.150	55.000 2.1654	54.987 2.1648	60.029 2.3633	60.010 2.3626
	55 2.1654	61 2.4016	26 1.024	K55X61X26H	44.3 9960	102 22900	15.9	S	5000	7600	0.063 0.139	55.000 2.1654	54.987 2.1648	61.029 2.4027	61.010 2.4020
	55 2.1654	62 2.4409	18 0.709	K55X62X18H	33.2 7460	62.8 14100	10.0	S	5000	7700	0.055 0.121	55.000 2.1654	54.987 2.1648	62.029 2.4421	62.010 2.4413
	55 2.1654	63 2.4803	15 0.591	K55X63X15F	30.5 6860	51.5 11600	8.00	S	5000	7800	0.054 0.119	55.000 2.1654	54.987 2.1648	63.029 2.4815	63.010 2.4807
	55 2.1654	63 2.4803	20 0.787	K55X63X20	40.3 9060	73.5 16500	11.7	S	5000	7800	0.072 0.159	55.000 2.1654	54.987 2.1648	63.029 2.4815	63.010 2.4807
	55 2.1654	63 2.4803	25 0.984	K55X63X25	49.8 11200	96.5 21700	15.1	S	5000	7800	0.080 0.176	55.000 2.1654	54.987 2.1648	63.029 2.4815	63.010 2.4807
	55 2.1654	63 2.4803	32 1.26	K55X63X32	62.3 14000	129 29000	20.0	S	5000	7800	0.108 0.238	55.000 2.1654	54.987 2.1648	63.029 2.4815	63.010 2.4807
58 2.2835	58 2.2835	63 2.4803	17 0.669	K58X63X17F	27.0 6070	62.6 14100	9.80	S	4700	7200	0.037 0.082	58.000 2.2835	57.987 2.2830	63.029 2.4815	63.010 2.4807
	58 2.2835	64 2.5197	19 0.748	K58X64X19H	32.9 7400	70.6 15900	11.3	S	4700	7200	0.037 0.082	58.000 2.2835	57.987 2.2830	64.029 2.5208	64.010 2.5201

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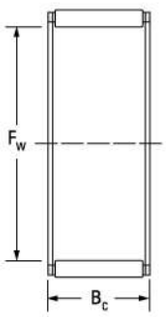
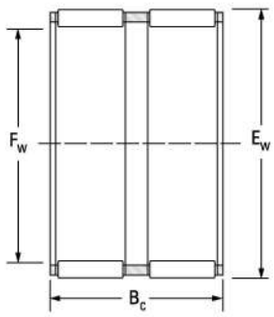
NEEDLE ROLLER BEARINGS

SINGLE-ROW, DOUBLE-ROW ASSEMBLIES

METRIC SERIES
K, K ZW SERIES



K

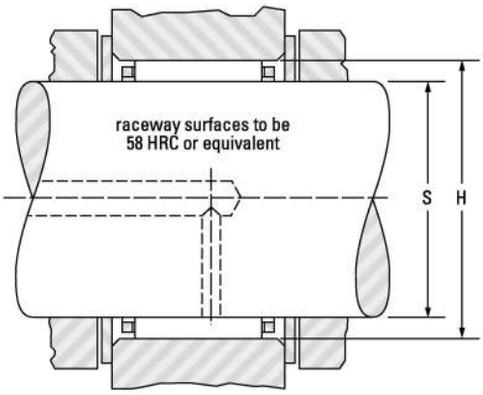


K ZW

Shaft Dia.	F_w	E_w	B_c -0.20 -0.008 -0.55 -0.022	Assembly Designation	Load Ratings Dynamic C	Load Ratings Static C_0	Fatigue Load Limit C_u	Cage material(1) P/S	Speed Ratings Grease	Speed Ratings Oil	Approx. Wt.	Mounting Dimensions S Max.	Mounting Dimensions S Min.	Mounting Dimensions H Max.	Mounting Dimensions H Min.
mm in	mm in	mm in	mm in		kN lbf		kN		min^{-1}		kg lbs	mm in	mm in	mm in	mm in
58 2.2835	58 2.2835	65 2.5591	18 0.709	K58X65X18H	34.3 7710	67.1 15100	10.7	S	4700	7300	0.058 0.128	58.000 2.2835	57.987 2.2830	65.029 2.5602	65.010 2.5594
60 2.3622	60 2.3622	65 2.5591	20 0.787	K60X65X20H	31.9 7170	78.1 17600	12.2	S	4500	6900	0.046 0.101	60.000 2.3622	59.987 2.3617	65.029 2.5602	65.010 2.5594
	60 2.3622	65 2.5591	26.8 1.055	K60X65X27FH	39.5 8880	103 23200	16.0	S	4500	6900	0.059 0.130	60.000 2.3622	59.987 2.3617	65.029 2.5602	65.010 2.5594
	60 2.3622	65 2.5591	29.8 1.173	K60X65X30FH	42.9 9640	114 25600	17.8	S	4500	6900	0.085 0.187	60.000 2.3622	59.987 2.3617	65.029 2.5602	65.010 2.5594
	60 2.3622	65 2.5591	30 1.181	K60X65X30	42.9 9640	114 25600	17.8	S	4500	6900	0.070 0.154	60.000 2.3622	59.987 2.3617	65.029 2.5602	65.010 2.5594
	60 2.3622	68 2.6772	17 0.669	K60X68X17F	34.2 7690	61.4 13800	9.50	S	4600	7100	0.066 0.146	60.000 2.3622	59.987 2.3617	68.029 2.6783	68.010 2.6776
	60 2.3622	68 2.6772	20 0.787	K60X68X20H	41.8 9400	79.2 17800	12.6	S	4600	7100	0.066 0.146	60.000 2.3622	59.987 2.3617	68.029 2.6783	68.010 2.6776
	60 2.3622	68 2.6772	23 0.906	K60X68X23H	49.0 11000	97.2 21900	15.4	S	4600	7100	0.089 0.196	60.000 2.3622	59.987 2.3617	68.029 2.6783	68.010 2.6776
	60 2.3622	68 2.6772	25 0.984	K60X68X25	51.6 11600	104 23400	16.3	S	4600	7100	0.091 0.201	60.000 2.3622	59.987 2.3617	68.029 2.6783	68.010 2.6776
	60 2.3622	68 2.6772	30 1.181	K60X68X30ZW	46.4 10400	90.1 20300	13.9	S	4600	7100	0.119 0.262	60.000 2.3622	59.987 2.3617	68.029 2.6783	68.010 2.6776
63 2.4803	63 2.4803	71 2.7953	20 0.787	K63X71X20	41.4 9310	79.4 17800	12.7	S	4400	6700	0.070 0.154	63.000 2.4803	62.987 2.4798	71.029 2.7964	71.010 2.7957
64 2.5197	64 2.5197	70 2.7559	16 0.63	K64X70X16	26.4 5930	55.1 12400	8.55	S	4200	6500	0.049 0.108	64.000 2.5197	63.987 2.5192	70.029 2.7570	70.010 2.7563
65 2.5591	65 2.5591	70 2.7559	20 0.787	K65X70X20CH	28.6 6430	69.2 15600	10.8	S	4100	6400	0.050 0.110	65.000 2.5591	64.987 2.5585	70.029 2.7570	70.010 2.7563
	65 2.5591	70 2.7559	30 1.181	K65X70X30	44.4 9980	123 27700	19.1	S	4100	6400	0.075 0.165	65.000 2.5591	64.987 2.5585	70.029 2.7570	70.010 2.7563
	65 2.5591	73 2.874	23 0.906	K65X73X23H	48.2 10800	97.7 22000	15.5	S	4200	6500	0.091 0.201	65.000 2.5591	64.987 2.5585	73.029 2.8752	73.010 2.8744
	65 2.5591	73 2.874	30 1.181	K65X73X30H	60.1 13500	129 29100	20.3	S	4200	6500	0.116 0.256	65.000 2.5591	64.987 2.5585	73.029 2.8752	73.010 2.8744
68 2.6772	68 2.6772	74 2.9134	20 0.787	K68X74X20FH	37.5 8430	88.1 19800	13.2	S	4000	6100	0.062 0.137	68.000 2.6772	67.987 2.6767	74.029 2.9145	74.010 2.9138

(1) Cage material: P: polymer cage, S: steel cage

Radial Needle Roller and Cage Assemblies



Shaft Dia.	F_w	E_w	B_c -0.20 -0.008 -0.55 -0.022	Assembly Designation	Load Ratings Dynamic C	Load Ratings Static C_0	Fatigue Load Limit C_u	Cage material(1) P/S	Speed Ratings Grease	Speed Ratings Oil	Approx. Wt.	Mounting Dimensions S Max.	Mounting Dimensions S Min.	Mounting Dimensions H Max.	Mounting Dimensions H Min.
mm in	mm in	mm in	mm in		kN lbf		kN		min-1		kg lbs	mm in	mm in	mm in	mm in
68 2.6772	68 2.6772	74 2.9134	28 1.102	K68X74X28CH	44.8 10100	110 24700	17.1	S	4000	6100	0.082 0.181	68.000 2.6772	67.987 2.6767	74.029 2.9145	74.010 2.9138
	68 2.6772	74 2.9134	30 1.181	K68X74X30H	47.6 10700	119 26800	18.5	S	4000	6100	0.098 0.216	68.000 2.6772	67.987 2.6767	74.029 2.9145	74.010 2.9138
	68 2.6772	74 2.9134	35 1.378	K68X74X35HZW	45.1 10100	111 25000	17.1	S	4000	6100	0.120 0.265	68.000 2.6772	67.987 2.6767	74.029 2.9145	74.010 2.9138
	68 2.6772	76 2.9921	20 0.787	K68X76X20	43.8 9850	87.8 19700	14.0	S	4000	6200	0.086 0.190	68.000 2.6772	67.987 2.6767	76.029 2.9933	76.010 2.9925
70 2.7559	70 2.7559	76 2.9921	20 0.787	K70X76X20	36.1 8120	84.7 19000	13.5	S	3900	5900	0.065 0.143	70.000 2.7559	69.987 2.7554	76.029 2.9933	76.010 2.9925
	70 2.7559	76 2.9921	30 1.181	K70X76X30	51.6 11600	134.0 30100	20.9	S	3900	5900	0.097 0.214	70.000 2.7559	69.987 2.7554	76.029 2.9933	76.010 2.9925
	70 2.7559	78 3.0709	20 0.787	K70X78X20H	43.6 9800	87.9 19800	14.0	S	3900	6000	0.090 0.198	70.000 2.7559	69.987 2.7554	78.029 3.0720	78.010 3.0713
	70 2.7559	78 3.0709	23 0.906	K70X78X23F	49.8 11200	104.0 23400	16.6	S	3900	6000	0.115 0.254	70.000 2.7559	69.987 2.7554	78.029 3.0720	78.010 3.0713
	70 2.7559	78 3.0709	24.8 0.976	K70X78X25F	49.8 11200	104.0 23400	16.6	S	3900	6000	0.115 0.254	70.000 2.7559	69.987 2.7554	78.029 3.0720	78.010 3.0713
	70 2.7559	78 3.0709	30 1.181	K70X78X30H	62.2 14000	139.0 31200	21.8	S	3900	6000	0.140 0.309	70.000 2.7559	69.987 2.7554	78.029 3.0720	78.010 3.0713
	70 2.7559	78 3.0709	46 1.811	K70X78X46ZW	78.4 17600	187.0 42000	29.5	S	3900	6000	0.188 0.414	70.000 2.7559	69.987 2.7554	78.029 3.0720	78.010 3.0713
	70 2.7559	85 3.3465	40 1.575	K70X85X40F	118 26500	203 45600	32.4	S	4100	6300	0.338 0.745	70.000 2.7559	69.987 2.7554	85.034 3.3478	85.012 3.3469
	70 2.7559	88 3.4646	30 1.181	K70X88X30H	115 25900	175 39300	28.1	S	4100	6400	0.205 0.452	70.000 2.7559	69.987 2.7554	88.034 3.4659	88.012 3.4650
72 2.8346	72 2.8346	80 3.1496	20 0.787	K72X80X20	44.4 9980	90.7 20400	14.5	S	3800	5800	0.084 0.185	72.000 2.8346	71.987 2.8341	80.029 3.1507	80.010 3.1500
73 2.8740	73 2.874	79 3.1102	20 0.787	K73X79X20	37.0 8320	88.7 19900	14.1	S	3700	5700	0.068 0.150	73.000 2.8740	72.987 2.8735	79.029 3.1114	79.010 3.1106
75 2.9528	75 2.9528	81 3.189	20 0.787	K75X81X20F	37.4 8410	90.7 20400	14.5	S	3600	5500	0.075 0.165	75.000 2.9528	74.987 2.9522	81.034 3.1903	81.012 3.1894
	75 2.9528	83 3.2677	23 0.906	K75X83X23	52.5 11800	114.0 25600	18.2	S	3600	5600	0.104 0.229	75.000 2.9528	74.987 2.9522	83.034 3.2691	83.012 3.2682

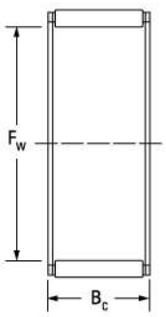
Continued on next page.

NEEDLE ROLLER BEARINGS

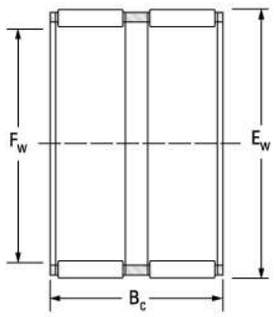
SINGLE-ROW, DOUBLE-ROW ASSEMBLIES

METRIC SERIES
K, K ZW SERIES

B



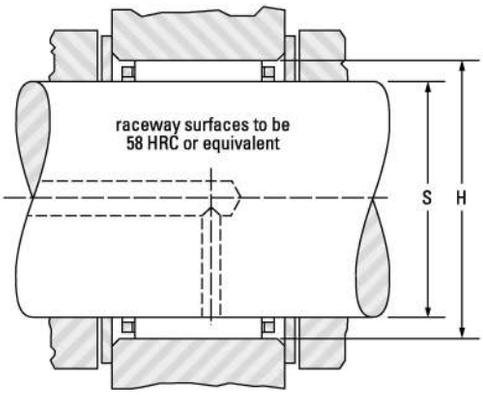
K



K ZW

Shaft Dia.	F_w	E_w	B_c -0.20 -0.008 -0.55 -0.022	Assembly Designation	Load Ratings Dynamic C	Load Ratings Static C_0	Fatigue Load Limit C_u	Cage material(1) P/S	Speed Ratings Grease	Speed Ratings Oil	Approx. Wt.	Mounting Dimensions S Max.	Mounting Dimensions S Min.	Mounting Dimensions H Max.	Mounting Dimensions H Min.
mm in	mm in	mm in	mm in		kN lbf		kN		min^{-1}		kg lbs	mm in	mm in	mm in	mm in
75 2.9528	75 2.9528	83 3.2677	30 1.181	K75X83X30	60.9 13700	138 31000	21.7	S	3600	5600	0.141 0.311	75.000 2.9528	74.987 2.9522	83.034 3.2691	83.012 3.2682
	75 2.9528	83 3.2677	30 1.181	K75X83X30FH	60.9 13700	138 31000	21.7	S	3600	5600	0.141 0.311	75.000 2.9528	74.987 2.9522	83.034 3.2691	83.012 3.2682
80 3.1496	80 3.1496	86 3.3858	20 0.787	K80X86X20H	38.6 8680	96.7 21700	15.4	S	3400	5200	0.072 0.159	80.000 3.1496	79.987 3.1491	86.034 3.3872	86.012 3.3863
	80 3.1496	88 3.4646	25 0.984	K80X88X25FV1	54.0 12100	121 27200	19.2	S	3400	5200	0.134 0.295	80.000 3.1496	79.987 3.1491	88.034 3.4659	88.012 3.4650
	80 3.1496	88 3.4646	30 1.181	K80X88X30	67.5 15200	161 36200	25.4	S	3400	5200	0.153 0.337	80.000 3.1496	79.987 3.1491	88.034 3.4659	88.012 3.4650
85 3.3465	85 3.3465	92 3.622	20 0.787	K85X92X20H	39.9 8970	91.7 20600	14.6	S	3200	4900	0.085 0.187	84.988 3.3460	84.973 3.3454	92.034 3.6234	92.012 3.6225
	85 3.3465	93 3.6614	25 0.984	K85X93X25F	58.8 13219	138 31024	21.7	S	3200	4900	0.128 0.282	84.988 3.3460	84.973 3.3454	93.034 3.6628	93.012 3.6619
	85 3.3465	93 3.6614	30 1.181	K85X93X30H	69.4 15600	170.4 38200	26.8	S	3200	4900	0.166 0.366	84.988 3.3460	84.973 3.3454	93.034 3.6628	93.012 3.6619
90 3.5433	90 3.5433	97 3.8189	20 0.787	K90X97X20	46.3 10400	114 25600	18.1	S	3000	4600	0.095 0.209	89.988 3.5428	89.973 3.5422	97.034 3.8202	97.012 3.8194
	90 3.5433	98 3.8583	25 0.984	K90X98X25F	54.8 12300	128 28800	20.3	S	3000	4600	0.134 0.295	89.988 3.5428	89.973 3.5422	98.034 3.8596	98.012 3.8587
	90 3.5433	98 3.8583	30 1.181	K90X98X30	63.6 14300	155 34800	24.3	S	3000	4600	0.168 0.370	89.988 3.5428	89.973 3.5422	98.034 3.8596	98.012 3.8587
95 3.7402	95 3.7402	103 4.0551	20 0.787	K95X103X20	49.3 11100	114 25600	18.3	S	2800	4400	0.130 0.287	94.988 3.7397	94.973 3.7391	103.034 4.0565	103.012 4.0556
	95 3.7402	103 4.0551	30 1.181	K95X103X30F	71.0 16000	183 41100	28.6	S	2800	4400	0.180 0.39	94.988 3.7397	94.973 3.7391	103.034 4.0565	103.012 4.0556
100 3.9370	100 3.937	108 4.252	30 1.181	K100X108X30	72.4 16300	191 42900	29.5	S	2700	4200	0.210 0.463	99.988 3.9365	99.973 3.9359	108.034 4.2533	108.012 4.2524
110 4.3307	110 4.3307	118 4.6457	24 0.945	K110X118X24	64.0 14400	168 37800	25.6	S	2400	3800	0.165 0.364	109.988 4.3302	109.973 4.3296	118.034 4.6470	118.012 4.6461
	110 4.3307	118 4.6457	30 1.181	K110X118X30H	75.3 16900	207 46500	31.2	S	2400	3800	0.200 0.441	109.988 4.3302	109.973 4.3296	118.034 4.6470	118.012 4.6461

