

Bearing selection

Aircraft bearings from McGill meet aircraft specifications and aircraft quality standards.

NBC series bearings are designed for applications where the bearing O.D. can be supported in a housing and are suitable for slow rotating or oscillating applications only.

NBE and NBK series bearings are for housing-supported applications with slow rotation or oscillating motions only. If properly mounted, they will accommodate $\pm 5^\circ$ misalignment using a self-aligning adapter ring.

NBF, NBL, AFC and AL series bearings are for use in applications where the bearing O.D. is unsupported and will support heavy rolling loads in cam- or track-support applications.

Aircraft static capacity:

Aircraft static capacity (ASC) is the maximum load which can be placed on a housing-mounted, needle roller bearing without seriously brinelling the raceways (approximately .0001" depth) or deforming the rollers.

Load rating:

The aircraft static capacity listed for the NBC, NBE and NBK bearings corresponds to the ultimate static load rating. The "limit load" rating, which is the maximum static load that can be applied without impairing subsequent dynamic operation, is $2/3$ ASC.

In the case of the NBF, NBL, AFC and AL bearings, the ultimate static load rating is reduced to $2/3$ ASC because of the unsupported outer ring. The "limit load" rating listed is the maximum static load that can be applied without impairing subsequent dynamic operation. The dynamic rating for these bearings is listed as "capacity as a track roller" and is $1/3$ ASC. "Capacity as a track roller" is based on the applied dynamic load for an L_{10} life of 20,000 revolutions.

Temperature:

The unsealed aircraft bearings can be operated at a maximum temperature of 400°F., provided a suitable lubricant is used. Exposure to higher temperature will result in loss of capacity due to reduction in material hardness.

In the event bearings for higher temperature environment are required, consult McGill Engineering Department.

The maximum continuous operating temperature for sealed bearings is 250°F. and is limited by the seal material.

Lubrication:

Normally, all aircraft bearings from McGill are pre-lubricated with grease per MIL-G-23827 which has a safe operating range of -100°F. to +250°F. However, special lubricants may be substituted upon request. When supplied with a special lubricant, the package marking will have a suffix code after the bearing number for internal factory identification.

Alignment:

In any full complement type needle bearing, good alignment is a necessity for obtaining optimum bearing life.

Good alignment provides uniform distribution of the load over the entire length of the bearing.

In the event good alignment is not economically or mechanically practical for a housing-mounted bearing, the NBE and NBK series bearings should be considered because of their ability to self-align within $\pm 5^\circ$.

Military qualification:

Aircraft bearings from McGill meet the requirements of U.S. Military Specification MIL-B-3990 and the following U.S. Military Standards:

Bearing Series	Military Standard
NBC	MS-24461
NBE	MS-24463
NBK	MS-24464
NBF	MS-24465
NBL	MS-24466
AFC	MS-21438
AL	MS-21439
HRS	MS-21432
CHRS	MS-21447

Nomenclature:

Part numbers for the NBC, NBE, NBK, NBL, AFC and AL bearing series are derived as follows:

Example: 4 NBC612ZP

BEARING BORE IN 1/16THS	BEARING TYPE	WIDTH IN 1/16THS	OUTER DIAMETER IN 1/16THS	RELUBRICATION	PLATING
4	NBC	6	12	Z	P
4	NBE	6	15	Z	P
16	NBK	20	36	YZ	P
12	NBF	16	28	Y	J
8	NBL	20	22	Y	J
6	AFC	8	17	Y*	J*
14	AL	32	34	Y*	J*

Y = Annular lubrication groove in bore and oil holes in inner ring

Z = Annular lubrication groove on O.D. and holes in outer ring

P = Exposed surfaces cadmium plated as mounted

J = Outer diameter and outer diameter corners chrome plated and other exposed surfaces as mounted cadmium plated

Y* = Features present but not coded in this series

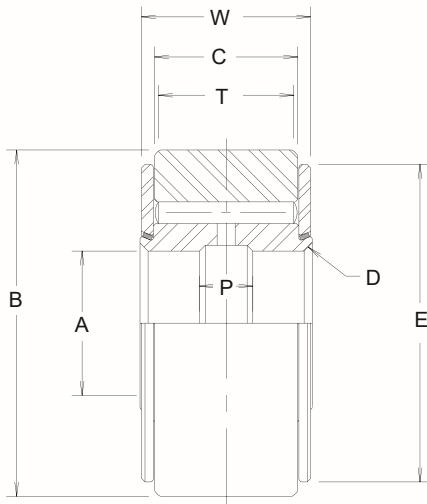
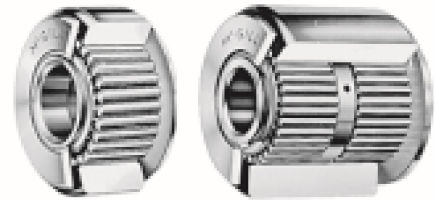
J* = Features present but not coded in this series

Mounting:

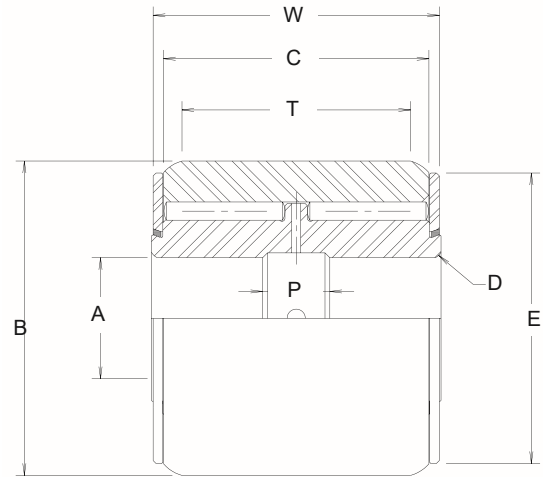
End plates which are fastened to the bearing as an aid to handling and installation should be firmly backed up by washers or other clamping surfaces which are flat and square with shaft centerline.

