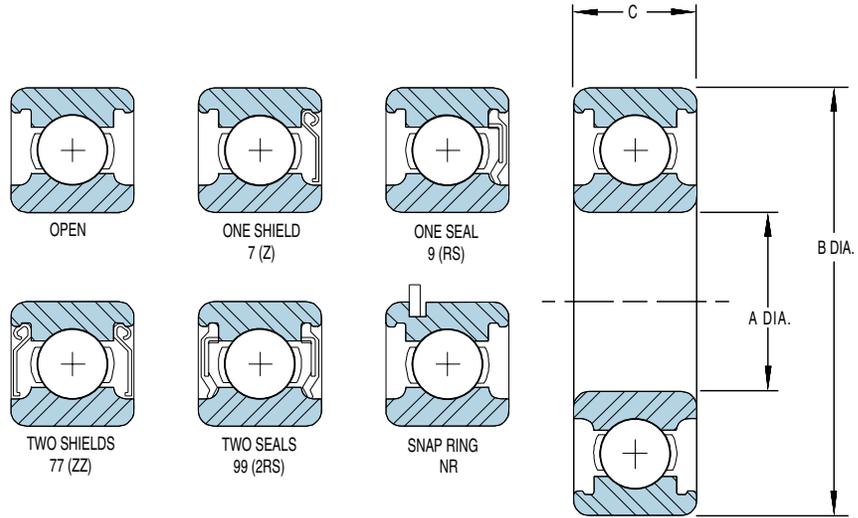


"R" Light Inch Series

ABEC-1



BASIC BEARING NUMBER	BORE A		OUTSIDE DIAMETER B		WIDTH C*		MAX FILLET RADIUS	BASIC STATIC LOAD (lbs)	BASIC DYNAMIC LOAD ¹ (lbs)	WEIGHT ² (lbs)	LIMITING SPEED ² (rpm)
	inch	tol. +.0000	inch	tol. +.0000	Open type	Shield or Seal					
R2	.1250	-.0003	.3750	-.0004	.1562	.1562	.012	51	144	.003	91000
R3	.1875	-.0003	.5000	-.0004	.1562	.1960	.012	109	294	.005	66000
R4	.2500	-.0003	.6250	-.0004	.1960	.1960	.012	139	333	.010	52000
R4A	.2500	-.0003	.7500	-.0004	.2188	.2812	.016	203	502	.017	45000
R6	.3750	-.0003	.8750	-.0004	.2188	.2812	.016	317	750	.029	36000
R8	.5000	-.0003	1.1250	-.0004	.2500	.3125	.016	538	1151	.040	28000
R10	.6250	-.0003	1.3750	-.0005	.2812	.3438	.031	653	1260	.067	23000
R12	.7500	-.0004	1.6250	-.0005	.3125	.4375	.031	993	1783	.100	19000
R14	.8750	-.0004	1.8750	-.0005	.3750	.5000	.031	1301	2266	.159	16000
R16	1.0000	-.0004	2.0000	-.0005	.3750	.5000	.031	1338	2259	.178	15000
R18	1.1250	-.0004	2.1250	-.0005	.3750	.5000	.031	1504	2394	.194	14000
R20	1.2500	-.0005	2.2500	-.0005	.3750	.5000	.031	1669	2517	.200	13000
90500-88 (99502H)	.6250	-.0003	1.3750	-.0005	.4330	.4330	.025	836	1717	.080	23000
90502-88 (99502HNR)	.6250	-.0003	1.3750	-.0005	.4330	.4330	.025	836	1717	.080	23000

* WIDTH TOLERANCE +.000/-0.005

¹ Dynamic Loads are based on 1 million revolutions.

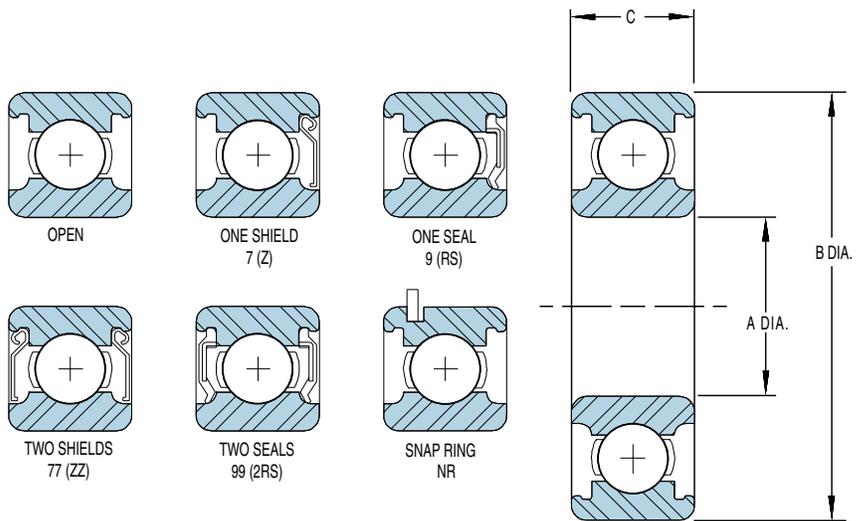
² Weight and Limiting Speed are based on an open, oiled bearing.