(1) Cage material: P: polymer cage, S: steel cage

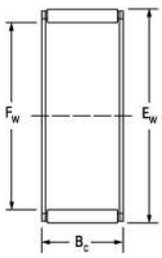

raceway surfaces to be
58 HRC or equivalent
S
H

NEEDLE ROLLER BEARINGS

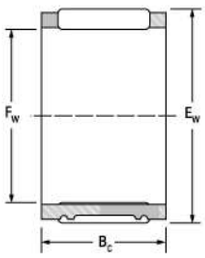
SINGLE-ROW, DOUBLE-ROW ASSEMBLIES

METRIC SERIES
R, RF, RFN, RP, RS, RV, V, VS, WR, WRF, WRP, WRS SERIES

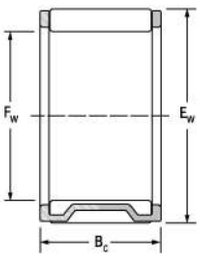
B



RF, RFN



RS, R, RP

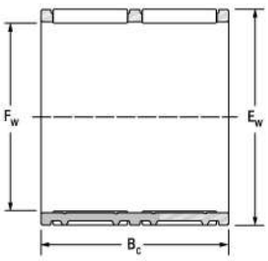


RV, V, VS

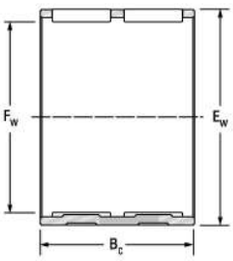
Shaft Dia.	F_w	E_w	B_c -0.20 -0.008 -0.55 -0.022	Assembly Designation	Load Ratings Dynamic C	Load Ratings Static C_0	Fatigue Load Limit C_u	Cage material(1) P/S	Speed Ratings Grease	Speed Ratings Oil	Approx. Wt.	Mounting Dimensions S Max.	Mounting Dimensions S Min.	Mounting Dimensions H Max.	Mounting Dimensions H Min.
mm in	mm in	mm in	mm in		kN lbf		kN		min^{-1}		kg lbs	mm in	mm in	mm in	mm in
12 0.4724	12	16	20	12R1620A	9.5	11.5	1.80	S	20000	30000	0.010	12.000	11.992	16.017	16.006
	12	17	11.5	RV121712A-2	8.25	8.4	1.25	S	16000	25000	0.007	12.000	11.992	17.017	17.006
13 0.5118	13	17	10	RS131710-2	5.85	6.35	0.970	S	23000	29000	0.006	13.000	12.992	17.017	17.006
	13	17	12	RS131712	7.25	8.35	1.25	S	23000	29000	0.007	13.000	12.992	17.017	17.006
15 0.5906	15	19	10	R15/10-1	6.3	7.2	1.10	S	18000	28000	0.006	15.000	14.992	19.02	19.007
	15	19	20	R15/20	12.6	17.7	2.80	S	18000	28000	0.012	15.000	14.992	19.02	19.007
	15	21	9	RV152109-4	7.65	7.15	1.10	S	14000	21000	0.008	15.000	14.992	21.02	21.007
17 0.6693	17	21	13	R17/13	9.4	12.6	1.90	S	17000	26000	0.009	17.000	16.992	21.02	21.007
	17	23	13	RS17/13	11.4	12.4	1.90	S	18000	27000	0.014	17.000	16.992	23.02	23.007
18 0.7087	18	22	16	R18/16-8	11.2	16	2.45	S	16000	24000	0.011	18.000	17.992	22.02	22.007
	18	22	17	R18/17	11.9	17.4	2.65	S	16000	24000	0.012	18.000	17.992	22.02	22.007
	18	24	17.2	RS182417	15.1	17.9	2.75	S	16000	25000	0.019	18.000	17.992	24.02	24.007
	18	26	21.9	RF182622A-1	19.1	20.3	3.20	P	17000	26000	0.019	18.000	17.992	26.02	26.007
	18	26	21.9	RV182622A-2	22.7	25.5	4.00	S	17000	26000	0.031	18.000	17.992	26.02	26.007
	18	27	11	RF182711-1	15.5	14.6	2.25	P	18000	27000	0.014	18.000	17.992	27.02	27.007
20 0.7874	20	24	10	R20/10	7.25	9.4	1.45	S	14000	22000	0.008	20.000	19.991	24.02	24.007
	20	25	25	RF202525	19.1	28.2	4.45	P	14000	22000	0.014	20.000	19.991	25.02	25.007

(1) Cage material: P: polymer cage, S: steel cage

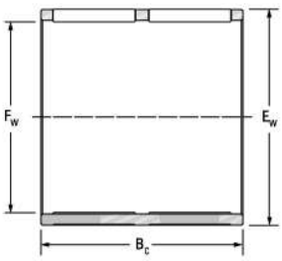
Radial Needle Roller and Cage Assemblies



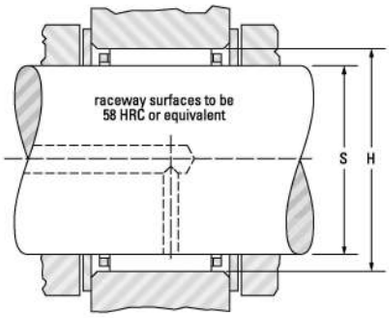
WR, WRS



WRP



WRF



Shaft Dia.	F_w	E_w	B_c -0.20 -0.008 -0.55 -0.022	Assembly Designation	Load Ratings Dynamic C	Load Ratings Static C_0	Fatigue Load Limit C_u	Cage material(1) P/S	Speed Ratings Grease	Speed Ratings Oil	Approx. Wt.	Mounting Dimensions S Max.	Mounting Dimensions S Min.	Mounting Dimensions H Max.	Mounting Dimensions H Min.
mm in	mm in	mm in	mm in		kN lbf		kN		min-1		kg lbs	mm in	mm in	mm in	mm in
20 0.7874	20	25	26	20WR2526	15.8	22	3.30	S	14000	22000	0.027	20.000	19.991	25.02	25.007
	20	26	11.7	20VS2612	10.8	11.9	1.85	S	15000	23000	0.012	20.000	19.991	26.02	26.007
	20	26	12	RV202612-4	13.1	15.4	2.35	S	15000	23000	0.014	20.000	19.992	26.02	26.007
	20	27	15	20V2715	16.2	18.3	2.80	S	15000	23000	0.019	20.000	19.991	27.02	27.007
	20	28	20	RP202820	24.3	28.5	4.55	S	15000	23000	0.028	20.000	19.992	28.02	28.007
22 0.8661	22	26	17	R22/17	13	20.7	3.15	S	13000	20000	0.014	22.000	21.991	26.02	26.007
	22	28	17	RS22/17	16.2	20.7	3.15	S	13000	20000	0.022	22.000	21.991	28.02	28.007
	22	28	23.2	VS22/23B	24.3	35.1	5.45	S	13000	20000	0.025	22.000	21.991	28.02	28.007
	22	30	20	RV223020-1	24.2	29	4.60	S	14000	21000	0.031	22.000	21.991	30.02	30.007
	22	32	11	RF223211-1	19.5	19.3	2.95	P	14000	22000	0.019	22.000	21.991	32.025	32.009
	22	32	15	RV223215	21.8	22.1	3.45	S	14000	22000	0.032	22.000	21.991	32.025	32.009
	22	32	16	RV223216	21.8	22.1	3.45	S	14000	22000	0.035	22.000	21.991	32.025	32.009
23 0.9055	23	33	20.3	23V3320-1	27.6	30.2	4.85	S	13000	20000	0.044	23.000	22.991	33.025	33.009
24 0.9449	24	28	13	RS242813-1	11.2	17.6	2.65	S	12000	18000	0.012	24.000	23.991	28.02	28.007
	24	28	17	R24/17A	13.7	22.8	3.45	S	12000	18000	0.016	24.000	23.991	28.02	28.007
	24	28	34	WR24/34	22	41.6	6.35	S	12000	18000	0.031	24.000	23.991	28.02	28.007
	24	32	15	RV243215-4	20.2	23.4	3.60	S	12000	19000	0.027	24.000	23.991	32.025	32.009

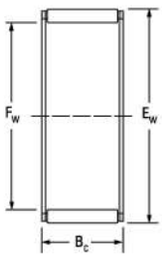
Continued on next page.

NEEDLE ROLLER BEARINGS

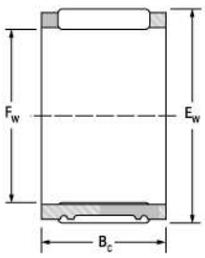
SINGLE-ROW, DOUBLE-ROW ASSEMBLIES

METRIC SERIES
R, RF, RFN, RP, RS, RV, V, VS, WR, WRF, WRP, WRS SERIES

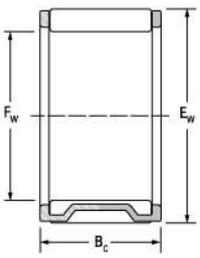
B



RF, RFN



RS, R, RP

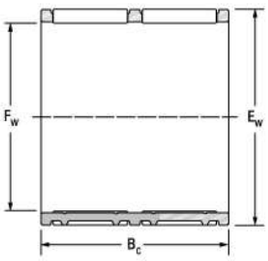


RV, V, VS

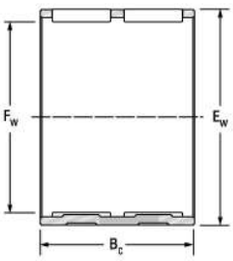
Shaft Dia.	F_w	E_w	B_c -0.20 -0.008 -0.55 -0.022	Assembly Designation	Load Ratings Dynamic C	Load Ratings Static C_0	Fatigue Load Limit C_u	Cage material(1) P/S	Speed Ratings Grease	Speed Ratings Oil	Approx. Wt.	Mounting Dimensions S Max.	Mounting Dimensions S Min.	Mounting Dimensions H Max.	Mounting Dimensions H Min.
mm in	mm in	mm in	mm in		kN lbf		kN		min^{-1}		kg lbs	mm in	mm in	mm in	mm in
24.9 0.9803	24.9	29.9	26.8	RFU253027A	20.3	32.3	5.05	P	12000	18000	0.017	24.900	24.891	29.92	29.907
25 0.9843	25	29	10.1	R25/10A	7.25	10.1	1.55	S	11000	17000	0.010	25.000	24.991	29.02	29.007
	25	29	17	RF252917	14	23.7	3.70	P	11000	17000	0.009	25.000	24.991	29.02	29.007
	25	29	22	WR25/22	16	28.2	4.30	S	11000	17000	0.022	25.000	24.991	29.02	29.007
	25	30	12	25R3012	10.5	14.1	2.10	S	11000	17000	0.015	25.000	24.991	30.02	30.007
	25	30	20	RFU253020	17.7	27.4	4.35	P	11000	17000	0.014	25.000	24.991	30.02	30.007
	25	30	26	25WR3026	22.4	37.2	5.75	S	11000	17000	0.032	25.000	24.991	30.02	30.007
	25	31	24	25R3124	25.1	37.8	5.90	S	12000	18000	0.035	25.000	24.991	31.025	31.009
	25	32	16	25V3216	19.5	24.7	3.80	S	12000	18000	0.025	25.000	24.991	32.025	32.009
	25	32	32	RV253232	40	62.5	9.75	S	12000	18000	0.049	25.000	24.991	32.025	32.009
	25	33	24	25R3324B-1	30.3	40	6.35	S	12000	18000	0.048	25.000	24.991	33.025	33.009
	25	33	30	RF253330	38.7	54.8	8.50	P	12000	18000	0.041	25.000	24.991	33.025	33.009
	25	34	32	RV253432	46.1	63.9	10.0	S	12000	18000	0.066	25.000	24.991	34.025	34.009
	25	35	25	25R3525	32.5	38	6.00	S	12000	19000	0.065	25.000	24.991	35.025	35.009
	25	37	24	25V3724	34.4	36.6	5.85	S	12000	19000	0.072	25.000	24.991	37.025	37.009
	25	37	25	25V3725A	38.9	43.1	6.85	S	12000	19000	0.077	25.000	24.991	37.025	37.009
	25	37	33	RV253733	48.2	56.7	8.90	S	12000	19000	0.100	25.000	24.991	37.025	37.009

(1) Cage material: P: polymer cage, S: steel cage

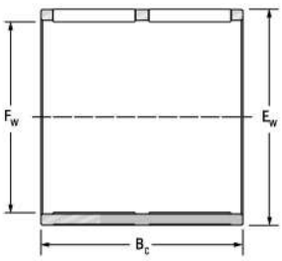
Radial Needle Roller and Cage Assemblies



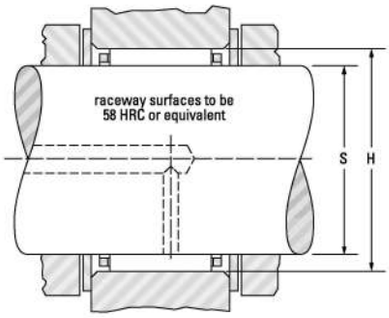
WR, WRS



WRP



WRF



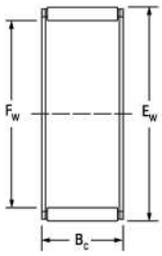
Shaft Dia.	F_w	E_w	B_c	Assembly Designation	Load Ratings		Fatigue Load Limit C_u	Cage material[1] P/S	Speed Ratings		Approx. Wt.	Mounting Dimensions			
					Dynamic	Static						S		H	
			-0.20 -0.008 -0.55 -0.022		C	C_0			Grease	Oil		Max.	Min.	Max.	Min.
mm in	mm in	mm in	mm in		kN lbf		kN		min-1		kg lbs	mm in	mm in	mm in	mm in
26 1.0236	26	30	17	RFU263017	13.9	23.7	3.70	P	10000	16000	0.009	26.000	25.991	30.02	30.007
	26	30	20	RS263020	17.1	31.1	4.90	S	10000	16000	0.020	26.000	25.991	30.02	30.007
	26	30	21.9	RS263022A	16.9	30.4	4.75	S	10000	16000	0.022	26.000	25.991	30.02	30.007
	26	31	24	26WR3124-2	20.7	33.9	5.20	S	11000	17000	0.030	26.000	25.991	31.025	31.009
	26	33	34	RPU263334F	30.7	44.3	6.90	S	11000	17000	0.043	26.000	25.991	33.025	33.009
27 1.0630	27	31	23.8	WRS273124A	19.1	36.2	5.50	S	10000	16000	0.025	27.000	26.991	31.025	31.009
28 1.1024	28	32	26	28R3226	17.1	31.5	4.95	S	10000	15000	0.027	28.000	27.991	32.025	32.009
	28	32	27	RF283227	22	43.9	6.80	P	10000	15000	0.017	28.000	27.991	32.025	32.009
	28	33	17	28R3317	18	29	4.50	S	10000	15000	0.022	28.000	27.991	33.025	33.009
	28	33	20	RF283320	19.5	32.2	5.10	P	10000	15000	0.016	28.000	27.991	33.025	33.009
	28	33	27	R28/27	25.1	44.5	6.95	S	10000	15000	0.036	28.000	27.991	33.025	33.009
	28	34	20	RFU283420	20.2	29.6	4.70	P	10000	16000	0.018	28.000	27.991	34.025	34.009
	28	35	37.5	RPU283538A	37	57.9	9.05	S	10000	16000	0.048	28.000	27.991	35.025	35.009
	28	38	20	28VU3820	21.6	22.9	3.65	S	10000	16000	0.048	28.000	27.991	38.025	38.009
	28	38	24	RS283824	31.7	37.9	6.05	S	10000	16000	0.070	28.000	27.991	38.025	38.009
	28	41	25	RV284125	40.9	44.6	7.15	S	11000	17000	0.088	28.000	27.991	41.025	41.009
	28	42	50.5	RF284251A	89.5	118	18.4	P	11000	17000	0.182	28.000	27.991	42.025	42.009

Continued on next page.