To provide sufficient support for the endplates, the clamping surfaces should have a minimum diameter as specified in column "Clamping Diameter." Care should be taken that endwise pressure on the endplate does not cause reduction in endwise clearance and possible binding of the bearings.

For coding and load rating information, refer to page 102. NBF and NBL series bearings are only for replacement in older applications. For current applications and future designs, use AFC and AL series bearings.



NBF



NBL

ABMA NUMBER	MILITARY STANDARD REFERENCE NUMBER MS-	A BORE		B		W OVER-ALL WIDTH +.000 -.005	C O.R. WIDTH +.000 -.005	D RADIUS OR 45° BEVEL	E END RING DIA.	P I.R. GROOVE WIDTH	T MIN. TRACK CONTACT WIDTH	TRACK CAPACITY 180,000 PSI STEEL	BEARING RATING		SHAFT DIAMETER				MIN. CLAMPING DIA.	APPROX. WEIGHT LBS.
		+.0000 -.0007	O.D.	TOL.	*AS A TRACK ROLLER								LIMIT LOAD	PUSH FIT		PRESS FIT				
														MAX.	TOL.	MAX.	TOL.			
3NBF512YJ	24465-3	.1900	.7500			.312	.218	.022	11/16	3/32	1/8	290	900	1200	.1894		.1902		7/16	.029
4NBF614YJ	24465-4	.2500	.8750			.375	.281	.022	3/4	1/8	7/32	575	1430	1910	.2494		.2502		33/64	.049
6NBF817YJ	24465-6	.3750	1.0625			.500	.375	.022	15/16	3/16	5/16	1000	2700	3600	.3744		.3752		43/64	.098
8NBF1012YJ	24465-8	.5000	1.3125			.625	.500	.032	1 3/16	3/16	7/16	1785	4300	5780	.4994	+.0000 -.0005	.5002	+.0000 -.0005	27/32	.178
10NBF1224YJ	24465-10	.6250	1.5000			.750	.625	.032	1 3/8	1/4	9/16	2600	6400	8530	.6244		.6252		61/64	.266
12NBF1628YJ	24465-12	.7500	1.7500			1.000	.875	.032	1 5/8	1/4	3/4	4050	10700	14200	.7494		.7502		1 7/64	.495
14NBF1832YJ	24465-14	.8750	2.0000	+.0000		1.125	1.000	.032	1 7/8	1/4	7/8	5350	13700	18300	.8744		.8752		1 7/32	.713
20NBF2040YJ	24465-20	1.2500	2.5000	+.0000	-.0010	1.250	1.049	.032	1 29/32	3/8	15/16	7370	18900	25200	1.2494		1.2503		1 5/8	1.060
24NBF2448YJ	24465-24	1.5000	3.0000			1.500	1.299	.032	2 7/8	3/8	1 11/64	10800	28800	38400	1.4994	+.0000 -.0006	1.5003	+.0000 -.0006	1 63/64	2.070
28NBF2455YJ	24465-28	1.7500	3.4375			1.500	1.299	.032	3 5/16	3/8	1 11/64	12400	33500	44400	1.7494		1.7503		2 9/32	2.710
32NBF2462YJ	24465-32	2.0000	3.8750			1.500	1.299	.032	3 3/4	3/8	1 11/64	13900	37100	49300	1.9994		2.0003		2 9/16	3.420
36NBF2469YJ	24465-36	2.2500	4.3125			1.500	1.299	.032	4 3/16	3/8	1 11/64	15500	41800	55600	2.2494	+.0000 -.0007	2.2503	+.0000 -.0007	2 55/64	4.230
40NBF2476YJ	24465-40	2.5000	4.7500			1.500	1.299	.032	4 5/8	3/8	1 11/64	17100	45500	60400	2.4994		2.5003		3 7/64	5.140
44NBF2480YJ	24465-44	2.7500	5.0000			1.500	1.299	.032	4 7/8	3/8	1 11/64	18000	49200	65800	2.7494		2.7503		3 11/32	5.490
6NBL1618YJ	24466-6	.3750	1.1250			1.000	.875	.022	1	3/16	3/4	2600	5370	7160	.3744		.3752		43/64	.228
8NBL2022YJ	24466-8	.5000	1.3750			1.250	1.125	.032	1 1/4	1/4	1	4250	9370	12500	.4994		.5002		57/64	.416
10NBL2426YJ	24466-10	.6250	1.6250			1.500	1.375	.032	1 1/2	3/8	1 1/8	5650	15000	20000	.6244	+.0000 -.0005	.6252	+.0000 -.0005	1 7/64	.693
12NBL2830YJ	24466-12	.7500	1.8750			1.750	1.625	.032	1 3/4	3/8	1 3/8	7950	21400	28500	.7494		.7502		1 9/32	1.080
14NBL3234YJ	24466-14	.8750	2.1250	+.0000		2.000	1.875	.032	2	3/8	1 5/8	10650	28900	38500	.8744		.8752		1 15/32	1.550
16NBL3638YJ	24466-16	1.0000	2.3750	+.0000	-.0010	2.250	2.049	.032	2 1/8	3/8	1 51/64	13200	33600	44900	.9994		1.0002		1 37/64	2.150
20NBL4044YJ	24466-20	1.2500	2.7500			2.500	2.299	.032	2 1/2	3/8	2 3/64	17300	44700	59600	1.2494		1.2502		1 27/32	3.090
24NBL4448YJ	24466-24	1.5000	3.0000			2.750	2.549	.032	2 3/4	3/8	2 19/64	21200	53600	71600	1.4994	+.0000 -.0006	1.5002	+.0000 -.0006	1 63/64	3.820
28NBL4855YJ	24466-28	1.7500	3.4375			3.000	2.799	.032	3 3/16	3/8	2 35/64	27000	69000	92000	1.7494		1.7502		2 9/32	5.400
32NBL4826YJ	24466-32	2.0000	3.8750			3.000	2.799	.032	3 5/8	3/8	2 35/64	30400	76600	102000	1.9994	+.0000 -.0007	2.0002	+.0000 -.0007	2 9/16	6.800