PART NUMBER NOMENCLATURE EXAMPLE:

R2 (R2) – Open

77R2 (R2ZZ) – 2 Shields

99R2 (R22RS) – 2 Seals



BASIC BEARING NUMBER	INDUSTRY NUMBER	BORE A		OUTSIDE DIAMETER B		MAX FILLET WIDTH C*	BASIC RADIUS	BASIC STATIC LOAD (lbs)	DYNAMIC LOAD ¹ (lbs)	WEIGHT ² (lbs)	LIMITING SPEED ² (rpm)
		mm inch	tol. +.0000	mm inch	tol. +.0000						
34	634	4 .1575	-0.008 -.0003	16 .6299	-0.010 -.0004	5 .1969	0.3 .012	153	423	.011	58000
35	635	5 .1969	-0.008 -.0003	19 .7480	-0.010 -.0004	6 .2362	0.3 .012	197	496	.018	48000
36	626	6 .2362	-0.008 -.0003	19 .7480	-0.010 -.0004	6 .2362	0.3 .012	201	500	.020	46000
37	627	7 .2756	-0.008 -.0003	22 .8661	-0.010 -.0004	7 .2756	0.3 .012	303	735	.030	40000
38	608	8 .3150	-0.008 -.0003	22 .8661	-0.010 -.0004	7 .2756	0.3 .012	307	742	.030	38000
39	629	9 .3543	-0.008 -.0003	26 1.0236	-0.010 -.0004	8 .3150	0.3 .012	437	1023	.040	33000

* WIDTH TOLERANCE: +.000/-0.005 (+0.000/-0.127mm).

¹ Dynamic Loads are based on 1 million revolutions.

² Weight and Limiting Speed are based on an open, oiled bearing.

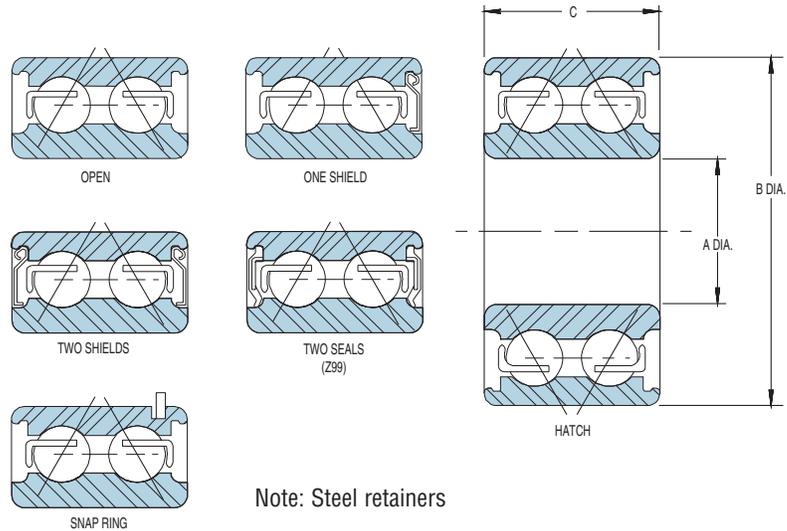
PART NUMBER NOMENCLATURE EXAMPLE:

38 - Open (608)

77038 - 2 Shields (608ZZ)

99038 - 2 Seals (6082RS)