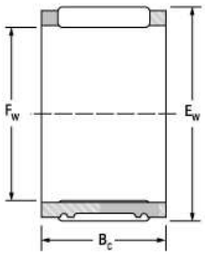
NEEDLE ROLLER BEARINGS

SINGLE-ROW, DOUBLE-ROW ASSEMBLIES

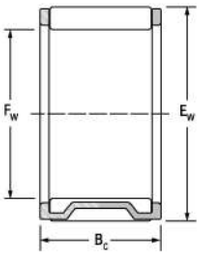
METRIC SERIES
R, RF, RFN, RP, RS, RV, V, VS, WR, WRF, WRP, WRS SERIES



RF, RFN



RS, R, RP

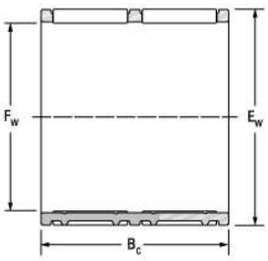


RV, V, VS

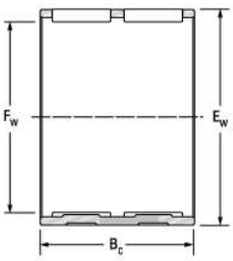
Shaft Dia.	F_w	E_w	B_c -0.20 -0.008 -0.55 -0.022	Assembly Designation	Load Ratings Dynamic C	Load Ratings Static C_0	Fatigue Load Limit C_u	Cage material(1) P/S	Speed Ratings Grease	Speed Ratings Oil	Approx. Wt.	Mounting Dimensions S Max.	Mounting Dimensions S Min.	Mounting Dimensions H Max.	Mounting Dimensions H Min.
mm in	mm in	mm in	mm in		kN lbf		kN		min^{-1}		kg lbs	mm in	mm in	mm in	mm in
29 1.1417	29	34	22	R29/22A	17.3	27.6	4.30	S	10000	15000	0.030	29.000	28.991	34.025	34.009
	29	34	24.4	RFU293424A-1	19.9	33.2	5.15	P	10000	15000	0.017	29.000	28.991	34.025	34.009
	29	34	27	29R3427A-1	25.8	46.7	7.30	S	10000	15000	0.037	29.000	28.991	34.025	34.009
	29	43	43	RV294343	74.4	93.3	14.7	S	10000	16000	0.177	29.000	28.991	43.025	43.009
30 1.1811	30	34	29	30WR3429A	14.3	25.2	3.85	S	9100	14000	0.032	30.000	29.991	34.025	34.009
	30	34	29	RF303429	20.6	41.2	6.50	P	9100	14000	0.016	30.000	29.991	34.025	34.009
	30	35	16	RS303516	18	29.7	4.55	S	9100	14000	0.023	30.000	29.991	35.025	35.009
	30	35	17	R30/17-1	18	29.7	4.55	S	9100	14000	0.024	30.000	29.991	35.025	35.009
	30	35	21.1	RS303521A	22.4	39.5	6.20	S	9100	14000	0.030	30.000	29.991	35.025	35.009
	30	35	24	RS303524	24.8	44.8	7.05	S	9100	14000	0.034	30.000	29.991	35.025	35.009
	30	37	16	RV303716	21.9	30.3	4.65	S	10000	15000	0.029	30.000	29.991	37.025	37.009
	30	37	26	RV303726	35.2	55.8	8.75	S	10000	15000	0.047	30.000	29.991	37.025	37.009
	30	37	32	WRS30/32B	32.6	50.4	7.75	S	10000	15000	0.066	30.000	29.991	37.025	37.009
	30	40	15.5	RV304016A-4	27.5	32.3	4.90	S	10000	15000	0.046	30.000	29.991	40.025	40.009
	30	42	32.2	30V4232	53.3	67.1	10.6	S	10000	16000	0.108	30.000	29.991	42.025	42.009
	30	45	30	30V4530	55.1	61.2	9.75	S	10000	16000	0.134	30.000	29.991	45.025	45.009
31 1.2205	31	36	20.3	RFU313620A-1	20.1	34.7	5.40	P	9100	14000	0.017	31.000	30.989	36.025	36.009

(1) Cage material: P: polymer cage, S: steel cage

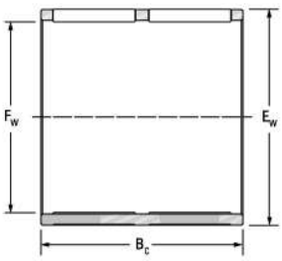
Radial Needle Roller and Cage Assemblies



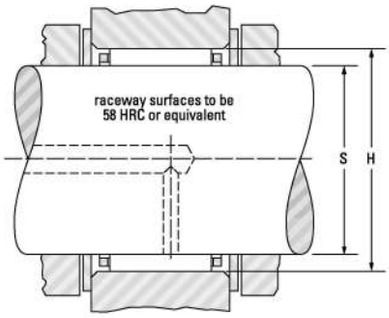
WR, WRS



WRP



WRF



Shaft Dia.	F_w	E_w	B_c -0.20 -0.008 -0.55 -0.022	Assembly Designation	Load Ratings Dynamic C	Load Ratings Static C_0	Fatigue Load Limit C_u	Cage material[1] P/S	Speed Ratings Grease	Speed Ratings Oil	Approx. Wt.	Mounting Dimensions S Max.	Mounting Dimensions S Min.	Mounting Dimensions H Max.	Mounting Dimensions H Min.
mm in	mm in	mm in	mm in		kN lbf		kN		min⁻¹		kg lbs	mm in	mm in	mm in	mm in
31 1.2205	31	36	24.4	RFU313624A	21.3	37.1	5.75	P	9100	14000	0.019	31.000	30.989	36.025	36.009
32 1.2598	32	37	17	R32/17-1	18.9	32.4	4.95	S	8500	13000	0.026	32.000	31.989	37.025	37.009
	32	37	35	WRS323735	33.1	66.5	10.3	S	8500	13000	0.053	32.000	31.989	37.025	37.009
	32	38	25.9	RP323826	27.6	46.1	7.20	S	9100	14000	0.034	32.000	31.989	38.025	38.009
	32	39	16	RS323916	20.8	28.9	4.40	S	9100	14000	0.035	32.000	31.989	39.025	39.009
	32	39	42	RVU323942	41.3	69.3	10.9	S	9100	14000	0.078	32.000	31.989	39.025	39.009
	32	42	16	RV324216	28.4	34.1	5.35	S	9100	14000	0.049	32.000	31.989	42.025	42.009
	32	42	20.5	RV324221-1	34.3	43.4	7.00	S	9100	14000	0.060	32.000	31.989	42.025	42.009
	32	45	28	32V4528	48.7	57.6	9.20	S	10000	15000	0.112	32.000	31.989	45.025	45.009
	32	46	18	RV324618-1	31.1	30.8	4.85	S	10000	15000	0.075	32.000	31.989	46.025	46.009
33 1.2992	33	37	26	RF333726	23	49.1	7.65	P	8500	13000	0.018	33.000	32.989	37.025	37.009
34 1.3386	34	39	20.3	RFU343920A	19.8	34.9	5.40	P	8500	13000	0.018	34.000	33.989	39.025	39.009
	34	39	62.1	WRFU343962A	46.6	105	16.3	P	8500	13000	0.052	34.000	33.989	39.025	39.009
	34	42	38.2	34R4238	49.5	81.9	12.8	S	8500	13000	0.098	34.000	33.989	42.025	42.009
35 1.3780	35	40	25	RS354025-1	27.2	53.2	8.40	S	7800	12000	0.041	35.000	34.989	40.025	40.009
	35	40	28	RF354028	28.7	56.9	8.90	P	7800	12000	0.027	35.000	34.989	40.025	40.009
	35	40	28.9	RP354029-1	30.6	61.7	9.50	S	7800	12000	0.033	35.000	34.989	40.025	40.009

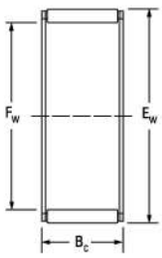
Continued on next page.

NEEDLE ROLLER BEARINGS

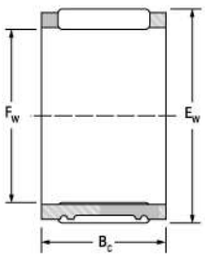
SINGLE-ROW, DOUBLE-ROW ASSEMBLIES

METRIC SERIES
R, RF, RFN, RP, RS, RV, V, VS, WR, WRF, WRP, WRS SERIES

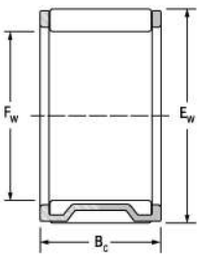
B



RF, RFN



RS, R, RP

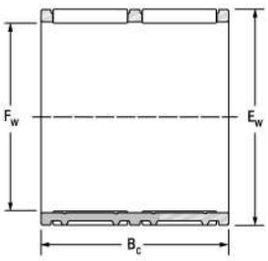


RV, V, VS

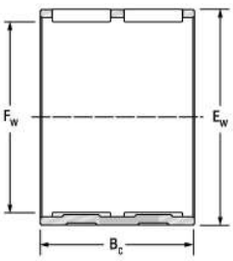
Shaft Dia.	F_w	E_w	B_c -0.20 -0.008 -0.55 -0.022	Assembly Designation	Load Ratings Dynamic C	Load Ratings Static C_0	Fatigue Load Limit C_u	Cage material(1) P/S	Speed Ratings Grease	Speed Ratings Oil	Approx. Wt.	Mounting Dimensions S Max.	Mounting Dimensions S Min.	Mounting Dimensions H Max.	Mounting Dimensions H Min.
mm in	mm in	mm in	mm in		kN lbf		kN		min^{-1}		kg lbs	mm in	mm in	mm in	mm in
35 1.3780	35	40	31	RP354031	30.8	62.1	9.60	S	7800	12000	0.037	35.000	34.989	40.025	40.009
	35	40	33	RP354033-1	31.3	63.8	9.85	S	7800	12000	0.040	35.000	34.989	40.025	40.009
	35	40	35	RF354035	31.8	64.9	10.1	P	7800	12000	0.032	35.000	34.989	40.025	40.009
	35	42	20	VS35/20	27.5	42.6	6.80	S	7800	12000	0.042	35.000	34.989	42.025	42.009
	35	48	17.5	RF354818A-1	42.5	50	7.85	P	8500	13000	0.061	35.000	34.989	48.025	48.009
	35	48	17.5	RV354818A-4	38.7	44.1	6.90	S	8500	13000	0.081	35.000	34.989	48.025	48.009
36 1.4173	36	41	20	RS364120	22	40.9	6.35	S	7800	12000	0.034	36.000	35.989	41.025	41.009
	36	42	17	RS364217-K	20.5	32.8	5.05	S	7800	12000	0.035	36.000	35.989	42.025	42.009
	36	43	22.4	RFU364322A	26	39.8	6.30	P	7800	12000	0.029	36.000	35.989	43.025	43.009
37 1.4567	37	42	22	37R4222	24.1	46.3	7.25	S	7200	11000	0.038	37.000	36.989	42.025	42.009
	37	42	23	RF374223-1	24.1	46.1	7.20	P	7200	11000	0.022	37.000	36.989	42.025	42.009
38 1.4961	38.02	42.98	17	R38/17-1	18.6	33.6	5.15	S	7200	11000	0.032	38.000	37.989	43.025	43.009
	38	44	26	RF384426	28.9	51.7	8.15	P	7200	11000	0.031	38.000	37.989	44.025	44.009
	38	44	33	RP384433	38.1	74	11.5	S	7200	11000	0.055	38.000	37.989	44.025	44.009
	38	44	39.8	RP384440A	43.9	88.7	13.8	S	7200	11000	0.064	38.000	37.989	44.025	44.009
	38	44	40	WRPU384440F	44.1	89.3	14.2	S	7200	11000	0.075	38.000	37.989	44.025	44.009
	38	46	26	RS384626	36.8	57.8	9.10	S	7800	12000	0.077	38.000	37.989	46.025	46.009

(1) Cage material: P: polymer cage, S: steel cage

Radial Needle Roller and Cage Assemblies



WR, WRS



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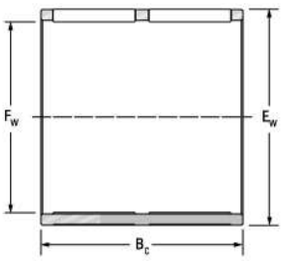

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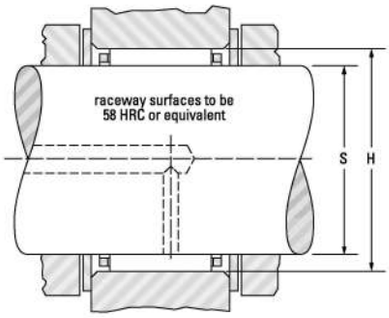


Shaft Dia.	F_w	E_w	B_c -0.20 -0.008 -0.55 -0.022	Assembly Designation	Load Ratings Dynamic C	Load Ratings Static C_0	Fatigue Load Limit C_u	Cage material[1] P/S	Speed Ratings Grease	Speed Ratings Oil	Approx. Wt.	Mounting Dimensions S Max.	Mounting Dimensions S Min.	Mounting Dimensions H Max.	Mounting Dimensions H Min.
mm in	mm in	mm in	mm in		kN lbf		kN		min-1		kg lbs	mm in	mm in	mm in	mm in
39 1.5354	39	44	43	WRS394443	41.3	94.3	14.9	S	7200	11000	0.075	39.000	38.989	44.025	44.009
	39	44	43.8	39WR4444	39.1	88	13.7	S	7200	11000	0.080	39.000	38.989	44.025	44.009
	39	46	32.8	39R4633	42.5	76.9	12.0	S	7200	11000	0.086	39.000	38.989	46.025	46.009
	39	46	37.8	RSU394638A	46.2	85.4	13.3	S	7200	11000	0.096	39.000	38.989	46.025	46.009
	39	46	44.3	WRP394644A	54.9	107	16.8	S	7200	11000	0.102	39.000	38.989	46.025	46.009
	39	55	20.5	RF395521A	56.1	64.2	10.5	P	7800	12000	0.098	39.000	38.989	55.029	55.01
40 1.5748	40	45	27	RS404527	30.3	63.6	9.90	S	7200	11000	0.049	40.000	39.989	45.025	45.009
	40	45	30	R40/30	30.8	64.9	10.1	S	7200	11000	0.055	40.000	39.989	45.025	45.009
	40	45	32	R40/32A	14.3	23.3	3.60	S	7200	11000	0.053	40.000	39.989	45.025	45.009
	40	47	20	RS40/20	27.7	44.8	7.00	S	7200	11000	0.054	40.000	39.989	47.025	47.009
	40	48	34	40V4834	50.5	88.3	13.7	S	7200	11000	0.087	40.000	39.989	48.025	48.009
	40	55	27.5	RF405528A-1	68.8	87.1	13.8	P	7800	12000	0.121	40.000	39.989	55.029	55.01
	40	55	30	RF405530	73.6	94.9	15.2	P	7800	12000	0.132	40.000	39.989	55.029	55.01
	40	56	20	RV405620-4	51.9	58.3	9.45	S	7800	12000	0.130	40.000	39.989	56.029	56.01
	40	60	31.5	RF406032A	95.2	112	17.8	P	7800	12000	0.214	40.000	39.989	60.029	60.01
41.3 1.6260	41.3	47.3	23.6	RFU414724A	27.9	50.8	7.95	P	6500	10000	0.030	41.300	41.289	47.325	47.309
42 1.6535	42	47	30	RSU424730F	32.3	70.4	11.0	S	6500	10000	0.058	42.000	41.989	47.025	47.009

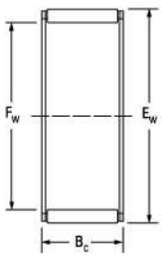
Continued on next page.