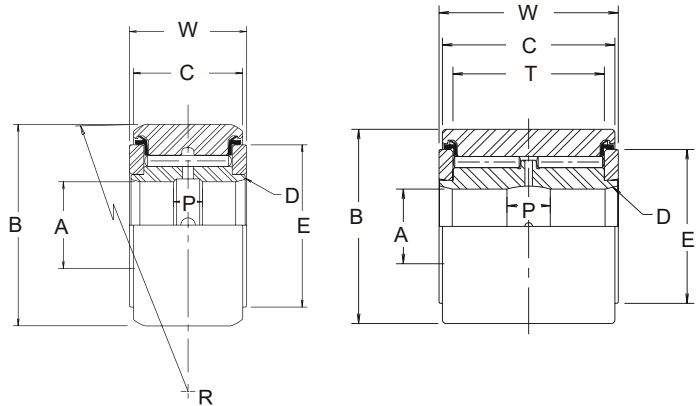
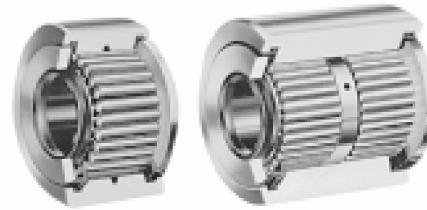
Some individual sizes not available from stock. Consult McGill Customer Service for availability.
* This is capacity as a track roller.

AFC & AL SERIES

AFC and AL series bearings, for track roller applications, were developed from, and are interchangeable dimensionally with NBF and NBL series bearings. They have heavy section outer rings and offer several advantages over NBF and NBL series bearings. LUBRI-DISC® seals provide integral sealing, reduced operating friction and longer relubrication intervals. They are molded, molybdenum disulfide-filled, type 6/6 nylon material. Contact sealing in the outer ring counterbore and on the end plate O.D. helps keep grease in and contaminants out. LUBRI-DISC® seals also eliminate metal on metal sliding contact, reducing friction and operating temperatures, and extend grease lubricant life. The ring portion also acts as a back-up seal. Outer ring counterbore construction provides a wider outer ring with increased effective track contact width. AFC series outer ring O.D.'s are crowned and AL series outer rings have large, blended corners to reduce edge stresses. Surface plating is the same as for NBF and NBL series bearings. End plates must be properly backed by machined boss faces on a clevis or washers, as they are not intended to support thrust loads.

Both types can be relubricated through the inner ring bore. They are supplied with grease prepack per customer requirement when so stated. Otherwise, they will be supplied with grease per MIL-G-23827. Minimum and maximum continuous operating temperatures limited by LUBRI-DISC® seal material to -65°F. to +250°F.

For coding and load rating information, refer to page 102.



AFC

AL

BEARING NUMBER	MILITARY STANDARD REFERENCE NUMBER MS-	BORE DIA.		W		C		D	R	E	P	T	TRACK CAPACITY 180,000 PSI STEEL	BEARING RATING		SHAFT DIAMETER				MIN. CLAMPING DIA.	APPROX. WEIGHT LBS.
		+0.0000 -0.0007	±0.001	+0.000 -0.010	+0.000 -0.005	*AS A TRACK ROLLER	LIMIT LOAD							PUSH FIT		PRESS FIT					
														MAX.	TOL.	MAX.	TOL.				
3AFC512	21438-103	.1900	.7500	.312	.280	.022	10	19/32	3/32	-	-	290	900	1200	.1894					7/16	.027
4AFC614	21438-104	.2500	.8750	.375	.345	.022	10	11/16	1/8	-	-	575	1430	1910	.2494					33/64	.047
6AFC817	21438-106	.3750	1.0625	.500	.455	.022	10	55/64	3/16	-	-	1000	2700	3600	.3744					43/64	.088
8AFC1021	21438-108	.5000	1.3125	.625	.580	.032	12 1/2	1 1/16	3/16	-	-	1785	4300	5700	.4994	+0.0000 -0.0005				27/32	.171
10AFC1224	21438-110	.6250	1.5000	.750	.705	.032	17 1/2	1 3/16	1/4	-	-	2600	6400	8500	.6244					61/64	.262
12AFC1628	21438-112	.7500	1.7500	1.000	.950	.032	25	1 13/32	1/4	-	-	4050	10700	14200	.7494					1 7/64	.493
14AFC1832	21438-114	.8750	2.0000	1.125	1.075	.032	27 1/2	1 1/2	1/4	-	-	5350	14400	19300	.8744					1 7/32	.695
20AFC2040	21438-120	1.2500	2.5000	1.250	1.200	.032	30	2 1/64	3/8	-	-	7100	18900	25300	1.2494					1 5/8	1.060
24AFC2448	21438-124	1.5000	3.0000	1.500	1.440	.032	60	2 29/64	3/8	-	-	10900	28400	37900	1.4994					2	2.070
28AFC2455	21438-128	1.7500	3.4375	1.500	1.440	.032	60	2 25/32	3/8	-	-	12400	33000	44100	1.7494					2 9/32	2.710
†32AFC2462	21438-132	2.0000	3.8750	1.500	1.440	.032	60	3 1/8	3/8	-	-	14000	36700	48900	1.9994					2 9/16	3.420
†36AFC2469	21438-136	2.2500	4.3125	1.500	1.440	.032	60	-	3/8	-	-	15600	41200	55000	2.2494	+0.0000 -0.0007				2 55/64	4.230
†40AFC2476	21438-140	2.5000	4.7500	1.500	1.440	.032	60	3 51/64	3/8	-	-	17200	44900	59900	2.4994					3 7/64	5.140
†44AFC2480	21438-144	2.7500	5.0000	1.500	1.440	.032	60	4 1/16	3/8	-	-	18100	48600	64800	2.7494					3 11/32	5.490
4AL1214	-	.2500	.875	.750	.720	.022	-	43/64	3/16	.560	.560	1550	2310	3080	.2494					37/64	.100
6AL1618	21439-106	.3750	1.1250	1.000	.940	.022	-	55/64	3/16	.750	.750	2600	5370	7130	.3744					43/64	.206
8AL2022	21439-108	.5000	1.3750	1.250	1.190	.032	-	1 5/64	1/4	1.000	1.000	4250	9370	12500	.4994					57/64	.416
10AL2426	21439-110	.6250	1.6250	1.500	1.440	.032	-	1 19/64	3/8	1.125	1.125	5650	15000	19900	.6244	+0.0000 -0.0005				1 7/64	.693
12AL2830	21439-112	.7500	1.8750	1.750	1.690	.032	-	1 1/2	3/8	1.375	1.375	7950	21400	28500	.7494					1 9/32	1.080
14AL3234	21439-114	.8750	2.1250	2.000	1.940	.032	-	1 21/32	3/8	1.625	1.625	10650	28900	38500	.8744					1 15/32	1.550
16AL3638	21439-116	1.0000	2.3750	2.250	2.190	.032	-	1 55/64	3/8	1.797	1.797	13200	33600	44900	.9994					1 37/64	2.150
†20AL4044	21439-120	1.2500	2.7500	2.500	2.440	.032	-	2 13/64	3/8	2.047	2.047	17300	44600	59500	1.2494					1 27/32	3.090
†24AL4448	21439-124	1.5000	3.0000	2.750	2.690	.032	-	2 29/64	3/8	2.297	2.297	21200	53600	71300	1.4994	+0.0000 -0.0006				1 63/64	3.820
†28AL4855	21439-128	1.7500	3.4375	3.000	2.940	.032	-	2 53/64	3/8	2.547	2.547	27000	69000	92000	1.7494					2 9/32	5.400
†32AL4862	21439-132	2.0000	3.8750	3.000	2.940	.032	-	3 7/32	3/8	2.547	2.547	30400	76600	102000	1.9994	+0.0000 -0.0007				2 9/16	6.800