DOUBLE ROW BALL BEARINGS



Note: Steel retainers

BASIC BEARING NUMBER				BORE A		OUTSIDE DIAMETER B		WIDTH C*	BASIC STATIC LOAD (lbs)	BASIC DYNAMIC LOAD ¹ (lbs)	WEIGHT ² (lbs)	LIMITING SPEED ² (rpm)
OPEN	ONE SHIELD	TWO SHIELDS	OPEN SN. RING	mm inch	tol. +.0000	mm inch	tol. +.0000	mm inch				
5200	5500	55500	45200	10 .3937	-0.008 -.0003	30 1.1811	-0.010 -.0004	14.3 .5625	854	1562	.12	22000
5201	5501	55501	45201	12 .4724	-0.008 -.0003	32 1.2598	-0.013 -.0005	15.9 .6250	1138	2053	.14	20000
5202	5502	55502	45202	15 .5906	-0.008 -.0003	35 1.3780	-0.013 -.0005	15.9 .6250	1359	2258	.15	17000
5203	5503	55503	45203	17 .6693	-0.008 -.0003	40 1.5748	-0.013 -.0005	17.5 .6875	1775	2871	.22	15000
5204	5504	55504	45204	20 .7874	-0.010 -.0004	47 1.8504	-0.013 -.0005	20.6 .8125	2717	4282	.38	13000
5205	5505	55505	45205	25 .9843	-0.010 -.0004	52 2.0472	-0.013 -.0005	20.6 .8125	3204	4633	.41	11000
5206	5506	55506	45206	30 1.1811	-0.010 -.0004	62 2.4409	-0.013 -.0005	23.8 .9375	3965	5479	.69	9500
5207	5507	55507	45207	35 1.3780	-0.013 -.0005	72 2.8346	-0.013 -.0005	27.0 1.0625	5506	7413	1.06	8000
5208	5508	55508	45208	40 1.5748	-0.013 -.0005	80 3.1496	-0.013 -.0005	30.2 1.1875	7273	9603	1.44	7200
5209	5509	55509	45209	45 1.7717	-0.013 -.0005	85 3.3465	-0.015 -.0006	30.2 1.1875	7326	9007	1.56	6700
5210	5510	55510	45210	50 1.9685	-0.015 -.0006	90 3.5433	-0.015 -.0006	30.2 1.1875	8171	9507	1.69	6000
5211	5511	55511	45211	55 2.1654	-0.015 -.0006	100 3.9370	-0.015 -.0006	33.3 1.3125	10610	12140	2.33	5500
5212	5512	55512	45212	60 2.3622	-0.015 -.0006	110 4.3307	-0.015 -.0006	36.5 1.4375	14695	16683	3.11	5000

TWO SEALS WIDE WIDTH

Z995203	—	—	—	17 .6693	-0.008 -.0003	40 1.5748	-0.013 -.0005	20.6 .8125	1775	2871	.28	15000
Z995204	—	—	—	20 .7874	-0.010 -.0004	47 1.8504	-0.013 -.0005	23.8 .9375	2717	4282	.46	13000
Z995205	—	—	—	25 .9843	-0.010 -.0004	52 2.0472	-0.013 -.0005	23.8 .9375	3204	4633	.49	11000

* WIDTH TOLERANCE +.000/-0.005 (+0.000/-0.127mm).

¹ Dynamic Loads are based on 1 million revolutions.

² Weight and Limiting Speed are based on an open, oiled bearing.

PART NUMBER NOMENCLATURE EXAMPLE:

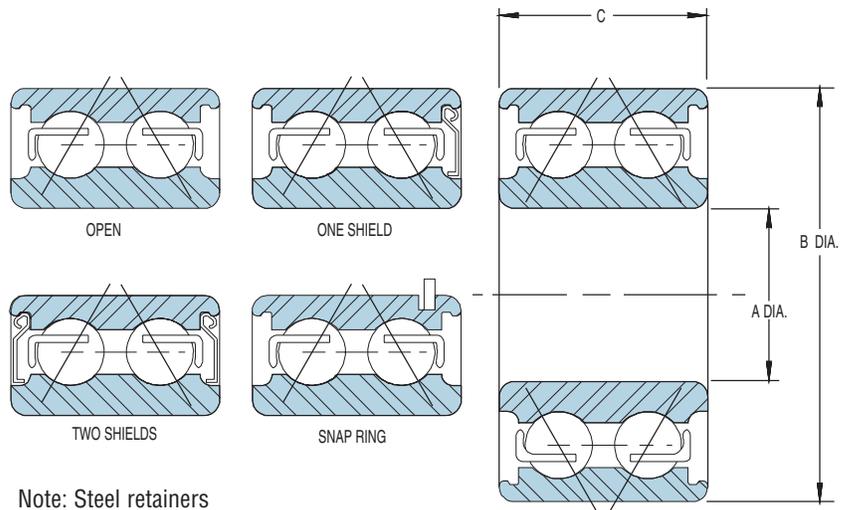
45500 – One Shield, Snap Ring

455500 – Two Shields, Snap Ring

5300 Medium Series

ABEC-1

DOUBLE ROW BALL BEARINGS



Note: Steel retainers

BASIC BEARING NUMBER				BORE A		OUTSIDE DIAMETER B		WIDTH C*	BASIC STATIC LOAD (lbs)	BASIC DYNAMIC LOAD ¹ (lbs)	WEIGHT ² (lbs)	LIMITING SPEED ² (rpm)
OPEN	ONE SHIELD	TWO SHIELDS	OPEN SN. RING	mm inch	tol. +.0000	mm inch	tol. +.0000	mm inch				
5300	5600	55600	45300	10 .3937	-0.008 -.0003	35 1.3780	-0.013 -.0005	19.0 .7500	1314	2375	.22	20000
5301	5601	55601	45301	12 .4724	-0.008 -.0003	37 1.4567	-0.013 -.0005	19.0 .7500	1507	2674	.23	18000
5302	5602	55602	45302	15 .5906	-0.008 -.0003	42 1.6535	-0.013 -.0005	19.0 .7500	1869	3031	.38	16000
5303	5603	55603	45303	17 .6693	-0.008 -.0003	47 1.8504	-0.013 -.0005	22.2 .8750	2857	4507	.42	14000
5304	5604	55604	45304	20 .7874	-0.010 -.0004	52 2.0472	-0.013 -.0005	22.2 .8750	2780	4292	.52	11000
5305	5605	55605	45305	25 .9843	-0.010 -.0004	62 2.4409	-0.013 -.0005	25.4 1.0000	4010	5959	.82	10000
5306	5606	55606	45306	30 1.1811	-0.010 -.0004	72 2.8346	-0.013 -.0005	30.2 1.1875	6194	8893	1.32	9500
5307	5607	55607	45307	35 1.3780	-0.012 -.0005	80 3.1496	-0.013 -.0005	34.9 1.3750	7884	11131	1.77	8500
5308	5608	55608	45308	40 1.5748	-0.012 -.0005	90 3.5433	-0.015 -.0006	36.5 1.4375	9896	13603	2.38	7500
5309	5609	55609	45309	45 1.7717	-0.012 -.0005	100 3.9370	-0.015 -.0006	39.7 1.5625	12129	16294	3.25	6700
5310	5610	55610	45310	50 1.9685	-0.012 -.0005	110 4.3307	-0.015 -.0006	44.4 1.7500	14036	18392	4.25	6000

* WIDTH TOLERANCE $+.000/-0.005$ ($+0.000/-0.127$ mm).

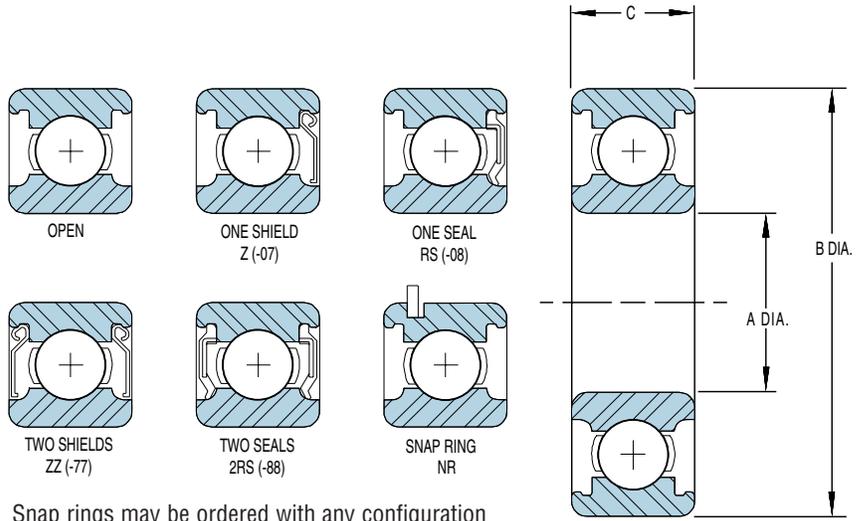
¹ Dynamic Loads are based on 1 million revolutions.

² Weight and Limiting Speed are based on an open, oiled bearing.

PART NUMBER NOMENCLATURE EXAMPLE:

45600 – One Shield, Snap Ring

455600 – Two Shields, Snap Ring



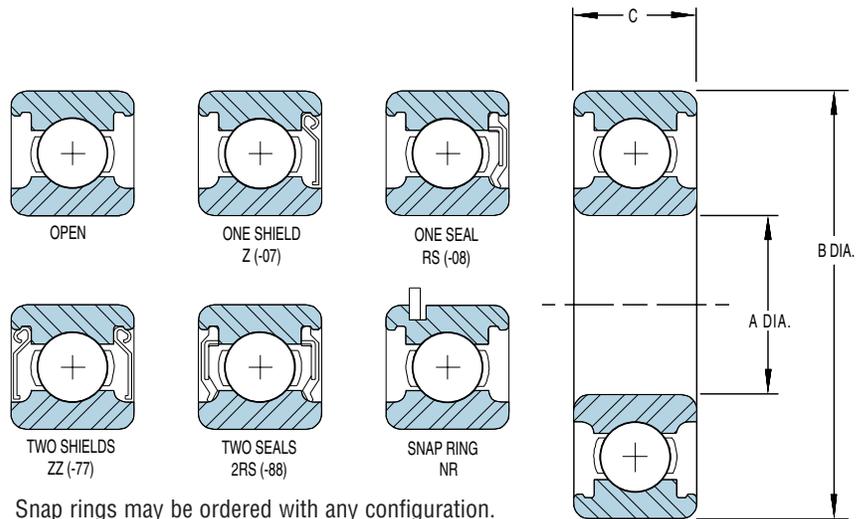
Snap rings may be ordered with any configuration