NEEDLE ROLLER BEARINGS

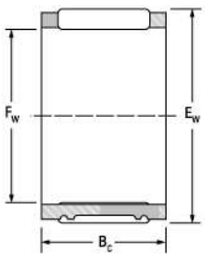
SINGLE-ROW, DOUBLE-ROW ASSEMBLIES

METRIC SERIES
R, RF, RFN, RP, RS, RV, V, VS, WR, WRF, WRP, WRS SERIES

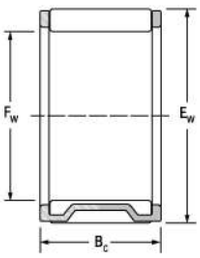
B



RF, RFN



RS, R, RP

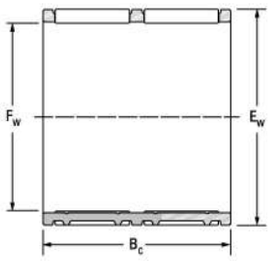


RV, V, VS

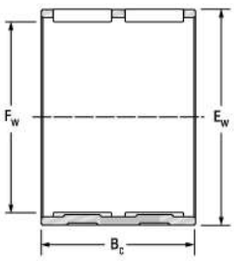
Shaft Dia.	F_w	E_w	B_c -0.20 -0.008 -0.55 -0.022	Assembly Designation	Load Ratings Dynamic C	Load Ratings Static C_0	Fatigue Load Limit C_u	Cage material(1) P/S	Speed Ratings Grease	Speed Ratings Oil	Approx. Wt.	Mounting Dimensions S Max.	Mounting Dimensions S Min.	Mounting Dimensions H Max.	Mounting Dimensions H Min.
mm in	mm in	mm in	mm in		kN lbf		kN		min^{-1}		kg lbs	mm in	mm in	mm in	mm in
42 1.6535	42	49	22	RF424922	29.7	49.7	7.95	P	6500	10000	0.035	42.000	41.989	49.025	49.009
43.5 1.7126	43.5	50.5	33.8	RF445134A	46.5	89.6	13.9	P	6500	10000	0.059	43.500	43.489	50.529	50.51
44 1.7323	44	50	27.5	44RFN5028	36	72.2	11.3	P	6500	10000	0.041	44.000	43.989	50.025	50.009
	44	50	39	RP445039	46.8	101	15.6	S	6500	10000	0.070	44.000	43.989	50.025	50.009
44.5 1.7520	44.5	51.5	36	RP455236A	49.1	96.6	15.0	S	6500	10000	0.075	44.500	44.489	51.529	51.51
	44.5	51.5	41.6	RP455242A	54	109	17.1	S	6500	10000	0.086	44.500	44.489	51.529	51.51
45 1.7717	45	49	25	RFU454925	25.3	61.5	9.70	P	6000	9300	0.023	45.000	44.989	49.025	49.009
	45	50	17	RS455017	23.1	46.8	7.30	S	6100	9400	0.035	45.000	44.989	50.025	50.009
	45	50	19	R45/19	24.2	49.7	7.80	S	6100	9400	0.039	45.000	44.989	50.025	50.009
	45	50	24	RS455024	29.4	63.9	10.0	S	6100	9400	0.050	45.000	44.989	50.025	50.009
	45	50	33	R45/33	37.1	86.1	13.3	S	6100	9400	0.068	45.000	44.989	50.025	50.009
	45	52	22	RS455222	35.4	63.9	10.0	S	6200	9500	0.066	45.000	44.989	52.029	52.01
	45	64	23	RV456423-7	65.2	72.1	11.8	S	6500	10000	0.191	45.000	44.989	64.029	64.01
46 1.8110	46	53	42.6	RPU465343A	48.3	95	14.9	S	6000	9300	0.084	46.000	45.989	53.029	53.01
47 1.8504	47	52	30	R47/30H	36.5	85.4	13.2	S	5800	8900	0.062	47.000	46.989	52.029	52.01
	47	53	28.8	RP475329A	35.6	72.7	11.4	S	5900	9000	0.054	47.000	46.989	53.029	53.01
	47	53	36	RP475336	47.4	105	16.2	S	5900	9000	0.068	47.000	46.989	53.029	53.01

(1) Cage material: P: polymer cage, S: steel cage

Radial Needle Roller and Cage Assemblies



WR, WRS



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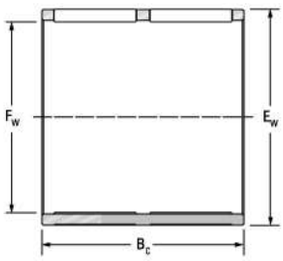

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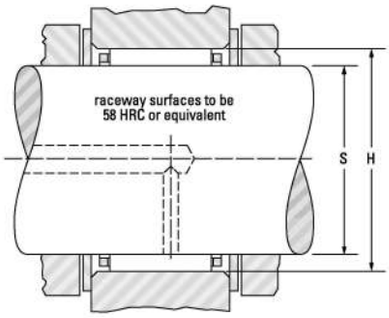


Shaft Dia.	F_w	E_w	B_c	Assembly Designation	Load Ratings		Fatigue Load Limit C_u	Cage material[1] P/S	Speed Ratings		Approx. Wt.	Mounting Dimensions			
					Dynamic	Static						S		H	
			-0.20 -0.008 -0.55 -0.022		C	C_0			Grease	Oil		Max.	Min.	Max.	Min.
mm in	mm in	mm in	mm in		kN lbf		kN		min^{-1}		kg lbs	mm in	mm in	mm in	mm in
47 1.8504	47	54	38.6	WRP475439A	49.1	98.4	15.5	S	5900	9100	0.107	47.000	46.989	54.029	54.01
47.9 1.8858	47.9	52.9	25	RF485325A-1	31.2	70.4	10.9	P	5700	8800	0.033	47.900	47.889	52.929	52.91
	47.9	52.9	33.8	RF485334A-1	23.7	48.3	7.50	P	5700	8800	0.030	47.900	47.889	52.929	52.91
48 1.8898	48	53	28	48R5328	34.2	79.2	12.3	S	5700	8700	0.060	48.000	47.989	53.029	53.01
	48	54	20	48R5420-1	29.4	57.3	8.90	S	5700	8800	0.054	48.000	47.989	54.029	54.01
	48	54	39	48R5439	48.5	109	16.8	S	5700	8800	0.106	48.000	47.989	54.029	54.01
49 1.9291	49	56	44.6	RF495645A	61.2	133	20.7	P	5700	8700	0.087	49.000	48.989	56.029	56.01
50 1.9685	50	55	27	R50/27A	11.5	18.9	2.95	S	5500	8400	0.056	50.000	49.989	55.029	55.01
	50	56	30	RF505630	41.2	89.6	14.0	P	5500	8500	0.050	50.000	49.989	56.029	56.01
	50	56	40	50WR5640	51.2	119	18.5	S	5500	8500	0.110	50.000	49.989	56.029	56.01
	50	57	33.5	RP505734A	48.1	97.9	15.3	S	5500	8500	0.080	50.000	49.989	57.029	57.01
	50	57	38.9	RS505739A	58.4	126	19.7	S	5500	8500	0.142	50.000	49.989	57.029	57.01
	50	58	25	RF505825	38.5	66.9	10.6	P	5600	8600	0.054	50.000	49.989	58.029	58.01
	50	70	36	RF507036	115	149	23.9	P	6000	9300	0.277	50.000	49.989	70.029	70.01
50.8 2.0000	50.8	64.8	50	RF516550A	124	207	32.4	P	5700	8800	0.258	50.800	50.787	64.829	64.81
	50.8	64.8	60	RV516560	138	237	36.7	S	5700	8800	0.369	50.800	50.787	64.829	64.81
51.9 2.0433	51.9	57.9	28	RF525828A	40.9	89.9	14.0	P	5300	8100	0.050	55.500	55.487	61.529	61.51

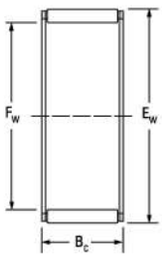
Continued on next page.

NEEDLE ROLLER BEARINGS

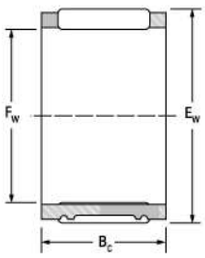
SINGLE-ROW, DOUBLE-ROW ASSEMBLIES

METRIC SERIES
R, RF, RFN, RP, RS, RV, V, VS, WR, WRF, WRP, WRS SERIES

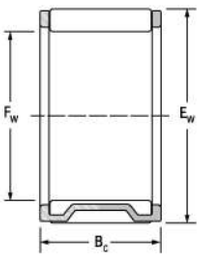
B



RF, RFN



RS, R, RP

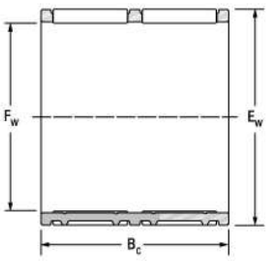


RV, V, VS

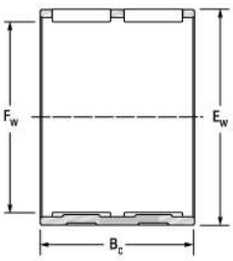
Shaft Dia.	F_w	E_w	B_c -0.20 -0.008 -0.55 -0.022	Assembly Designation	Load Ratings Dynamic C	Load Ratings Static C_0	Fatigue Load Limit C_u	Cage material(1) P/S	Speed Ratings Grease	Speed Ratings Oil	Approx. Wt.	Mounting Dimensions S Max.	Mounting Dimensions S Min.	Mounting Dimensions H Max.	Mounting Dimensions H Min.
mm in	mm in	mm in	mm in		kN lbf		kN		min^{-1}		kg lbs	mm in	mm in	mm in	mm in
51.9 2.0433	51.9	57.9	35.4	RF525835A	28.2	54.3	8.45	P	5300	8100	0.041	55.500	55.487	61.529	61.51
53 2.0866	53	58	25	RF535825	32.3	76	11.9	P	5100	7900	0.035	53.000	52.987	58.029	58.01
54 2.1260	54	60	36	RP546036	46	105	16.5	S	5100	7800	0.085	54.000	53.987	60.029	60.01
	54	61	35.8	RFU546136A	53.2	114	17.8	P	5100	7900	0.075	54.000	53.987	61.029	61.01
	54	61	41.3	RF546141A	63.5	143	22.4	P	5100	7900	0.092	54.000	53.987	61.029	61.01
55 2.1654	55	59	13	55RFN5913A	10.9	21.9	3.35	P	4900	7500	0.011	55.000	54.987	59.029	59.01
56 2.2047	56	61	33.5	R56/34	42.6	111	17.2	S	4800	7400	0.084	56.000	55.987	61.029	61.01
	56	63	47	RPU566347	60	135	21.1	S	4900	7600	0.119	56.000	55.987	63.029	63.01
58 2.2835	58	65	26.2	58R6526	42.2	87.1	13.7	S	4700	7300	0.099	58.000	57.987	65.029	65.01
	58	65	36.6	58RFN6537A	55.9	125	19.5	P	4700	7300	0.081	58.000	57.987	65.029	65.01
	58	65	36.6	RS586537A-2	56.7	127	19.8	S	4700	7300	0.157	58.000	57.987	65.029	65.01
	58	65	42.6	WRP586543A	60.1	137	21.9	S	4700	7300	0.144	58.000	57.987	65.029	65.01
	58	80	72	RV588072	233	361	55.9	S	5200	8000	0.889	58.000	57.987	80.029	80.01
60 2.3622	60	65	30	R60/30	40.1	105	16.2	S	4500	6900	0.081	60.000	59.987	65.029	65.01
	60	82	30	RF608230	120	155	24.9	P	5000	7700	0.340	60.000	59.987	82.034	82.012
63 2.4803	63	68	30	R63/30	41	110	17.0	S	4300	6600	0.083	63.000	62.987	68.029	68.01
	63	75	38.15	RV637538-1	121	240	38.0	S	4500	6900	0.270	63.000	62.987	75.029	75.01

(1) Cage material: P: polymer cage, S: steel cage

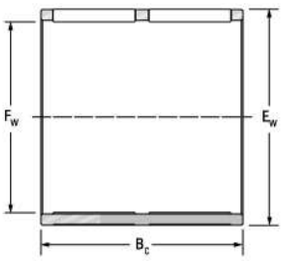
Radial Needle Roller and Cage Assemblies



WR, WRS



WRP



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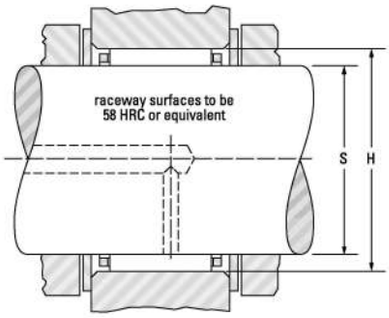

Shaft Dia.	F_w	E_w	B_c -0.20 -0.008 -0.55 -0.022	Assembly Designation	Load Ratings Dynamic C	Load Ratings Static C_0	Fatigue Load Limit C_u	Cage material(1) P/S	Speed Ratings Grease	Speed Ratings Oil	Approx. Wt.	Mounting Dimensions S Max.	Mounting Dimensions S Min.	Mounting Dimensions H Max.	Mounting Dimensions H Min.
mm in	mm in	mm in	mm in		kN lbf		kN		min-1		kg lbs	mm in	mm in	mm in	mm in
65 2.5591	65	70	20	R65/20A	12.2	22.3	3.50	S	4200	6400	0.057	65.000	64.987	70.029	70.01
	65	70	24	R65/24A	12.5	22.9	3.60	S	4200	6400	0.067	65.000	64.987	70.029	70.01
68 2.6772	68	73	31.6	WRS687332A	45.7	129	19.8	S	4000	6100	0.095	68.000	67.987	73.029	73.01
70 2.7559	70	76	20	70R7620	34.8	80.8	12.7	S	3800	5900	0.077	70.000	69.987	76.029	76.01
	70	80	55	70WR8055	103	225	35.5	S	4000	6100	0.351	70.000	69.987	80.029	80.01
71 2.7953	71	79	30.15	71V7930B	61.5	138	21.4	S	3800	5900	0.135	71.000	70.987	79.029	79.01
73 2.8740	73	79	20	R73/20	36.4	86.8	13.5	S	3700	5700	0.084	73.000	72.987	79.029	79.01
76.2 3.0000	76.2	85.5	31.7	76V8632A	76.3	167	26.1	S	3600	5600	0.177	76.200	76.187	85.534	85.512
	76.2	85.5	33.2	RV768633A	78.5	173	27.2	S	3600	5600	0.187	76.200	76.187	85.534	85.512
	76.2	85.5	44.2	RV768644A-2	95.6	222	34.8	S	3600	5600	0.235	76.200	76.187	85.534	85.512
	76.2	88	34	RV768834A	91.1	177	27.9	S	3600	5600	0.250	76.200	76.187	88.034	88.012

RADIAL NEEDLE ROLLER AND CAGE ASSEMBLIES FOR CONNECTING ROD APPLICATIONS

METRIC SERIES

Connecting rods have two bearing positions: the crank pin or big end, and the wrist pin or small end.

In the crank pin position there may be severe operating conditions due to centrifugal forces, internal forces, accelerations and high rotational speeds, requiring the use of special radial needle roller and cage assemblies.

Similarly, in the wrist pin position the reciprocating inertia loads and high oscillating speeds dictate the use of special cage designs.