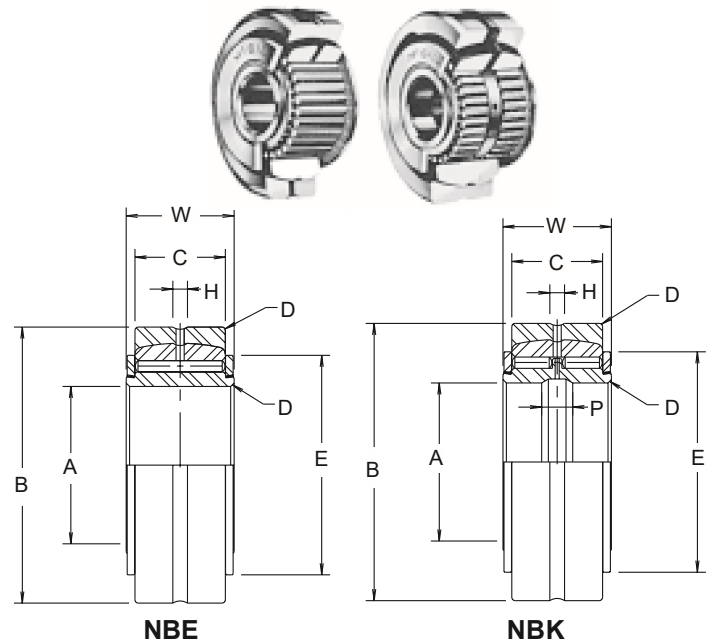
* This is capacity as a track roller.

† Not available from stock, consult factory for availability.

NBE and NBK series bearings are self-aligning, housing outer race-supported needle bearings. They are self-aligned by a spherical outer race O.D. mating in a spherical adapter bore and relubricated both through the bore of the inner race and the O.D. of the outer race. External surfaces except bore are cadmium[®] plated. Outer race surfaces are black oxide finished and bearings are packed with MIL-G-23827 grease unless otherwise specified. Races and rollers are 52100 bearing quality steel and end plates are hardened spring steel. End plates are retained by a swedged ring that holds the bearing together prior to application assembly.

Inner race holes and grooves are omitted from the -3, -4 and -5 sizes because of bolt strength limitations. The shaft and housing fit dimensions shown below are for steel housings only. Decrease dimension .0002" for aluminum alloy housings.

NBK series is basically the same as the NBE series except for an integral rib on the O.D. of the inner race and two rows of full complement needle rollers.



ABMA NUMBER	MILITARY STANDARD REFERENCE NUMBER MS-	A		B		W	C	D	E	H	P
		BORE		O.D.		OVERALL WIDTH	O.R. WIDTH	RADIUS OR 45° BEVEL	END RING DIA.	O.R. GROOVE WIDTH	I.R. GROOVE WIDTH
		IN.	TOL.	IN.	TOL.	+ .000 - .005	+ .000 - .005				
3NBE514ZP	24463-3	.1900	+.0000 -.0007	.8750	+.0000 -.0005	.312	.218	.022	5/8	1/16	-
4NBE615ZP	24463-4	.2500		.9375		.375	.281	.022	11/16	3/32	-
5NBE717ZP	24463-5	.3125		1.0625		.437	.344	.022	3/4	3/32	-
6NBK919YZP	24464-6	.3750		1.1875		.562	.469	.022	13/16	1/8	3/16
7NBK1021YZP	24464-7	.4375		1.3125		.625	.531	.032	7/8	1/8	3/16
8NBK1224YZP	24464-8	.5000		1.5000		.750	.656	.032	1 1/32	1/8	3/16
9NBK1427YZP	24464-9	.5625		1.6875		.875	.781	.032	1 3/32	5/32	3/16
10NBK1628YZP	24464-10	.6250		1.7500		1.000	.906	.032	1 5/32	5/32	1/4
12NBK1830YZP	24464-12	.7500		1.8750		1.125	1.000	.032	1 9/32	5/32	1/4
14NBK2034YZP	24464-14	.8750		2.1250		1.250	1.125	.032	1 1/2	5/32	3/8
16NBK2036YZP	24464-16	1.0000		2.2500		1.250	1.125	.032	1 5/8	5/32	3/8
20NBK2040YZP	24464-20	1.2500		2.5000		1.250	1.049	.032	1 29/32	5/32	3/8
24NBK2044YZP	24464-24	1.5000		2.7500		1.250	1.049	.032	2 5/32	5/32	3/8
32NBK2052YZP	24464-32	2.0000		3.2500		1.250	1.049	.032	2 21/32	5/32	3/8
40NBK2060YZP	24464-40	2.5000		3.7500		1.250	1.049	.032	3 5/32	5/32	3/8
48NBK2068YZP	24464-48	3.0000		4.2500		1.250	1.049	.032	3 21/32	5/32	3/8
56NBK2078YZP	24464-56	3.5000	4.8750	1.250	1.049	.044	4 7/32	5/32	3/8		