BASIC BEARING NUMBER	BORE A		OUTSIDE DIAMETER B		WIDTH C*	MAX FILLET RADIUS	BASIC STATIC LOAD (lbs)	BASIC DYNAMIC LOAD ¹ (lbs)	WEIGHT ² (lbs)	LIMITING SPEED ² (rpm)
	mm inch	tol. +.0000	mm inch	tol. +.0000						
6000	10 .3937	-0.008 -.0003	26 1.0236	-0.010 -.0004	8 .3150	0.3 .012	443	1030	.040	32000
6001	12 .4724	-0.008 -.0003	28 1.1024	-0.010 -.0004	8 .3150	0.3 .012	534	1148	.040	28000
6002	15 .5906	-0.008 -.0003	32 1.2598	-0.013 -.0005	9 .3543	0.3 .012	639	1258	.060	24000
6003	17 .6693	-0.008 -.0003	35 1.3780	-0.013 -.0005	10 .3937	0.3 .012	731	1350	.090	22000
6004	20 .7874	-0.010 -.0004	42 1.6535	-0.013 -.0005	12 .4724	0.6 .024	1004	1951	.160	18000
6005	25 .9843	-0.010 -.0004	47 1.8504	-0.013 -.0005	12 .4724	0.6 .024	1315	2264	.170	16000
6006	30 1.1811	-0.010 -.0004	55 2.1654	-0.013 -.0005	13 .5118	1.0 .039	1859	2977	.260	13000
6007	35 1.3780	-0.013 -.0005	62 2.4409	-0.013 -.0005	14 .5512	1.0 .039	2309	3593	.320	12000
6008	40 1.5748	-0.013 -.0005	68 2.6672	-0.013 -.0005	15 .5906	1.0 .039	2593	3775	.430	10000
6009	45 1.7717	-0.013 -.0005	75 2.9528	-0.013 -.0005	16 .6299	1.0 .039	3406	4721	.550	9000
6010	50 1.9685	-0.013 -.0005	80 3.1496	-0.013 -.0005	16 .6299	1.0 .039	3455	4672	.600	9000
6011	55 2.1654	-0.015 -.0006	90 3.5433	-0.015 -.0006	18 .7087	1.0 .039	4776	6360	.860	8000
6012	60 2.3622	-0.015 -.0006	95 3.7402	-0.015 -.0006	18 .7087	1.0 .039	4834	6303	.920	7000
6013	65 2.5591	-0.015 -.0006	100 3.9370	-0.015 -.0006	18 .7087	1.0 .039	5653	6870	.980	7000
6014	70 2.7559	-0.015 -.0006	110 4.3307	-0.015 -.0006	20 .7874	1.0 .039	6938	8560	1.330	6000
6015	75 2.9528	-0.015 -.0006	115 4.5276	-0.015 -.0006	20 .7874	1.0 .039	7522	8892	1.410	6000
6016	80 3.1496	-0.015 -.0006	125 4.9213	-0.018 -.0007	22 .8661	1.0 .039	8919	10716	1.870	5000
6017	85 3.3465	-0.020 -.0008	130 5.1181	-0.018 -.0007	22 .8661	1.0 .039	9658	11141	1.960	5000

* WIDTH TOLERANCE: Bore up to 1.9685 +.000/-0.005 (+0.000/-0.127mm);
Bore 2.1654 up to 3.1496 +.000/-0.006 (+0.000/-0.152mm);
Bore 3.3465 up to 4.7244 +.000/-0.008 (+0.000/-0.203mm).

¹ Dynamic Loads are based on 1 million revolutions.

² Weight and Limiting Speed are based on an open, oiled bearing.



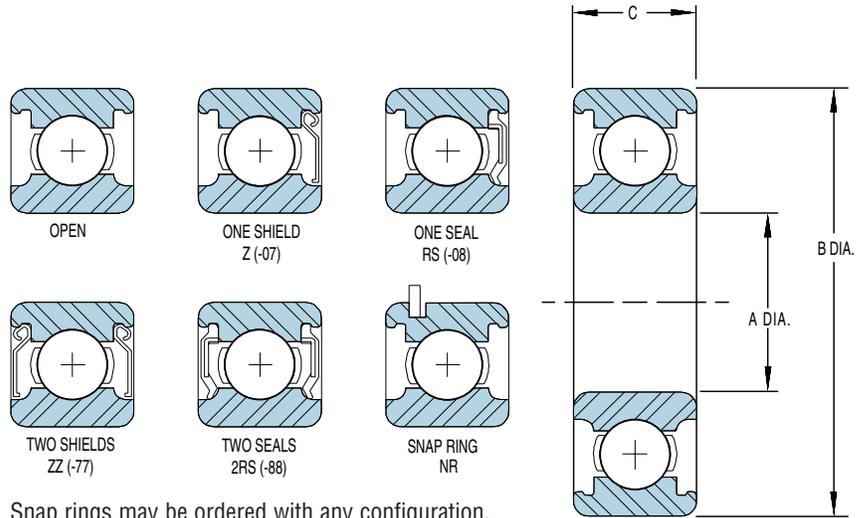
Snap rings may be ordered with any configuration.