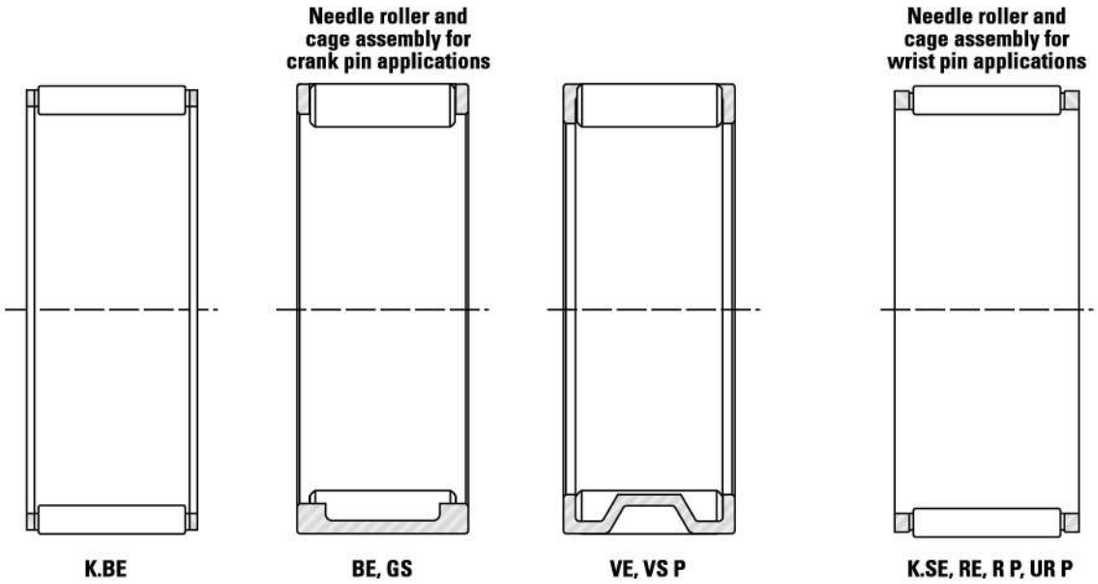

Fig. B1-3. Types of metric series radial needle roller and cage assemblies

CONSTRUCTION

METRIC SERIES RADIAL NEEDLE ROLLER AND CAGE ASSEMBLIES FOR CRANK PIN POSITIONS

Needle roller and cage assemblies for use in crank pin positions have cages with a large outside cylindrical surface to ensure optimum radial guidance in the connecting rod bore. Due to the inherent low weight and strength of the heat-treated cages, the needle roller and cage assemblies are well-suited for high-speed engine applications. When necessary, silver plating and copper plating can be applied for optimum performance during operation at high speeds.

METRIC SERIES RADIAL NEEDLE ROLLER AND CAGE ASSEMBLIES FOR WRIST PIN POSITIONS

Reciprocating inertia loads and oscillating speeds require the cages used in the wrist pin positions to be heat-treated and to guide on the wrist pin.

These cages are available in a variety of widths to allow the selection of a needle roller and cage assembly with the length of needle rollers to match the connecting rod width.

SIZE SELECTION

In most instances, selection of a suitable size of a needle roller and cage assembly for typical connecting rod positions may be based on the cylinder displacement of the engine which in turn, dictates the crank pin and wrist pin diameters.

Suggestions, based on engine displacements, are listed in the following table.

Table B1-3. Crank pin and wrist pin diameters, determined by the cylinder displacement of the engine

Cylinder displacement in cm³								
Cylinder Displacement	>		40	60	100	150	200	300
	≤	40	60	100	150	200	300	

Diameter								
		mm in	mm in	mm in	mm in	mm in	mm in	mm in
Crank pin		**12/14** 0.4724/0.5512	**15/16/18** 0.5906/0.6299/0.7087	**18/20** 0.7087/0.7874	**18/20/22** 0.7087/0.7874/0.8661	**24/25/28** 0.9449/0.9843/1.1024	**28/30** 1.1024/1.1811	**35/40** 1.3780/1.5748
Wrist pin		**10/11** 0.3937/0.4331	**12/13** 0.4724/0.5118	**14/15** 0.5512/0.5906	**15/16** 0.5906/0.6299	**18** 0.7087	**20** 0.7874	**20** 0.7874

CONNECTING ROD GUIDANCE ARRANGEMENTS

End guidance of a connecting rod can be provided either at the crank pin or at the wrist pin end. Connecting-rod guidance is achieved at the crank pin end using a small clearance between the crank counterweights. Guidance at the wrist pin end is controlled by a small clearance between the piston bosses.

CRANK PIN END GUIDANCE

With crank pin end guidance, care must be taken that an adequate amount of lubricant is supplied to the crank pin bearing and the surfaces that guide the connecting rod. For this purpose, grooves in the connecting rod end faces, or slots in the connecting rod bore aligned with the incoming lubrication path, should be provided. Occasionally, bronze or hardened steel washers may be used for end guidance of the connecting rod.

At the wrist pin end, the needle roller and cage assembly is located axially between the piston bosses. It may be both economical and effective to machine the connecting rod at the wrist pin end and at the crank pin end to the same width. It is suggested that, at the wrist pin end, the needle roller length does not overhang the connecting rod width. Otherwise, the load rating of the needle roller and cage assembly will be reduced.

WRIST PIN END GUIDANCE

Wrist pin end will get the most effective axial guidance between the piston bosses. Grooves in the bottom of the piston bosses and a chamfer of small angle – on each side of the upper portion of the connecting rod small end – can improve the oil flow to the needle roller and cage assembly and its guiding surfaces.

The length of the needle roller and cage assembly and the connecting rod width at the crank pin end should be identical to ensure best possible radial piloting of cage in the bore of the connecting rod. The crank counterweights are recessed to allow proper axial alignment of the connecting rod. As a rule, it is not necessary to have an additional supply of lubricant. Only in engines with sparse lubrication should consideration be given to provide lubricating slots in the connecting rod bores as with crank pin end guidance.

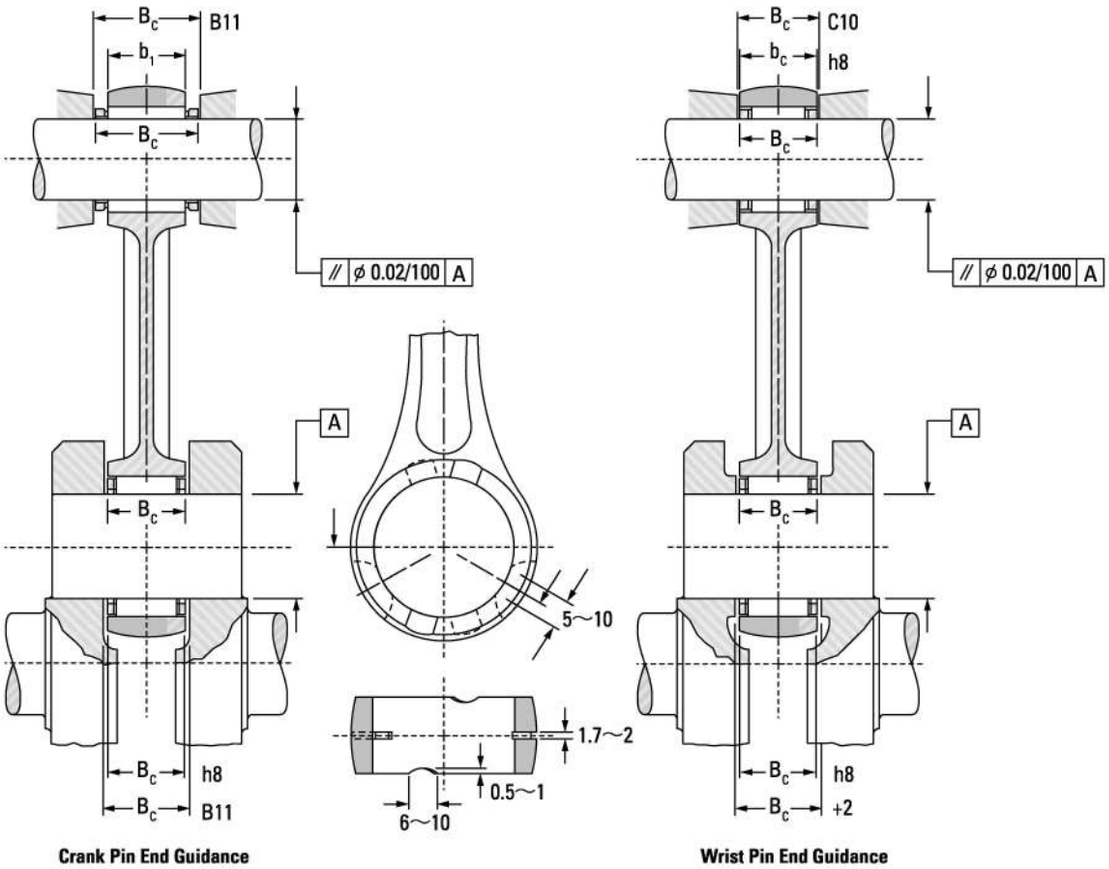

Fig. B1-4. Crank pin and wrist pin end guidance

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SUITABLE MATERIALS AND HEAT TREATMENT

Connecting rod crank pin end and wrist pin end bores that serve as raceways:

a case-hardening steel such as SNCM 420, 15 CrNi 6, 17 MnCr 5, or AISI 8620.

Crank pins:

a case-hardening steel such as SCM 415, 15 Cr 3, AISI 8620, or AISI 1018; a through-hardening steel such as SUJ 2m, 100 Cr 6, or AISI 52100; or a similar substance.

Wrist pins:

a case-hardening steel such as SCr 420, Ck 15, or 15 Cr 3; a through-hardening steel such as SUJ 2, 100 Cr 6, or AISI 52100; or a similar substance.

See Table B1-4 for the effective case depths of the raceways.

After hardening, the connecting rods must be stress-relieved.

FORM TOLERANCES

The recommended mounting specifications for crank pins, wrist pins, and connecting rods are listed in Table B1-4.

Table B1-4. Form tolerances

Classification		Connecting rod crank pin end and wrist pin end holes	Crank pin and wrist pin outer diameters
Surface roughness (Ra)		0.16 a or less	0.1 a or less
Hardness		60 – 64 HRC	
Hardening layer depth (mm) (depth to 550 HV)		0.6 – 1.2 mm	
Out-of-roundness (µm)	Greater than 9 and less than or equal to 18	1.5	1
	Greater than 18 and less than or equal to 30	2	1.5
	Greater than 30 and less than or equal to 40	2.5	2
Taper (µm)	Greater than 9 and less than or equal to 18	2	1
	Greater than 18 and less than or equal to 30	3	2
	Greater than 30 and less than or equal to 42	4	3
Parallelism		0.02 mm or less per 100 mm	

RADIAL CLEARANCE

METRIC SERIES CRANK PIN BEARINGS

The high speeds of modern production engines dictate the need for crank pin bearings with a relatively large radial clearance. As an approximation, the minimum clearance can be taken as the crank pin diameter/1000. The maximum radial clearance would be a result of the sorting plan shown in Table B1-6(1) on page B1-46.

As shown in the example of the matching scheme, the suggested mounting diameters for the crank pin position are G6 for the connecting rod bore diameters and h5 for the crank pin diameters. Axial location of the cage is shown on the crank pin end guidance arrangement.

Racing and sport engines operate at even higher speeds than production engines, requiring 50 percent larger radial clearances in the crank pin bearings. The larger radial clearances also should be used in bores of split connecting rods to avoid the danger of distortion – resulting from the unavoidable connecting rod deformation occurring in operation. Consult your representative for advice on such applications.

METRIC SERIES WRIST PIN BEARINGS

The radial clearance in wrist pin bearings should be held as small as possible. The minimum clearance should be aimed at 2 µm with the maximum clearance resulting from the proposed sorting plan in Table B1-6(2) on page B1-46. The maximum clearance should be held as close as possible to 12 µm for all wrist pin bearings based on sorting wrist pins made to a tolerance h5, small end bore diameter tolerance of K6 and needle roller grades as shown in Table B1-6(2) on page B1-46.

The recommended radial clearances for prefix BE, GS, VE, VSP, RE, RP, and URP bearings are shown in Table B1-5.

Table B1-5. Recommended radial clearances

Diameter classification		Crank pin end		Wrist pin end	
Over	Or less	Min.	Max.	Min.	Max.
mm		µm		µm	
–	10	9	25	3	14
10	18	9	25	3	14
18	30	10	25	5	17
30	40	18	33	–	–

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METRIC SERIES RADIAL NEEDLE ROLLER AND CAGE ASSEMBLIES FOR CONNECTING ROD APPLICATIONS

B

MATCHING SCHEME FOR A CRANK PIN BEARING ARRANGEMENT
(three diameter ranges are specified for the connecting rod and crank pin)

Example: Satisfy conditions of Radial clearance 20 µm – 33 µm

Crank pin diameter	20 mm, tolerance h5
Connecting rod bore diameter	26 mm, tolerance G6
Needle roller and cage assembly	K20x26x12BE

Table B1-6(1). Radial clearance

		Connecting Rod Crank Pin End Bore Diameter 26 mm Tolerance range					
		+7 – +12		+12 – +16		+16 – +20	
		Needle Roller Tolerance	Radial Clearance	Needle Roller Tolerance	Radial Clearance	Needle Roller Tolerance	Radial Clearance
Crank Pin Diameter 20 mm Tolerance range	-3 – 0	-9 – -7	21 – 33	-6 – -4 -7 – -5	20 – 31 22 – 33	-4 – -2 -5 – -3	20 – 31 22 – 33
	-6 – -3	-7 – -5	20 – 32	-5 – -3	21 – 32	-3 – -1	21 – 32
	-9 – -6	-6 – -4	21 – 33	-3 – -1 -4 – -2	20 – 31 22 – 33	-2 – 0	22 – 33

MATCHING SCHEME FOR A WRIST PIN BEARING ARRANGEMENT
(three diameter ranges are specified for the connecting rod and wrist pin)

Example: Satisfy conditions of Radial clearance 2 µm – 16 µm

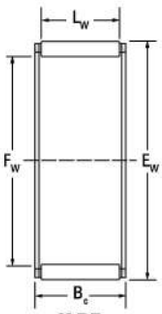
Wrist pin diameter	16 mm, tolerance h5
Connecting rod bore diameter	20 mm, tolerance K6
Needle roller and cage assembly	K16x20x20SE

Table B1-6(2). Radial clearance

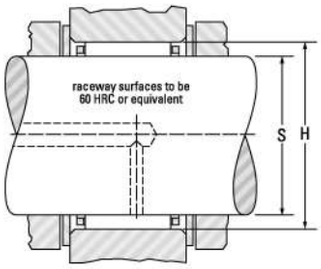
		Wrist Pin End Bore Diameter 20 mm Tolerance range					
		-11 – -6		-6 – -2		-2 – +2	
		Needle Roller Tolerance	Radial Clearance	Needle Roller Tolerance	Radial Clearance	Needle Roller Tolerance	Radial Clearance
Wrist Pin Diameter 16 mm Tolerance range	-3 – 0			-6 – -4 -7 – -5	2 – 13 4 – 15	-4 – -2 -5 – -3	2 – 13 4 – 15
	-6 – -3	-7 – -5	2 – 14	-5 – -3 -6 – -4	3 – 14 5 – 16	-3 – -1 -4 – -2	3 – 14 5 – 16
	-8 – -6	-6 – -4 -7 – -5	3 – 14 5 – 16	-3 – -1 -4 – -2	2 – 12 4 – 14	-2 – 0	4 – 10