ABMA NUMBER	MILITARY STANDARD REFERENCE NUMBER MS-	* AIRCRAFT STATIC CAPACITY	SHAFT DIAMETER				HOUSING BORE				MIN. CLAMPING DIA.	APPROX. WEIGHT LBS.
			SLIP FIT		PRESS FIT		PRESS FIT		SLIP FIT			
			MAX.	TOL.	MAX.	TOL.	MIN.	TOL.	MIN.	TOL.		
3NBE514ZP	24463-3	2700	.1894	+.0000 -.0005	.1902	+.0000 -.0005	.8742	+.0005 -.0000	.8749	+.0005 -.0000	7/16	.041
4NBE615ZP	24463-4	4300	.2494		.2502		.9367		.9374			
5NBE717ZP	24463-5	6100	.3119		.3127		1.0617		1.0624			
6NBK919YZP	24464-6	6800	.3744		.3752		1.1867		1.1874			
7NBK1021YZP	24464-7	8800	.4369		.4377		1.3116		1.3124			
8NBK1224YZP	24464-8	13000	.4994		.5002		1.4991		1.4999			
9NBK1427YZP	24464-9	17700	.5619		.5627		1.6866		1.6874			
10NBK1628YZP	24464-10	23200	.6244		.6252		1.7491		1.7499			
12NBK1830YZP	24464-12	30000	.7494		.7502		1.8741		1.8749			
14NBK2034YZP	24464-14	38700	.8744		.8752		2.1238		2.1249			
16NBK2036YZP	24464-16	43000	.9994		1.0002		2.2488		2.2499			
20NBK2040YZP	24464-20	47100	1.2494		1.2503		2.4988		2.4999			
24NBK2044YZP	24464-24	54900	1.4994		1.5003		2.7488		2.7499			
32NBK2052YZP	24464-32	70600	1.9994		2.0003		3.2485		3.2498			
40NBK2060YZP	24464-40	86200	2.4994		2.5003		3.7485		3.7498			
48NBK2068YZP	24464-48	101900	2.9994		3.0003		4.2485		4.2498			
56NBK2078YZP	24464-56	120200	3.4994	3.5004	4.8735	4.8748						

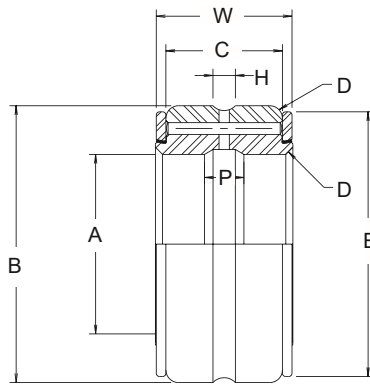
* Aircraft Static Capacity is the Ultimate Static Load Rating.
[®] Cadmium plating to be replaced by zinc-nickel plating at a later date.

NBC SERIES

NBC aircraft needle bearings are self-contained, outer race housing supported bearings having a full complement of spherical end rollers. External surfaces except bore are cadmium[®] plated. Bearings are packed with MIL-G 23827 grease unless otherwise specified. Races and rollers are 52100 bearing quality steel and end plates are hardened spring steel. End plates are retained by a swedged ring holding the bearing together prior to application assembly. This series is ordinarily supplied with lubrication grooves and holes in both inner and outer races.

Inner race holes and grooves are omitted from the -3, -4 and -5 sizes because of bolt strength limitations. The shaft and housing fit dimensions shown are for steel housings only. Decrease dimension .0002" for aluminum alloy housings.

For coding and load rating information, refer to page 102.