BASIC BEARING NUMBER	BORE A		OUTSIDE DIAMETER B		WIDTH C*	MAX FILLET RADIUS	BASIC STATIC LOAD (lbs)	BASIC DYNAMIC LOAD ¹ (lbs)	WEIGHT ² (lbs)	LIMITING SPEED ² (rpm)
	mm inch	tol. +.0000	mm inch	tol. +.0000						
6200	10 .3937	-0.008 -.0003	30 1.1811	-0.010 -.0004	9 .3543	0.6 .025	536	1150	.060	28000
6201	12 .4724	-0.008 -.0003	32 1.2598	-0.013 -.0005	10 .3937	0.6 .025	685	1531	.080	26000
6202	15 .5906	-0.008 -.0003	35 1.3780	-0.013 -.0005	11 .4331	0.6 .025	837	1718	.090	22000
6203	17 .6693	-0.008 -.0003	40 1.5748	-0.013 -.0005	12 .4724	0.6 .025	1076	2153	.140	20000
6204	20 .7874	-0.010 -.0004	47 1.8504	-0.013 -.0005	14 .5512	1.0 .040	1495	2888	.230	16000
6205	25 .9843	-0.010 -.0004	52 2.0472	-0.013 -.0005	15 .5906	1.0 .040	1771	3154	.280	15000
6206	30 1.1811	-0.010 -.0004	62 2.4409	-0.013 -.0005	16 .6299	1.0 .040	2543	4378	.430	12000
6207	35 1.3780	-0.013 -.0005	72 2.8346	-0.013 -.0005	17 .6693	1.0 .040	3439	5775	.640	10000
6208	40 1.5748	-0.013 -.0005	80 3.1496	-0.013 -.0005	18 .7087	1.0 .040	4071	6629	.830	9000
6209	45 1.7717	-0.013 -.0005	85 3.3465	-0.015 -.0006	19 .7480	1.0 .040	4473	6871	.940	9000
6210	50 1.9685	-0.013 -.0005	90 3.5433	-0.015 -.0006	20 .7874	1.0 .040	5209	7890	1.050	8000
6211	55 2.1654	-0.015 -.0006	100 3.9370	-0.015 -.0006	21 .8268	1.5 .060	6564	9758	1.400	7000
6212	60 2.3622	-0.015 -.0006	110 4.3307	-0.015 -.0006	22 .8661	1.5 .060	7400	10743	1.730	6000
6213	65 2.5591	-0.015 -.0006	120 4.7244	-0.015 -.0006	23 .9055	1.5 .060	8990	12870	2.180	6000
6214	70 2.7559	-0.015 -.0006	125 4.9213	-0.018 -.0007	24 .9449	1.5 .060	9888	13992	2.360	6000
6215	75 2.9528	-0.015 -.0006	130 5.1181	-0.018 -.0007	25 .9843	1.5 .059	11074	14887	2.600	5000
6216	80 3.1496	-0.015 -.0006	140 5.5118	-0.018 -.0007	26 1.0236	2.0 .079	12179	16105	3.090	5000
6217	85 3.3465	-0.020 -.0008	150 5.9055	-0.018 -.0007	28 1.1024	2.0 .079	16965	20393	3.950	5000

* WIDTH TOLERANCE: Bore up to 1.9685 +.000/-0.005 (+0.000/-0.127mm);
Bore 2.1654 up to 3.1496 +.000/-0.006 (+0.000/-0.152mm);
Bore 3.3465 up to 4.7244 +.000/-0.008 (+0.000/-0.203mm).

¹ Dynamic Loads are based on 1 million revolutions.

² Weight and Limiting Speed are based on an open, oiled bearing.



Snap rings may be ordered with any configuration.