ASSEMBLIES FOR CRANK PIN END APPLICATIONS

METRIC SERIES
K BE SERIES



K BE



Shaft Dia.	F_w	E_w	B_c -0.20 -0.008 -0.55 -0.022	L_w	Assembly Designation	Load Ratings Dynamic C	Load Ratings Static C_0	Fatigue Load Limit C_u	Approx. Wt.	Mounting Dimensions (non-high performance engines) S Max.	S Min.	H Max.	H Min.
mm in	mm in	mm in	mm in	mm in		kN lbf		kN	kg lbs	mm in	mm in	mm in	mm in
12 0.4724	12 0.4724	16 0.6299	10 0.394	7.8 0.307	K12X16X10BE	6.21 1400	6.70 1510	1.00	0.004 0.009	12.000 0.4724	11.992 0.4721	16.017 0.6306	16.006 0.6302
	12 0.4724	17 0.6693	10 0.394	7.8 0.307	K12X17X10BE	7.32 1650	7.21 1620	1.10	0.005 0.011	12.000 0.4724	11.992 0.4721	17.017 0.6700	17.006 0.6695
14 0.5512	14 0.5512	18 0.7087	10 0.394	7.8 0.307	K14X18X10BE	6.89 1550	7.98 1790	1.20	0.005 0.011	14.000 0.5512	13.992 0.5509	18.017 0.7093	18.006 0.7089
	14 0.5512	20 0.7874	10 0.394	7.8 0.307	K14X20X10BE	8.90 2000	8.61 1940	1.30	0.007 0.015	14.000 0.5512	13.992 0.5509	20.020 0.7882	20.007 0.7877
	14 0.5512	20 0.7874	12 0.472	9.5 0.374	K14X20X12BE	10.50 2360	10.60 2380	1.60	0.009 0.020	14.000 0.5512	13.992 0.5509	20.020 0.7882	20.007 0.7877
16 0.6299	16 0.6299	21 0.8268	10 0.394	7.8 0.307	K16X21X10BE	8.17 1840	8.90 2000	1.35	0.007 0.015	16.000 0.6299	15.992 0.6296	21.020 0.8276	21.007 0.8270
	16 0.6299	22 0.8661	12 0.472	9.5 0.374	K16X22X12BE	11.20 2520	11.90 2680	1.80	0.011 0.024	16.000 0.6299	15.992 0.6296	22.020 0.8669	22.007 0.8664
18 0.7087	18 0.7087	24 0.9449	12 0.472	9.5 0.374	K18X24X12BE	11.80 2650	13.10 2940	1.95	0.011 0.024	18.000 0.7087	17.992 0.7083	24.020 0.9457	24.007 0.9452
	18 0.7087	24 0.9449	13 0.512	10.5 0.413	WK18X24X13BE	12.80 2880	14.60 3280	2.20	0.011 0.024	18.000 0.7087	17.992 0.7083	24.020 0.9457	24.007 0.9452
	18 0.7087	24 0.9449	15 0.591	11.8 0.465	K18X24X15BE	13.30 2990	15.20 3420	2.35	0.014 0.031	18.000 0.7087	17.992 0.7083	24.020 0.9457	24.007 0.9452
19 0.748	19 0.748	25 0.9843	15 0.591	12.5 0.492	K19X25X15BE	14.70 3300	17.60 3960	2.70	0.014 0.031	19.000 0.7480	18.991 0.7477	25.020 0.9850	25.007 0.9845
20 0.7874	20 0.7874	26 1.0236	12 0.472	9.8 0.386	K20X26X12BE	13.30 2990	15.80 3550	2.40	0.013 0.029	20.000 0.7874	19.991 0.7870	26.020 1.0244	26.007 1.0239
	20 0.7874	26 1.0236	17 0.669	13.8 0.543	K20X26X17BE	14.90 3350	18.20 4090	2.85	0.017 0.037	20.000 0.7874	19.991 0.7870	26.020 1.0244	26.007 1.0239
22 0.8661	22 0.8661	28 1.1024	13 0.512	9.8 0.386	K22X28X13BE	13.90 3120	17.10 3840	2.60	0.015 0.033	22.000 0.8661	21.991 0.8658	28.020 1.1031	28.007 1.1026
	22 0.8661	29 1.1417	16 0.63	12.8 0.504	K22X29X16BE	18.50 4160	22.30 5010	3.45	0.021 0.046	22.000 0.8661	21.991 0.8658	29.020 1.1425	29.007 1.1420
24 0.9449	24 0.9449	30 1.1811	13 0.512	9.8 0.386	K24X30X13BE	14.40 3240	18.40 4140	2.80	0.016 0.035	24.000 0.9449	23.991 0.9445	30.020 1.1819	30.007 1.1814
	24 0.9449	30 1.1811	15 0.591	11.8 0.465	K24X30X15BE	15.30 3440	19.70 4430	3.05	0.018 0.040	24.000 0.9449	23.991 0.9445	30.020 1.1819	30.007 1.1814

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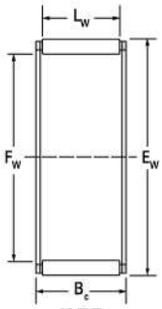
NEEDLE ROLLER BEARINGS

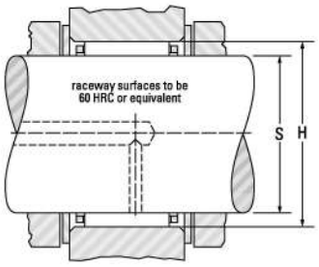
ASSEMBLIES FOR CRANK PIN END APPLICATIONS

METRIC SERIES
K BE SERIES

B



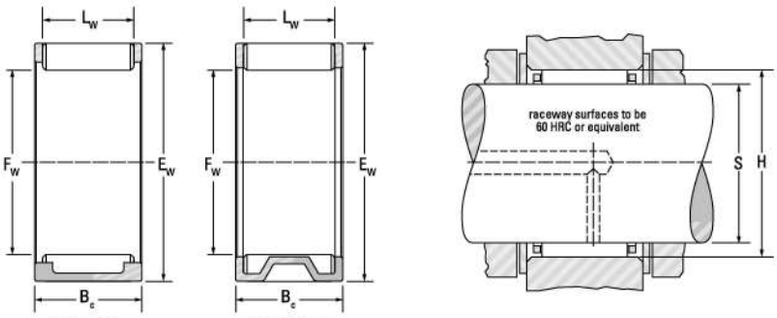
K BE



Shaft Dia.	F_w	E_w	B_c -0.20 -0.008 -0.55 -0.022	L_w	Assembly Designation	Load Ratings Dynamic C	Load Ratings Static C_0	Fatigue Load Limit C_u	Approx. Wt.	Mounting Dimensions (non-high performance engines) S Max.	S Min.	H Max.	H Min.
mm in	mm in	mm in	mm in	mm in		kN lbf		kN	kg lbs	mm in	mm in	mm in	mm in
24 0.9449	24 0.9449	30 1.1811	17 0.669	13.8 0.543	K24X30X17BE	19.00 4270	26.30 5910	4.15	0.021 0.040	24.000 0.9449	23.991 0.9445	30.020 1.1819	30.007 1.1814
25 0.9843	25 0.9843	31 1.2205	19.8 0.78	17.8 0.701	WK25X31X20BE	23.30 5240	34.50 7760	5.40	0.024 0.053	25.000 0.9843	24.991 0.9839	31.025 1.2215	31.009 1.2208
	25 0.9843	32 1.2598	16 0.63	12.8 0.504	K25X32X16BE	19.20 4320	24.30 5460	3.75	0.022 0.049	25.000 0.9843	24.991 0.9839	32.025 1.2608	32.009 1.2602
	25 0.9843	32 1.2598	24 0.945	19.8 0.780	K25X32X24BE	27.50 6180	38.50 8660	6.05	0.035 0.077	25.000 0.9843	24.991 0.9839	32.025 1.2608	32.009 1.2602
30 1.1811	30 1.1811	37 1.4567	16 0.63	12.8 0.504	K30X37X16BE	21.60 4860	29.80 6700	4.60	0.029 0.064	30.000 1.1811	29.991 1.1807	37.025 1.4577	37.009 1.4570
35 1.378	35 1.378	42 1.6535	20 0.787	16.8 0.661	K35X42X20BE	29.70 6680	47.00 10600	7.45	0.039 0.086	35.000 1.3780	34.989 1.3775	42.025 1.6545	42.009 1.6539

ASSEMBLIES FOR CRANK PIN END APPLICATIONS

METRIC SERIES
BE, GS, VE, VS P SERIES



BE, GS VE, VS P

Shaft Dia.	F_w	E_w	B_c -0.20 -0.008 -0.55 -0.022	L_w	Assembly Designation	Load Ratings Dynamic C	Load Ratings Static C_0	Fatigue Load Limit C_u	Approx. Wt.	Mounting Dimensions (non-high performance engines) S Max.	S Min.	H Max.	H Min.
mm in	mm in	mm in	mm in	mm in		kN lbf		kN	kg lbs	mm in	mm in	mm in	mm in
12 0.4724	12	16	10	7.4	12VS1610P-1	5.95	6.35	0.960	0.004				
16 0.6299	16	22	11.8	8.8	VE162212AB1-2	9.65	9.8	1.50	0.011				
	16	22	13.2	9.8	VE162213ASB1	10.6	11	1.70	0.012				
17 0.6693	17	23	14	10.8	17VS2314AP	11.2	12.1	1.85	0.013				
20 0.7874	20	26	13.8	10.8	BE202614BSB1	15.2	18.7	2.85	0.017				
	20	26	14	10.8	20VS2614CP-2	13.3	15.7	2.40	0.015				
	20	26	14	10.8	BE202614SY1B1	13.3	15.7	2.40	0.016				
22 0.8661	22	28	14	10.8	22VS2814FP	13.2	15.9	2.45	0.016				
	22	28	15.7	12.8	BE222816ASB1	17.9	23.7	3.65	0.02				
	22	28	16	11.8	VS22/16KP-1	13.8	16.9	2.55	0.018				
	22	29	16	11.8	22VS2916BP	15.7	18	2.75	0.021				
	22	29	16.8	12.8	BE222917ASY1B1-2	18.7	22.7	3.45	0.027				
23 0.9055	23	28	12	8.8	23VS2812AP	11.6	15.5	2.30	0.013				
25 0.9843	25	32	15.8	12.8	BE253216ASY1B1	20.6	26.6	4.10	0.026				
26 1.0236	26	32	19.8	15.8	BE263220ASB1	22.9	34.2	5.45	0.03				
27 1.0630	27	36	18	13.8	27VS3618P	23.4	27.1	4.15	0.042				
	27	36	20.8	16.8	VE273621AB1	29.8	37.1	5.90	0.047				

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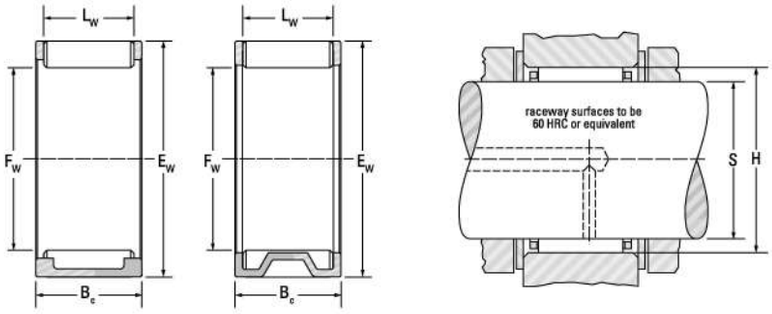
NEEDLE ROLLER BEARINGS

ASSEMBLIES FOR CRANK PIN END APPLICATIONS

METRIC SERIES
BE, GS, VE, VS P SERIES

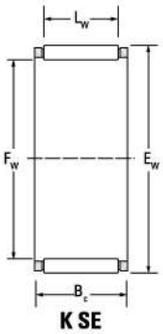


BE, GS VE, VS P

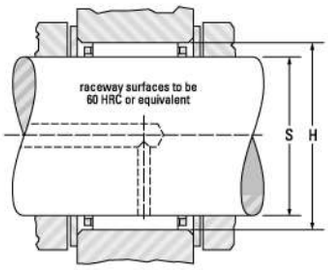
Shaft Dia.	F_w	E_w	B_c -0.20 -0.008 -0.55 -0.022	L_w	Assembly Designation	Load Ratings Dynamic C	Load Ratings Static C_0	Fatigue Load Limit C_u	Approx. Wt.	Mounting Dimensions (non-high performance engines) S Max.	S Min.	H Max.	H Min.
mm in	mm in	mm in	mm in	mm in		kN lbf		kN	kg lbs	mm in	mm in	mm in	mm in
30 1.1811	30	37	16	12.8	30VS3716AP-1	20.8	28.3	4.35	0.03				
	30	37	20	15.8	30VS3720P	24.6	35.2	5.50	0.036				
	30	38	17.8	14.8	VE303818AB1	26.5	35.4	5.60	0.038				
32 1.2598	32	40	20	15.8	VE324020SB1	29.9	42.2	6.75	0.048				
34 1.3386	34	43	19.8	15.8	BE344320ASB1	34.2	47.2	7.60	0.059				
	34	43	22	17.8	GS344322-1	37.7	53.5	8.45	0.063				
	34	44	19.8	16.8	BE344420ASY1B1	38.6	51.5	8.25	0.064				
35 1.378	35	43	20	15.8	35VS4320BP	32	47.4	7.60	0.051				
	35	43	21.8	17.8	BE354322ASB1	36.6	56.4	8.90	0.057				
	35	45	21.8	17.8	BE354522ASYB1	43.5	60.7	9.75	0.081				
	35	45	24.8	20.8	BE354525ASYB1	48.6	70.0	11.1	0.088				
37 1.4567	37	47	25	20.8	37VS4725P-1	43.9	61.9	9.80	0.082				
38 1.4961	38	50	22.8	18.8	BE385023ASY1B3-5	51.4	68.2	10.9	0.113				

ASSEMBLIES FOR WRIST PIN END APPLICATIONS

METRIC SERIES
K SE SERIES



K SE



Shaft Dia.	F_w	E_w	B_c -0.20 -0.008 -0.55 -0.022	L_w	Assembly Designation	Load Ratings Dynamic C	Load Ratings Static C_0	Fatigue Load Limit C_u	Approx. Wt.	Mounting Dimensions (non-high performance engines) S Max.	S Min.	H Max.	H Min.
mm in	mm in	mm in	mm in	mm in		kN lbf		kN	kg lbs	mm in	mm in	mm in	mm in
9 0.3543	9 0.3543	12 0.4724	11.5 0.453	8.4 0.331	K9X12X11,5SE	4.23 951	4.53 1020	0.690	0.003 0.007	9.000 0.3543	8.994 0.3541	12.017 0.4731	12.006 0.4727
	9 0.3543	13 0.5118	12.5 0.492	9.8 0.386	K9X13X12,5SE	5.58 1250	5.41 1220	0.820	0.005 0.011	9.000 0.3543	8.994 0.3541	13.017 0.5125	13.006 0.5120
10 0.3937	10 0.3937	13 0.5118	14.5 0.571	11.8 0.465	K10X13X14,5SE	5.93 1330	7.20 1620	1.10	0.004 0.009	10.000 0.3937	9.994 0.3935	13.017 0.5125	13.006 0.5120
	10 0.3937	14 0.5512	10 0.394	7.0 0.276	K10X14X10SE	4.62 1040	4.36 980	0.640	0.004 0.009	10.000 0.3937	9.994 0.3935	14.017 0.5519	14.006 0.5514
12 0.4724	12 0.4724	15 0.5906	13 0.512	9.8 0.386	K12X15X13SE	6.00 1350	7.72 1740	1.20	0.004 0.009	12.000 0.4724	11.992 0.4721	15.017 0.5912	15.006 0.5908
	12 0.4724	15 0.5906	15 0.591	11.8 0.465	K12X15X15SE	6.97 1570	9.36 2100	1.40	0.005 0.011	12.000 0.4724	11.992 0.4721	15.017 0.5912	15.006 0.5908
	12 0.4724	15 0.5906	17.5 0.689	12.8 0.504	K12X15X17,5SE	7.45 1670	10.2 2290	1.60	0.006 0.013	12.000 0.4724	11.992 0.4721	15.017 0.5912	15.006 0.5908
	12 0.4724	16 0.6299	13 0.512	9.8 0.386	K12X16X13SE	6.03 1360	6.38 1430	0.970	0.006 0.013	12.000 0.4724	11.992 0.4721	16.017 0.6306	16.006 0.6302
	12 0.4724	17 0.6693	13 0.512	9.8 0.386	K12X17X13SE	7.61 1710	7.54 1700	1.15	0.007 0.015	12.000 0.4724	11.992 0.4721	17.017 0.6700	17.006 0.6695
	12 0.4724	17 0.6693	15 0.591	12.5 0.492	K12X17X15SE	9.30 2090	9.75 2190	1.50	0.007 0.015	12.000 0.4724	11.992 0.4721	17.017 0.6700	17.006 0.6695
13 0.5118	13 0.5118	16 0.6299	14 0.551	9.8 0.386	K13X16X14SE	5.62 1260	7.23 1630	1.10	0.005 0.011	13.000 0.5118	12.992 0.5115	16.017 0.6306	16.006 0.6302
	13 0.5118	17 0.6693	17.7 0.697	13.8 0.543	K13X17X17,7SE	9.80 2200	12.3 2770	1.90	0.008 0.018	13.000 0.5118	12.992 0.5115	17.017 0.6700	17.006 0.6695
	13 0.5118	18 0.7087	15 0.591	12.5 0.492	K13X18X15SE	9.28 2090	9.88 2220	1.50	0.008 0.018	13.000 0.5118	12.992 0.5115	18.017 0.7093	18.006 0.7089
14 0.5512	14 0.5512	18 0.7087	13 0.512	9.8 0.386	K14X18X13SE	7.39 1660	8.69 1950	1.30	0.007 0.015	14.000 0.5512	13.992 0.5509	18.017 0.7093	18.006 0.7089
	14 0.5512	18 0.7087	17 0.669	11.8 0.465	K14X18X17SE	8.59 1930	10.5 2360	1.60	0.009 0.020	14.000 0.5512	13.992 0.5509	18.017 0.7093	18.006 0.7089
	14 0.5512	18 0.7087	21 0.827	14.8 0.583	K14X18X21SE	10.3 2320	13.3 2990	2.05	0.011 0.024	14.000 0.5512	13.992 0.5509	18.017 0.7093	18.006 0.7089
15 0.5906	15 0.5906	19 0.748	17 0.669	11.8 0.465	K15X19X17SE	9.05 2030	11.5 2590	1.75	0.009 0.020	15.000 0.5906	14.992 0.5902	19.020 0.7488	19.007 0.7483