ABMA NUMBER	MILITARY STANDARD REFERENCE NUMBER MS-	A		B		W	C	D	E	H	P
		BORE		O.D.		OVERALL WIDTH	O.R. WIDTH	RADIUS OR 45° BEVEL	END RING DIA.	O.R. GROOVE WIDTH	I.R. GROOVE WIDTH
		NOM. DIA.	TOL.	NOM. DIA.	TOL.	+ .000 - .005	+ .000 - .005				
3NBC511ZP	24461-3	.1900	+ .0000 - .0007	.6875	+ .0000 - .0005	.312	.218	.022	5/8	1/16	-
4NBC612ZP	24461-4	.2500		.7500		.375	.281	.022	11/16	3/32	-
5NBC713ZP	24461-5	.3125		.8125		.437	.344	.022	3/4	3/32	-
6NBC914YZP	24461-6	.3750		.8750		.562	.469	.022	13/16	1/8	3/16
7NBC1015YZP	24461-7	.4375		.9375		.625	.531	.032	7/8	1/8	3/16
8NBC1218YZP	24461-8	.5000		1.1250		.750	.656	.032	1 1/32	1/8	3/16
9NBC1419YZP	24461-9	.5625		1.1875		.875	.781	.032	1 3/32	5/32	3/16
10NBC1620YZP	24461-10	.6250		1.2500		1.000	.906	.032	1 5/32	5/32	1/4
12NBC1822YZP	24461-12	.7500		1.3750		1.125	1.000	.032	1 9/32	5/32	1/4
14NBC2026YZP	24461-14	.8750		1.6250		1.250	1.125	.032	1 1/2	5/32	3/8
16NBC2028YZP	24461-16	1.0000	1.7500	1.250	1.125	.032	1 5/8	5/32	3/8		
20NBC2032YZP	24461-20	1.2500	2.0000	1.250	1.049	.032	1 29/32	5/32	3/8		
24NBC2036YZP	24461-24	1.5000	2.2500	1.250	1.049	.032	2 5/32	5/32	3/8		
28NBC2040YZP	24461-28	1.7500	2.5000	1.250	1.049	.032	2 13/32	5/32	3/8		
32NBC2044YZP	24461-32	2.0000	2.7500	1.250	1.049	.032	2 21/32	5/32	3/8		
36NBC2048YZP	24461-36	2.2500	3.0000	1.250	1.049	.032	2 29/32	5/32	3/8		
40NBC2052YZP	24461-40	2.5000	3.2500	1.250	1.049	.032	3 5/32	5/32	3/8		
44NBC2056YZP	24461-44	2.7500	3.5000	1.250	1.049	.032	3 13/32	5/32	3/8		
48NBC2060YZP	24461-48	3.0000	3.7500	1.250	1.049	.032	3 21/32	5/32	3/8		
52NBC2064YZP	24461-52	3.2500	4.0000	1.250	1.049	.032	3 29/32	5/32	3/8		
56NBC2070YZP	24461-56	3.5000	4.3750	1.250	1.049	.044	4 7/32	5/32	3/8		
60NBC2074YZP	24461-60	3.7500	4.6250	1.250	1.049	.044	4 15/32	5/32	3/8		
64NBC2078YZP	24461-64	4.0000	4.8750	1.250	1.049	.044	4 23/32	5/32	3/8		

ABMA NUMBER	MILITARY STANDARD REFERENCE NUMBER MS-	* AIRCRAFT STATIC CAPACITY	SHAFT DIAMETER				HOUSING BORE				MIN. CLAMPING DIA.	APPROX. WEIGHT LBS.
			SLIP FIT		PRESS FIT		PRESS FIT		SLIP FIT			
			MAX.	TOL.	MAX.	TOL.	MIN.	TOL.	MIN.	TOL.		
3NBC511ZP	24461-3	2700	.1894	+ .0000 - .0005	.1902	+ .0000 - .0005	.6867	+ .0005 - .0000	.6874	+ .0005 - .0000	7/16	.028
4NBC612ZP	24461-4	4300	.2494		.2502		.7492		.7499		33/64	.040
5NBC713ZP	24461-5	6100	.3119		.3127		.8117		.8124		37/64	.057
6NBC914YZP	24461-6	9500	.3744		.3752		.8742		.8749		41/64	.075
7NBC1015YZP	24461-7	12000	.4369		.4377		.9367		.9374		45/64	.097
8NBC1218YZP	24461-8	17400	.4994		.5002		1.1242		1.1249		27/32	.165
9NBC1419YZP	24461-9	22500	.5619		.5627		1.1867		1.1874		57/64	.207
10NBC1620YZP	24461-10	28300	.6244		.6252		1.2492		1.2499		61/64	.252
12NBC1822YZP	24461-12	35800	.7494		.7502		1.3741		1.3749		1 5/64	.336
14NBC2026YZP	24461-14	45800	.8744		.8752		1.6241		1.6249		1 1/4	.423
16NBC2028YZP	24461-16	50900	.9994	1.0002	1.7491	1.7499	1 3/8	.510				
20NBC2032YZP	24461-20	56800	1.2494	1.2503	1.9990	1.9999	1 5/8	.600				
24NBC2036YZP	24461-24	66300	1.4994	1.5003	2.2488	2.2499	1 7/8	.710				
28NBC2040YZP	24461-28	75700	1.7494	1.7503	2.4988	2.4999	2 1/8	.780				
32NBC2044YZP	24461-32	85200	1.9994	2.0003	2.7488	2.7499	2 3/8	.880				
36NBC2048YZP	24461-36	94600	2.2494	2.2503	2.9988	2.9999	2 5/8	.980				
40NBC2052YZP	24461-40	104100	2.4994	2.5003	3.2485	3.2498	2 7/8	1.060				
44NBC2056YZP	24461-44	113500	2.7494	2.7503	3.4985	3.4998	3 1/8	1.150				
48NBC2060YZP	24461-48	123000	2.9994	3.0003	3.7485	3.7498	3 3/8	1.240				
52NBC2064YZP	24461-52	132500	3.2494	3.2504	3.9985	3.9998	3 41/64	1.340				
56NBC2070YZP	24461-56	145100	3.4994	3.5004	4.3735	4.3748	3 31/32	1.730				
60NBC2074YZP	24461-60	154500	3.7494	3.7504	4.6235	4.6248	4 7/32	1.840				
64NBC2078YZP	24461-64	164000	3.9994	4.0004	4.8735	4.8748	4 15/32	1.990				

* Aircraft Static Capacity is the Ultimate Static Load Rating. Not all sizes available from stock. Consult McGill Customer Service for availability.

® Cadmium plating to be replaced by zinc-nickel plating at a later date.

McGill manufactures integral stud type airframe bearings in accordance with MS21432, MS21447 and NAS-562 standards, as well as special modifications. Consult McGill Customer Service for availability.