BASIC BEARING NUMBER	BORE A		OUTSIDE DIAMETER B		WIDTH C*	MAX FILLET RADIUS	BASIC STATIC LOAD (lbs)	BASIC DYNAMIC LOAD ¹ (lbs)	WEIGHT ² (lbs)	LIMITING SPEED ² (rpm)
	mm inch	tol. +0.000	mm inch	tol. +0.000						
6300	10 .3937	-0.008 -0.0003	35 1.3780	-0.013 -0.0005	11 .4331	0.6 .025	774	1822	.117	25000
6301	12 .4724	-0.008 -0.0003	37 1.4567	-0.013 -0.0005	12 .4724	1.0 .040	941	2184	.132	23000
6302	15 .5906	-0.008 -0.0003	42 1.6535	-0.013 -0.0005	13 .5118	1.0 .040	1202	2548	.181	20000
6303	17 .6693	-0.008 -0.0003	47 1.8504	-0.013 -0.0005	14 .5512	1.0 .040	1468	3043	.254	18000
6304	20 .7874	-0.010 -0.0004	52 2.0472	-0.013 -0.0005	15 .5906	1.0 .040	1771	3586	.317	16000
6305	25 .9843	-0.010 -0.0004	62 2.4409	-0.013 -0.0005	17 .6693	1.0 .040	2586	5042	.511	13000
6306	30 1.1811	-0.010 -0.0004	72 2.8346	-0.013 -0.0005	19 .7480	1.0 .040	3414	6075	.763	11000
6307	35 1.3780	-0.013 -0.0005	80 3.1496	-0.013 -0.0005	21 .8268	1.5 .060	4304	7496	1.010	10000
6308	40 1.5748	-0.013 -0.0005	90 3.5433	-0.015 -0.0006	23 .9055	1.5 .060	5382	9161	1.400	9000
6309	45 1.7717	-0.013 -0.0005	100 3.9370	-0.015 -0.0006	25 .9843	1.5 .060	7190	11913	1.840	8000
6310	50 1.9685	-0.013 -0.0005	110 4.3307	-0.015 -0.0006	27 1.0630	2.0 .080	8583	13947	2.360	7000
6311	55 2.1654	-0.015 -0.0006	120 4.7244	-0.015 -0.0006	29 1.1417	2.0 .080	10019	16079	3.020	6000
6312	60 2.3622	-0.015 -0.0006	130 5.1181	-0.018 -0.0007	31 1.2205	2.0 .080	11653	18392	3.750	6000
6313	65 2.5591	-0.015 -0.0006	140 5.5118	-0.018 -0.0007	33 1.2992	2.0 .080	13411	20841	4.590	5000
6314	70 2.7559	-0.015 -0.0006	150 5.9055	-0.018 -0.0007	35 1.3780	2.0 .080	15291	23425	5.560	5000
6315	75 2.9528	-0.015 -0.0006	160 6.2992	-0.025 -0.0010	37 1.4567	2.0 .080	17298	25516	6.660	5000
6316	80 3.1496	-0.020 -0.0008	170 6.6929	-0.025 -0.0010	39 1.5354	2.0 .080	19441	27657	7.910	4000
6317	85 3.3465	-0.020 -0.0008	180 7.0866	-0.025 -0.0010	41 1.6141	2.5 .098	21708	29845	9.330	4000

* WIDTH TOLERANCE: Bore up to 1.9685 +0.00/-0.005 (+0.000/-0.127mm);
Bore 2.1654 up to 3.1496 +0.00/-0.006 (+0.000/-0.152mm);
Bore 3.3465 up to 4.3307 +0.00/-0.008 (+0.000/-0.203mm).

¹ Dynamic Loads are based on 1 million revolutions.

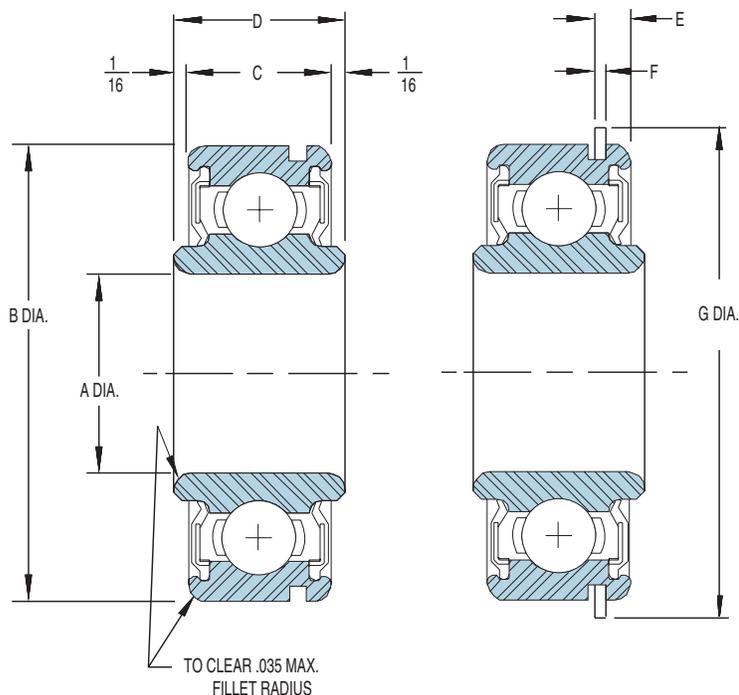
² Weight and Limiting Speed are based on an open, oiled bearing.