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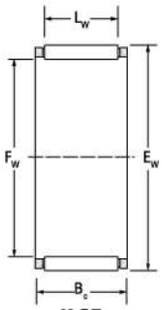
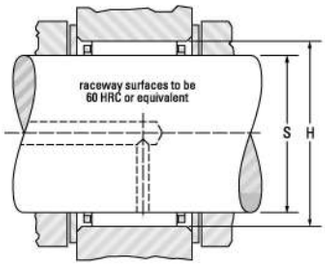
NEEDLE ROLLER BEARINGS

ASSEMBLIES FOR WRIST PIN END APPLICATIONS

METRIC SERIES
K SE SERIES



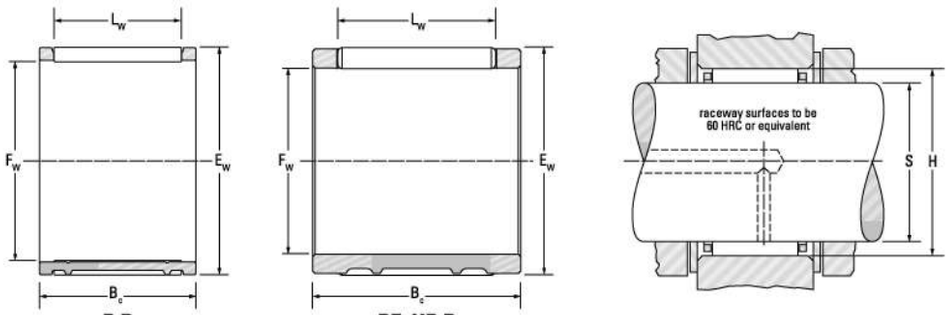
K SE



Shaft Dia.	F_w	E_w	B_c -0.20 -0.008 -0.55 -0.022	L_w	Assembly Designation	Load Ratings Dynamic C	Load Ratings Static C_0	Fatigue Load Limit C_u	Approx. Wt.	Mounting Dimensions (non-high performance engines) S Max.	S Min.	H Max.	H Min.
mm in	mm in	mm in	mm in	mm in		kN lbf		kN	kg lbs	mm in	mm in	mm in	mm in
15 0.5906	15 0.5906	19 0.748	19.5 0.768	15.8 0.622	K15X19X19,5SE	10.8 2430	14.3 3210	2.25	0.010 0.022	15.000 0.5906	14.992 0.5902	19.020 0.7488	19.007 0.7483
	15 0.5906	19 0.748	20 0.787	15.8 0.622	K15X19X20SE	10.8 2430	14.3 3210	2.25	0.010 0.022	15.000 0.5906	14.992 0.5902	19.020 0.7488	19.007 0.7483
16 0.6299	16 0.6299	20 0.7874	20 0.787	15.8 0.622	K16X20X20SE	12.0 2700	16.9 3800	2.60	0.011 0.024	16.000 0.6299	15.992 0.6296	20.020 0.7882	20.007 0.7877
	16 0.6299	20 0.7874	23 0.906	15.8 0.622	K16X20X23SE	10.7 2410	14.5 3260	2.25	0.013 0.029	16.000 0.6299	15.992 0.6296	20.020 0.7882	20.007 0.7877
18 0.7087	18 0.7087	22 0.8661	22 0.866	17.8 0.701	K18X22X22SE	14.4 3240	22.0 4950	3.45	0.016 0.035	18.000 0.7087	17.992 0.7083	22.020 0.8669	22.007 0.8664
	18 0.7087	23 0.9055	20 0.787	15.8 0.622	K18X23X20SE	13.6 3060	17.6 3960	2.80	0.015 0.033	18.000 0.7087	17.992 0.7083	23.020 0.9063	23.007 0.9058
	18 0.7087	23 0.9055	23 0.906	17.8 0.701	K18X23X23SE	15.9 3570	21.6 4860	3.35	0.018 0.040	18.000 0.7087	17.992 0.7083	23.020 0.9063	23.007 0.9058
20 0.7874	20 0.7874	24 0.9449	23 0.906	17.8 0.701	K20X24X23SE	14.8 3330	23.7 5330	3.70	0.017 0.037	20.000 0.7874	19.991 0.7870	24.020 0.9457	24.007 0.9452
	20 0.7874	25 0.9843	22 0.866	16.8 0.661	K20X25X22SE	15.9 3570	22.2 4990	3.50	0.020 0.044	20.000 0.7874	19.991 0.7870	25.020 0.9850	25.007 0.9845
	20 0.7874	25 0.9843	23 0.906	17.8 0.701	K20X25X23SE	17.5 3930	25.2 5670	3.95	0.025 0.055	20.000 0.7874	19.991 0.7870	25.020 0.9850	25.007 0.9845

ASSEMBLIES FOR WRIST PIN END APPLICATIONS

METRIC SERIES
R P, RE, UR P SERIES



R P RE, UR P

Shaft Dia.	F_w	E_w	B_c -0.20 -0.008 -0.55 -0.022	L_w	Assembly Designation	Load Ratings Dynamic C	Load Ratings Static C_0	Fatigue Load Limit C_u	Approx. Wt.	Mounting Dimensions (non-high performance engines) S Max.	S Min.	H Max.	H Min.
mm in	mm in	mm in	mm in	mm in		kN lbf		kN	kg lbs	mm in	mm in	mm in	mm in
9 0.3543	9	12	12	8.8	9R1212P	4.95	5.55	0.830	0.004				
12 0.4724	12	16	14.8	11.8	12R1615CP	8.35	9.8	1.50	0.008				
	12	16	15.4	11.8	RE121615AL1	8.35	9.8	1.50	0.008				
	12	16	16	12.8	12UR1616P	7.7	8.75	1.35	0.008				
14 0.5512	14	18	15.8	11.8	RE141816AL1	8.9	11.1	1.70	0.01				
	14	18	16.5	12.8	RE141817AL2-2	9.45	11.9	1.80	0.01				
	14	18	17.5	11.8	14R1818P	8.3	10.1	1.55	0.011				
	14	18	20	13.8	UR14/20P	8.9	11	1.70	0.012				
15 0.5906	15	19	17.3	12.8	RE151917BL3	9.9	12.9	1.95	0.011				
	15	19	20	15.8	15R1920BP-1	12.1	16.6	2.60	0.013				
	15	20	17.8	13.8	RE152018BL2	12.3	14.7	2.30	0.014				
	15	20	19.8	15.8	RE152020CL2	13.1	16	2.50	0.016				
16 0.6299	16	20	18.8	14.8	R16/18.8AP-2	11	15.1	2.35	0.013				
	16	20	19.5	13.8	R16/19.5FP	9.95	13.2	2.05	0.014				
	16	20	19.5	13.8	RE162020AL2	9.95	13.2	2.05	0.013				
	16	20	22.5	14.8	R16/22.5EP	9.85	13	2.00	0.016				
	16	21	17.5	13.8	16R2118BP-2	12.2	14.8	2.30	0.016				

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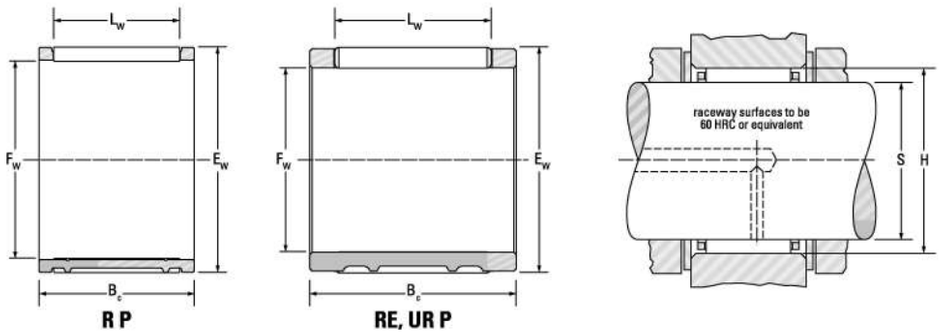
NEEDLE ROLLER BEARINGS

ASSEMBLIES FOR WRIST PIN END APPLICATIONS

METRIC SERIES
R P, RE, UR P SERIES



Shaft Dia.	F_w	E_w	B_c -0.20 -0.008 -0.55 -0.022	L_w	Assembly Designation	Load Ratings Dynamic C	Load Ratings Static C_0	Fatigue Load Limit C_u	Approx. Wt.	Mounting Dimensions (non-high performance engines) S Max.	S Min.	H Max.	H Min.
mm in	mm in	mm in	mm in	mm in		kN lbf		kN	kg lbs	mm in	mm in	mm in	mm in
16 0.6299	16	21	19.5	15.8	16R2120EP-2	13.5	16.9	2.65	0.017				
	16	21	22.5	16.8	RE162123AL2	15.4	20	3.15	0.02				
18 0.7087	18	22	19.65	13.8	RE182220AL1	10.9	15.4	2.40	0.015				
	18	22	22	15.8	18R2222P	12.1	17.6	2.70	0.017				
	18	22	23.6	17.8	RE182224AL2	13.3	20	3.10	0.017				
	18	23	22	15.8	18R2322P	14.2	18.6	2.90	0.021				
	18	23	23.8	17.8	RE182324AL2	16.5	22.7	3.55	0.024				
19 0.7480	19	24	24.8	18.8	RE192425AL1	18.3	26.2	4.10	0.026				
20 0.7874	20	24	13	9.8	R20/13P	9.85	14	2.15	0.01				
	20	25	13	9.8	20R2513P	11.2	14.1	2.15	0.013				
	20	25	21.8	16.8	RE202522AL2	17.6	25.3	4.00	0.024				
	20	25	23	18.8	RE202523L1	19.1	28.2	4.40	0.024				
	20	25	24	17.8	RE202524L2-1	16.3	23	3.60	0.026				
	20	25	27.8	21.8	RE202528AL1	21.7	33.2	5.15	0.03				

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RADIAL NEEDLE ROLLER AND CAGE ASSEMBLIES

INCH SERIES

Inch series radial needle roller and cage assemblies are available in a variety of sizes and designs. This catalog includes the most popular, standardized designs.

REFERENCE STANDARDS:

- **ANSI/ABMA 18.2** – needle roller bearings – radial, inch design.

Before selecting specific inch series radial needle roller and cage assemblies, the engineering section should be reviewed.

WJ

WJC

Fig. B1-5 . Types of inch series radial needle roller and cage assemblies

There are two primary constructions of inch series needle roller and cage assemblies. WJ assemblies are heavy-duty compared to WJC assemblies due to the nature of the roller diameter.

CONSTRUCTION

Radial needle roller and cage assemblies have a steel cage that provides both inward and outward retention for the needle rollers. The designs provide maximum cage strength consistent with the inherent high load-ratings of needle roller bearings.

Accurate guidance of the needle rollers by the cage bars allows for operation at high speeds. Needle roller and cage assemblies have either one or two rows of needle rollers.

Also available (by request) are needle roller and cage assemblies using molded, one-piece glass-reinforced engineered polymer cages. These operate well at temperatures up to 250° F (120° C) over extended periods. However, care should be exercised when bearings are lubricated with oils containing additives, as service life may be reduced if the operating temperature exceeds 212° F (100° C). At such high temperatures, oil can deteriorate with time and it is suggested that oil change intervals are observed.

Needle rollers with relieved ends – used in these assemblies are made of high carbon chrome steel through-hardened, ground and lapped to close tolerances for diameter and roundness. See the engineering section for further discussion of relieved end rollers.

DIMENSIONAL ACCURACY

The nominal inch assemblies, WJ and WJC, contain needle rollers manufactured to only one diameter grade. Within any one assembly, the needle rollers have a total diameter tolerance of 0.0001 in (0.003 mm).

The limit to precision of the radial clearance of mounted needle roller and cage assemblies is the capability of the user to hold close tolerances on the inner and outer raceways.

The tolerance of the overall width of these assemblies is given in the bearing tables of this section.

MOUNTING DIMENSIONS

The needle roller and cage assembly normally uses the shaft and housing as the inner and outer raceways. To realize full bearing load rating and life, the shaft and housing must have the correct geometric and metallurgical characteristics.

The tables of dimensions for these assemblies list the suggested diameters for the shaft when used as the inner raceway. These are consistent with ISO h5 shaft raceway tolerances. Additional design details for shafts used as inner raceways can be found in the engineering section.

Since the housing normally serves as the outer raceway, it should be of sufficient cross section to maintain adequate roundness and running clearance under load. The tables of dimensions

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also list the suggested diameters for the housings when used as outer raceways. These are consistent with ISO G6 housing bore tolerances. Additional design details for housings used as outer raceways can be found in the engineering section.

The suggested mounting diameter tolerances for these needle roller and cage assemblies will provide correct running clearance for most applications.

The needle roller and cage assembly must be axially located by shoulders or other suitable means. End locating surfaces should be hardened to minimize wear. For satisfactory operation, minimum axial clearance should be 0.008 in (0.203 mm). When using type WJ assembly, fillets adjacent to the assembly must not exceed 0.03 in (0.762 mm) radius. When it is necessary to use fillets adjacent to WJC assembly, please consult your representative for suggestions.

LUBRICATION

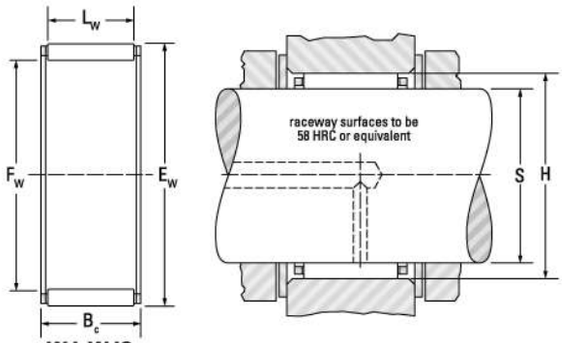
Oil is the preferred lubricant for most applications. In critical applications involving high speeds, ample oil flow must be provided. Where assemblies are subjected to high centrifugal forces, such as in epicyclic gearing, or inertia forces, as in the small end of a connecting rod, the contact pressure between the cage and the raceway guiding surface becomes critical. The allowable contact pressure depends on a combination of the induced force and the relative velocity between the cage and the raceway and the rate of lubricant flow. Consult your representative when cages will be subjected to high induced forces.

SPECIAL DESIGNS

Needle roller and cage assemblies made to special dimensions or configurations, such as those that are split to assemble around a one-piece crankshaft, can be made available on special order where quantities permit. Special plated cages to enhance life under conditions of high induced forces can also be made available.