General engineering data

The integral stud type airframe track roller for cantilever mounting should be applied only after the following design features are considered:

1. The limit load listed in the tabular material is for rolling elements only; therefore, stud strength must be considered for actual maximum load carrying design limits.
2. Track capacity may supersede bearing fatigue capacity.
3. Threads on all bearings listed in tabular material conform to MIL-S-8879 for Class UNJF-3A.
4. Proper housing support is imperative for optimum performance. Studs must be supported uniformly with mounting holes square with boss faces. Junction of boss face and mounting hole should be kept as sharp as possible without burrs.
5. Bearings packed with MIL-G-23827 grease unless otherwise specified.

The coding of the HRS and CHRS will be as follows:

Basic Type	Size	Plating	Relub.	Cotter Pin Hole Requirement	Grip Lgth. Seals in 1/16ths
------------	------	---------	--------	-----------------------------	-----------------------------

HRS — Standard bearing with stud heat treated to 36-44 Rockwell "C" scale.

CHRS — Standard bearing with stud heat treated to 36-44 Rockwell "C" scale and crowned roller O.D.

C — Exposed surfaces of the outer race chrome plated .0004" min. The remaining exposed surfaces cadmium plated.

T — Lubricator installed in threaded end of stud and cotter pin hole will be eliminated.

K — Stud slotted to receive an NAS 460 washer.

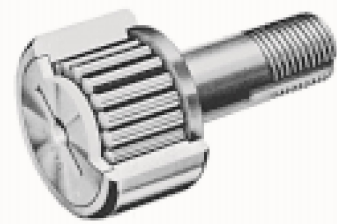
F — Lubricator installed in flange end of stud.

A — No cotter pin hole in threaded end of stud.

R — Sealed bearing.

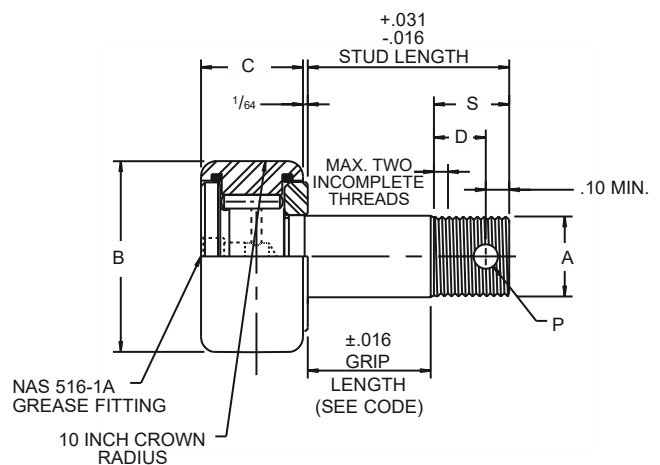
P — Exposed surfaces of outer race cadmium plated. Remaining exposed surfaces of end plate, flange and stud also cadmium plated.

Example: HRS4 CT8 — Bearing type "HRS" indicates heat treated stud, "4" indicates a .375 stud diameter, .875 O.D., and .469 outer width, "C" indicates chrome plated outer, "T" indicates lubricator in threaded end of stud and cotter pin hole omitted, "8" indicates a grip length of 8/16" or 1/2".

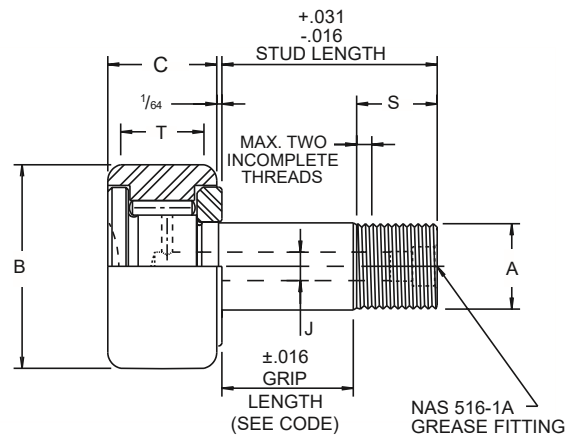


Double sealed bearings are available in the HRS or CHRS series. To specify, add letter "R" to catalog number. Example: HRS1CFAR8.

RELUBRICATION FROM FLANGE END



RELUBRICATION FROM THREADED END



McGILL NUMBER		MILITARY STANDARD NUMBER		NAS 562 NUMBER	A	B	C	D	S	THREAD SIZE	P	T	J	TRACK CAPACITY 180,000 PSI STEEL	BEARING RATING		HOUSING BORE DIA. FOR STUD	
CYLINDRICAL O.D.	CROWNED O.D.	CYLINDRICAL O.D.	CROWNED O.D.	CYLINDRICAL O.D.	STUD DIA.	ROLLER O.D.	ROLLER WIDTH	(MIN.)	THREAD LENGTH (REF.)	3	COTTER PIN HOLE DIA.	TRACK CONTACT LENGTH (MIN.)	DIA. (REF.)	2	AS A TRACK ROLLER	LIMIT LOAD	MAX.	MIN.
HRS1	CHRS1	MS21432-3	MS21447-3	NAS562-3	.190	.5000	.281	.211	.344	10-32	.070	.230	none	385	395	790	.1905	.1900
HRS2	CHRS2	MS21432-4	MS21447-4	NAS562-4	.250	.6875	.281	.224	.344	1/4-28	.076	.230	.076	525	470	940	.2505	.2500
HRS3	CHRS3	MS21432-5	MS21447-5	NAS562-5	.312	.7500	.344	.234	.359	5/16-24	.076	.290	.076	725	830	1660	.3125	.3120
HRS4	CHRS4	MS21432-6	MS21447-6	NAS562-6	.375	.8750	.469	.265	.359	3/8-24	.106	.380	.106	1100	1360	2720	.3755	.3750
HRS5	CHRS5	MS21432-7	MS21447-7	NAS562-7	.437	1.0000	.531	.283	.422	7/16-20	.106	.430	.106	1425	1930	3860	.4375	.4370
HRS6	CHRS6	MS21432-8	MS21447-8	NAS562-8	.500	1.1250	.656	.314	.422	1/2-20	.106	.530	.106	1975	3040	6080	.5005	.5000

* Limit load is two-thirds of aircraft static capacity.