SINGLE-ROW ASSEMBLIES

INCH SERIES



WJ, WJC

Shaft Dia.	F_w	E_w	B_c +0 -0.38 +0 -0.015	Assembly Designation	Load Ratings Dynamic C	Load Ratings Static C_0	Fatigue Load Limit C_u	Speed Ratings Grease	Speed Ratings Oil	Mounting Dimensions S (ISO h5) Max.	S (ISO h5) Min.	H (ISO G6) Max.	H (ISO G6) Min.	Approx. Wt.
in	mm in	mm in	mm in		kN lbf		kN	min^{-1}		mm in	mm in	mm in	mm in	kg lbs
3/8	9.525 0.3750	12.700 0.5000	9.53 0.375	WJC-060806	3.87 870	4.00 900	0.600	24000	37000	9.525 0.3750	9.520 0.3748	12.715 0.5006	12.705 0.5002	0.003 0.006
1/2	12.700 0.5000	15.875 0.6250	12.70 0.500	WJC-081008	6.23 1400	8.01 1800	1.65	23000	35000	12.700 0.5000	12.692 0.4997	15.890 0.6256	15.880 0.6252	0.005 0.010
9/16	14.288 0.5625	17.463 0.6875	12.70 0.500	WJC-091108	6.81 1530	9.25 2080	1.40	22000	34000	14.288 0.5625	14.280 0.5622	17.478 0.6881	17.468 0.6877	0.006 0.013
5/8	15.875 0.6250	19.050 0.7500	12.70 0.500	WJC-101208	7.03 1580	9.96 2240	1.50	18000	27000	15.875 0.6250	15.867 0.6247	19.070 0.7508	19.058 0.7503	0.006 0.013
	15.875 0.6250	22.225 0.8750	15.88 0.625	WJ-101410	15.6 3510	17.8 3990	2.80	19000	29000	15.875 0.6250	15.867 0.6247	22.245 0.8758	22.233 0.8753	0.012 0.027
	15.875 0.6250	22.225 0.8750	22.23 0.875	WJ-101414	21.3 4780	26.4 5940	4.10	19000	29000	15.875 0.6250	15.867 0.6247	22.245 0.8758	22.233 0.8753	0.017 0.038
3/4	19.050 0.7500	25.400 1.0000	25.40 1.000	WJ-121616	26.8 6020	37.2 8370	5.80	16000	24000	19.050 0.7500	19.040 0.7496	25.420 1.0008	25.408 1.0003	0.023 0.051
13/16	20.638 0.8125	26.988 1.0625	22.23 0.875	WJ-131714	25.1 5650	35.0 7880	5.50	14000	22000	20.638 0.8125	20.627 0.8121	27.008 1.0633	26.995 1.0628	0.021 0.046
7/8	22.225 0.8750	28.575 1.1250	25.40 1.000	WJ-141816	29.2 6570	43.5 9770	6.75	13000	20000	22.225 0.8750	22.215 0.8746	28.595 1.1258	28.583 1.1253	0.026 0.058
1	25.400 1.0000	33.338 1.3125	19.05 0.750	WJ-162112	28.1 6320	37.1 8340	5.90	12000	18000	25.400 1.0000	25.390 0.9996	33.363 1.3135	33.348 1.3129	0.029 0.063
	25.400 1.0000	33.338 1.3125	25.40 1.000	WJ-162116	36.8 8270	52.5 11800	8.20	12000	18000	25.400 1.0000	25.390 0.9996	33.363 1.3135	33.348 1.3129	0.038 0.084
	25.400 1.0000	33.338 1.3125	31.75 1.250	WJ-162120	44.5 10000	67.2 15100	10.5	12000	18000	25.400 1.0000	25.390 0.9996	33.363 1.3135	33.348 1.3129	0.048 0.105
1 1/8	28.575 1.1250	38.100 1.5000	25.40 1.000	WJ-182416	42.4 9520	57.8 13000	9.05	10000	16000	28.575 1.1250	28.565 1.1246	38.125 1.5010	38.110 1.5004	0.041 0.090
	28.575 1.1250	38.100 1.5000	31.75 1.250	WJ-182420	52 11700	74.7 16800	11.7	10000	16000	28.575 1.1250	28.565 1.1246	38.125 1.5010	38.110 1.5004	0.065 0.143
1 1/4	31.750 1.2500	41.275 1.6250	19.05 0.750	WJ-202612	33.4 7520	43.7 9830	7.05	9300	14000	31.750 1.2500	31.740 1.2496	41.300 1.6260	41.285 1.6254	0.043 0.094
	31.750 1.2500	41.275 1.6250	25.40 1.000	WJ-202616	44.1 9910	62.3 14000	9.80	9300	14000	31.750 1.2500	31.740 1.2496	41.300 1.6260	41.285 1.6254	0.061 0.134
	31.750 1.2500	41.275 1.6250	31.75 1.250	WJ-202620	53.8 12100	81.0 18200	12.6	9300	14000	31.750 1.2500	31.740 1.2496	41.300 1.6260	41.285 1.6254	0.071 0.156

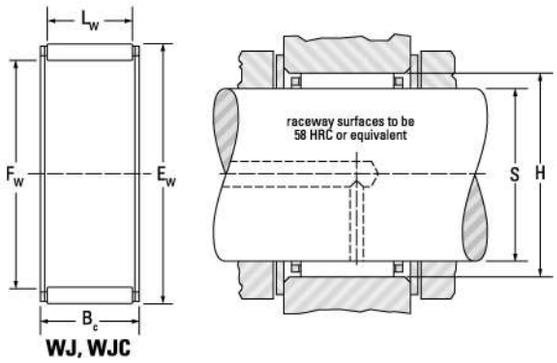
· Load ratings are based on a minimum raceway hardness of 58 HRC or equivalent.
· Minimum axial clearance should be 0.02 mm (0.008 in).

Continued on next page.

NEEDLE ROLLER BEARINGS

SINGLE-ROW ASSEMBLIES

INCH SERIES



WJ, WJC

Shaft Dia.	F_w	E_w	B_c +0 -0.38 +0 -0.015	Assembly Designation	Load Ratings Dynamic C	Load Ratings Static C_0	Fatigue Load Limit C_u	Speed Ratings Grease	Speed Ratings Oil	Mounting Dimensions S (ISO h5) Max.	S (ISO h5) Min.	H (ISO G6) Max.	H (ISO G6) Min.	Approx. Wt.
in	mm in	mm in	mm in		kN lbf		kN	min^{-1}		mm in	mm in	mm in	mm in	kg lbs
1¼	**31.750** 1.2500	**41.275** 1.6250	**38.10** 1.500	WJ-202624	**63.6** 14300	**99.6** 22400	15.6	9300	14000	**31.750** 1.2500	**31.740** 1.2496	**41.300** 1.6260	**41.285** 1.6254	**0.085** 0.188
1⅜	**34.925** 1.3750	**44.450** 1.7500	**25.40** 1.000	WJ-222816	**45.8** 10300	**67.2** 15100	10.5	8300	13000	**34.925** 1.3750	**34.915** 1.3746	**44.475** 1.7510	**44.460** 1.7504	**0.067** 0.147
	34.925 1.3750	**44.450** 1.7500	**31.75** 1.250	WJ-222820	**56.0** 12600	**87.2** 19600	13.6	8300	13000	**34.925** 1.3750	**34.915** 1.3746	**44.475** 1.7510	**44.460** 1.7504	**0.077** 0.170
1½	**38.100** 1.5000	**47.625** 1.8750	**25.40** 1.000	WJ-243016	**47.2** 10600	**71.6** 16100	11.3	7600	12000	**38.100** 1.5000	**38.090** 1.4996	**47.650** 1.8760	**47.635** 1.8754	**0.078** 0.172
	38.100 1.5000	**47.625** 1.8750	**31.75** 1.250	WJ-243020	**57.8** 13000	**93.0** 20900	14.5	7600	12000	**38.100** 1.5000	**38.090** 1.4996	**47.650** 1.8760	**47.635** 1.8754	**0.083** 0.184
	38.100 1.5000	**47.625** 1.8750	**38.10** 1.500	WJ-243024	**68.1** 15300	**114.8** 25800	18.0	7600	12000	**38.100** 1.5000	**38.090** 1.4996	**47.650** 1.8760	**47.635** 1.8754	**0.100** 0.220
	38.100 1.5000	**47.625** 1.8750	**44.45** 1.750	WJ-243028	**77.4** 17400	**135.7** 30500	21.2	7600	12000	**38.100** 1.5000	**38.090** 1.4996	**47.650** 1.8760	**47.635** 1.8754	**0.134** 0.295
1¾	**44.450** 1.7500	**53.975** 2.1250	**19.05** 0.750	WJ-283412	**39.5** 8870	**59.6** 13400	9.60	6400	9900	**44.450** 1.7500	**44.440** 1.7496	**54.003** 2.1261	**53.985** 2.1254	**0.058** 0.127
	44.450 1.7500	**53.975** 2.1250	**25.40** 1.000	WJ-283416	**52.0** 11700	**85.0** 19100	13.4	6400	9900	**44.450** 1.7500	**44.440** 1.7496	**54.003** 2.1261	**53.985** 2.1254	**0.084** 0.185
	44.450 1.7500	**53.975** 2.1250	**38.10** 1.500	WJ-283424	**74.7** 16800	**136** 30600	21.3	6400	9900	**44.450** 1.7500	**44.440** 1.7496	**54.003** 2.1261	**53.985** 2.1254	**0.115** 0.253
2	**50.800** 2.0000	**60.325** 2.3750	**19.05** 0.750	WJ-323812	**42.8** 9610	**69** 15500	11.1	5600	8600	**50.800** 2.0000	**50.787** 1.9995	**60.353** 2.3761	**60.335** 2.3754	**0.065** 0.143
	50.800 2.0000	**60.325** 2.3750	**25.40** 1.000	WJ-323816	**56.5** 12700	**98** 22100	15.5	5600	8600	**50.800** 2.0000	**50.787** 1.9995	**60.353** 2.3761	**60.335** 2.3754	**0.105** 0.231
	50.800 2.0000	**60.325** 2.3750	**31.75** 1.250	WJ-323820	**69.0** 15500	**127** 28700	20.0	5600	8600	**50.800** 2.0000	**50.787** 1.9995	**60.353** 2.3761	**60.335** 2.3754	**0.108** 0.238
	50.800 2.0000	**60.325** 2.3750	**38.10** 1.500	WJ-323824	**81.0** 18200	**157** 35300	24.6	5600	8600	**50.800** 2.0000	**50.787** 1.9995	**60.353** 2.3761	**60.335** 2.3754	**0.130** 0.286
2 1/16	**52.388** 2.0625	**61.913** 2.4375	**25.40** 1.000	WJ-333916	**57.8** 13000	**102** 23100	16.2	5400	8300	**52.388** 2.0625	**52.375** 2.0620	**61.940** 2.4386	**61.923** 2.4379	**0.099** 0.218
2⅛	**53.975** 2.1250	**63.500** 2.5000	**25.40** 1.000	WJ-344016	**52.5** 11800	**92.08** 20700	14.6	5200	8000	**53.975** 2.1250	**53.962** 2.1245	**63.528** 2.5011	**63.510** 2.5004	**0.089** 0.196
	53.975 2.1250	**63.500** 2.5000	**38.10** 1.500	WJ-344024	**78.3** 17600	**153** 34500	24.0	5200	8000	**53.975** 2.1250	**53.962** 2.1245	**63.528** 2.5011	**63.510** 2.5004	**0.137** 0.302

· Load ratings are based on a minimum raceway hardness of 58 HRC or equivalent.
· Minimum axial clearance should be 0.02 mm (0.008 in).

Radial Needle Roller and Cage Assemblies

Shaft Dia.	F_w	E_w	B_c +0 -0.38	B_c +0 -0.015	Assembly Designation	Load Ratings Dynamic C	Load Ratings Static C_0	Fatigue Load Limit C_u	Speed Ratings Grease	Speed Ratings Oil	Mounting Dimensions S (ISO h5) Max.	Mounting Dimensions S (ISO h5) Min.	Mounting Dimensions H (ISO G6) Max.	Mounting Dimensions H (ISO G6) Min.	Approx. Wt.
in	mm in	mm in	mm in			kN lbf		kN	min^{-1}		mm in	mm in	mm in	mm in	kg lbs
2 3/16	55.563 2.1875	65.088 2.5625	19.05 .750		WJ-354112	44.5 10000	75.17 16900	12.2	5000	7800	55.563 2.1875	55.550 2.1870	65.115 2.5636	65.098 2.5629	0.070 0.155
	55.563 2.1875	65.088 2.5625	25.40 1.000		WJ-354116	57.8 13000	107 24100	16.9	5000	7800	55.563 2.1875	55.550 2.1870	65.115 2.5636	65.098 2.5629	0.094 0.207
2 1/4	57.150 2.2500	66.675 2.6250	25.40 1.000		WJ-364216	53.8 12100	96.08 21600	15.2	4900	7500	57.150 2.2500	57.137 2.2495	66.703 2.6261	66.685 2.6254	0.096 0.212
	57.150 2.2500	66.675 2.6250	31.75 1.250		WJ-364220	67.6 15200	128 28900	20.1	4900	7500	57.150 2.2500	57.137 2.2495	66.703 2.6261	66.685 2.6254	0.120 0.265
2 3/8	60.325 2.3750	69.850 2.7500	38.10 1.500		WJ-384424	81.4 18300	167 37600	26.1	4600	7100	60.325 2.3750	60.312 2.3745	69.878 2.7511	69.860 2.7504	0.151 0.334
2 1/2	63.500 2.5000	73.025 2.8750	25.40 1.000		WJ-404616	55.6 12500	104 23400	16.5	4400	6700	63.500 2.5000	63.487 2.4995	73.053 2.8761	73.035 2.8754	0.106 0.234
	63.500 2.5000	73.025 2.8750	31.75 1.250		WJ-404620	69.8 15700	139 31400	21.8	4400	6700	63.500 2.5000	63.487 2.4995	73.053 2.8761	73.035 2.8754	0.132 0.292
	63.500 2.5000	73.025 2.8750	38.10 1.500		WJ-404624	83.2 18700	173 39100	27.2	4400	6700	63.500 2.5000	63.487 2.4995	73.053 2.8761	73.035 2.8754	0.179 0.395
2 3/4	69.850 2.7500	79.375 3.1250	25.40 1.000		WJ-445016	57.8 13000	112.54 25300	17.8	4000	6100	69.850 2.7500	69.837 2.7495	79.403 3.1261	79.385 3.1254	0.116 0.256
3	76.200 3.0000	85.725 3.3750	25.40 1.000		WJ-485416	59.6 13400	120.55 27100	19.1	3600	5600	76.200 3.0000	76.187 2.9995	85.761 3.3764	85.738 3.3755	0.126 0.278
	76.200 3.0000	85.725 3.3750	38.10 1.500		WJ-485424	85.4 19200	191.72 43100	29.9	3600	5600	76.200 3.0000	76.187 2.9995	85.761 3.3764	85.738 3.3755	0.189 0.416
3 1/4	82.550 3.2500	92.075 3.6250	25.40 1.000		WJ-525816	61.4 13800	128.55 28900	20.4	3300	5100	82.550 3.2500	82.535 3.2494	92.111 3.6264	92.088 3.6255	0.136 0.299
	82.550 3.2500	92.075 3.6250	38.10 1.500		WJ-525824	88.1 19800	204.62 46000	31.9	3300	5100	82.550 3.2500	82.535 3.2494	92.111 3.6264	92.088 3.6255	0.220 0.486
3 1/2	88.900 3.5000	98.425 3.8750	25.40 1.000		WJ-566216	63.2 14200	136.56 30700	21.7	3100	4700	88.900 3.5000	88.885 3.4994	98.461 3.8764	98.438 3.8755	0.146 0.321
	88.900 3.5000	101.600 4.0000	25.40 1.000		WJ-566416	79.6 17900	150.35 33800	23.9	3100	4800	88.900 3.5000	88.885 3.4994	101.636 4.0014	101.613 4.0005	0.197 0.435
	88.900 3.5000	101.600 4.0000	38.10 1.500		WJ-566424	113 25600	237.53 53400	37.4	3100	4800	88.900 3.5000	88.885 3.4994	101.636 4.0014	101.613 4.0005	0.296 0.653
4	101.600 4.0000	114.300 4.5000	25.40 1.000		WJ-647216	83.6 18800	166.59 37450	30.9	2700	4200	101.600 4.0000	101.585 3.9994	114.336 4.5014	114.313 4.5005	0.224 0.493
	101.600 4.0000	114.300 4.5000	38.10 1.500		WJ-647224	119 26800	263.33 59200	40.6	2700	4200	101.600 4.0000	101.585 3.9994	114.336 4.5014	114.313 4.5005	0.335 0.739
5	127.000 5.0000	152.400 6.0000	38.10 1.500		WJ-809624	211 47600	365.20 82100	51.9	2200	3400	127.000 5.0000	126.982 4.9993	152.438 6.0015	152.415 6.0006	1.018 2.244

NOTES