AIRCRAFT BEARINGS

INTERCHANGEABILITY CHART



MILITARY STANDARD NUMBER	* TORRINGTON®	McGILL
24461-3	3NBC511ZP	3NBC511ZP
24461-4	4NBC612ZP	4NBC612ZP
24461-5	5NBC713ZP	5NBC713ZP
24461-6	6NBC914ZP	6NBC914ZP
24461-7	7NBC1015ZP	7NBC1015ZP
24461-8	8NBC1218ZP	8NBC1218ZP
24461-9	9NBC1419ZP	9NBC1419ZP
24461-10	10NBC1620ZP	10NBC1620ZP
24461-12	12NBC1822ZP	12NBC1822ZP
24461-14	14NBC2026ZP	14NBC2026ZP
24461-16	16NBC2028ZP	16NBC2028ZP
24461-20	20NBC2032ZP	20NBC2032ZP
24461-24	24NBC2036ZP	24NBC2036ZP
24461-28	28NBC2040ZP	28NBC2040ZP
24461-32	32NBC2044ZP	32NBC2044ZP
24461-36	36NBC2048ZP	36NBC2048ZP
24461-40	40NBC2052ZP	40NBC2052ZP
24461-44	44NBC2056ZP	44NBC2056ZP
24461-48	48NBC2060ZP	48NBC2060ZP
24461-52	52NBC2064ZP	52NBC2064ZP
24461-56	56NBC2070ZP	56NBC2070ZP
24461-60	60NBC2074ZP	60NBC2074ZP
24461-64	64NBC2078ZP	64NBC2078ZP
24465-3	3NBF512YJ	3NBF512YJ
24465-4	4NBF614YJ	4NBF614YJ
24465-6	6NBF817YJ	6NBF817YJ
24465-8	8NBF1021YJ	8NBF1021YJ
24465-10	10NBF1224YJ	10NBF1224YJ
24465-12	12NBF1628YJ	12NBF1628YJ
24465-14	14NBF1832YJ	14NBF1832YJ
24465-20	20NBF2040YJ	20NBF2040YJ
24465-24	24NBF2448YJ	24NBF2448YJ
24465-28	28NBF2455YJ	28NBF2455YJ
24465-32	32NBF2462YJ	32NBF2462YJ
24465-36	36NBF2469YJ	36NBF2469YJ
21438-103	ATF-3	3AFC512
21438-104	ATF-4	4AFC614
21438-106	ATF-6	6AFC817
21438-108	ATF-8	8AFC1021
21438-110	ATF-10	10AFC1224
21438-112	ATF-12	12AFC1628
21438-114	ATF-14	14AFC1832
21438-120	ATF-20	20AFC2040
21438-124	ATF-24	24AFC2448
21438-128	ATF-28	28AFC2455
21438-132	ATF-32	32AFC2462
21438-136	ATF-36	36AFC2469
21438-140	ATF-40	40AFC2476
21438-144	ATF-44	44AFC2480

MILITARY STANDARD NUMBER	* TORRINGTON®	McGILL
24465-40	40NBF2476YJ	40NBF2476YJ
24465-44	44NBF2480YJ	44NBF2480YJ
24466-6	6NBL1618YJ	6NBL1618YJ
24466-8	8NBL2022YJ	8NBL2022YJ
24466-10	10NBL2426YJ	10NBL2426YJ
24466-12	12NBL2830YJ	12NBL2830YJ
24466-14	14NBL3234YJ	14NBL3234YJ
24466-16	16NBL3638YJ	16NBL3638YJ
24466-20	20NBL4044YJ	20NBL4044YJ
24466-24	24NBL4448YJ	24NBL4448YJ
24466-28	28NBL4855YJ	28NBL4855YJ
24466-32	32NBL4862YJ	32NBL4862YJ
24463-3	3NBE514ZP	3NBE514ZP
24463-4	4NBE615ZP	4NBE615ZP
24463-5	5NBE717ZP	5NBE717ZP
24464-6	6NBK919ZP	6NBK919ZP
24464-7	7NBK1021ZP	7NBK1021ZP
24464-8	8NBK1224ZP	8NBK1224ZP
24464-9	9NBK1427YJ	9NBK1427YJ
24464-10	10NBK1628YJ	10NBK1628YJ
24464-12	12NBK1830YJ	12NBK1830YJ
24464-14	14NBK2034YJ	14NBK2034YJ
24464-16	16NBK2036YJ	16NBK2036YJ
24464-20	20NBK2040YJ	20NBK2040YJ
24464-24	24NBK2044YJ	24NBK2044YJ
24464-32	32NBK2052YJ	32NBK2052YJ
24464-40	40NBK2060YJ	40NBK2060YJ
24464-48	48NBK2068YJ	48NBK2068YJ
24464-56	56NBK2078YJ	56NBK2078YJ
	HRS-1C	HRS-1C
	HRS-2C	HRS-2C
	HRS-3C	HRS-3C
	HRS-4C	HRS-4C
	HRS-5C	HRS-5C
	HRS-6C	HRS-6C
N/A	AE55879	4AL1214
21439-106	ATL-6	6AL1618
21439-108	ATL-8	8AL2022
21439-110	ATL-10	10AL2426
21439-112	ATL-12	12AL2830
21439-114	ATL-14	14AL3234
21439-116	ATL-16	16AL3638
21439-120	ATL-20	20AL4044
21439-124	ATL-24	24AL4448
21439-128	ATL-28	28AL4855
21439-132	ATL-32	32AL4862
21447-3	HRSC-1C	CHRS-1C
21447-4	HRSC-2C	CHRS-2C
21447-5	HRSC-3C	CHRS-3C
21447-6	HRSC-4C	CHRS-4C
21447-7	HRSC-5C	CHRS-5C
21447-8	HRSC-6C	CHRS-6C

* The trademark TORRINGTON is a registered trademark of The Torrington Company.