8600 Extra Light Inch Series

EXTENDED INNER RING



This retainer-type, extra light, inch series bearing with extended inner ring, has a snap ring groove. The snap ring allows for easy positioning during mounting and eliminates costly machining operations. Ground raceways are 52100 chrome steel material with steel retainers. Maximum recommended speed is 5000 RPM. Bearings are factory lubricated and sealed.



BASIC BEARING NUMBER	WITH SNAP RING	OUTSIDE DIAMETER B		WIDTH C OUTER	WIDTH D INNER RING	RING	E	F	BASIC G	BASIC STATIC LOAD (lbs)	DYNAMIC LOAD ¹ (lbs)	WEIGHT (lbs)
		BORE A +.0000 -.0005	inch									
8601	S8601	.5000	1.7500	-.0005	.625	.750	.136	.042	1.921	707	1366	.30
8602	S8602	.6250	1.7500	-.0005	.625	.750	.136	.042	1.921	707	1366	.28
8603	S8603	.7500	1.7500	-.0005	.625	.750	.136	.042	1.921	707	1366	.25
8604	S8604	.8750	2.0000	-.0006	.625	.750	.136	.042	2.156	1096	2040	.32
8605	S8605	1.0000	2.0000	-.0006	.625	.750	.136	.042	2.156	1096	2040	.29
8606	S8606	1.1250	2.5625	-.0006	.750	.875	.190	.065	2.844	1831	3070	.65
8607	S8607	1.2500	2.5625	-.0006	.750	.875	.190	.065	2.844	1831	3070	.60

¹ Dynamic Loads are based on 1 million revolutions.

PART NUMBER NOMENCLATURE EXAMPLE:
8601-88 (7508 DL) – Snap Ring Groove only
S8601-88 (7508 DLG) – Snap Ring

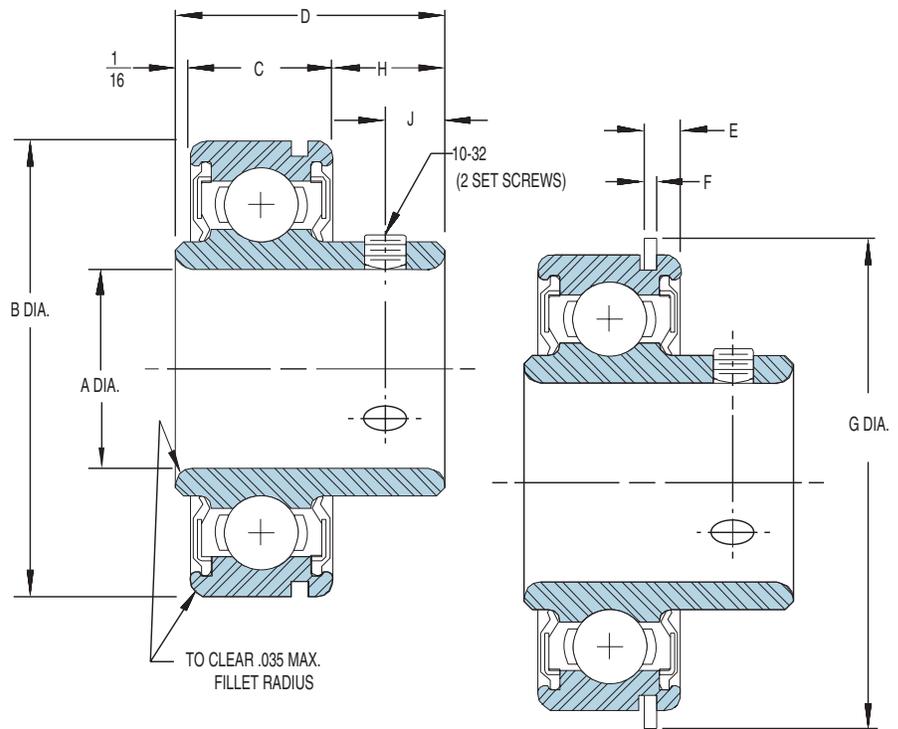
Directly interchangeable with industry standard 7500 series.
Refer to page 39.

8700 Extra Light Inch Series

EXTENDED INNER RING AND SET SCREWS



This retainer-type, extra light, inch series bearing with extended inner ring, has a snap ring groove. The snap ring allows for easy positioning during mounting and eliminates costly machining operations. Ground raceways are 52100 chrome steel material with steel retainers. The extended inner ring is equipped with two set screws to secure the ring to the shaft. Maximum recommended speed is 5000 RPM. Bearings are factory lubricated and sealed.



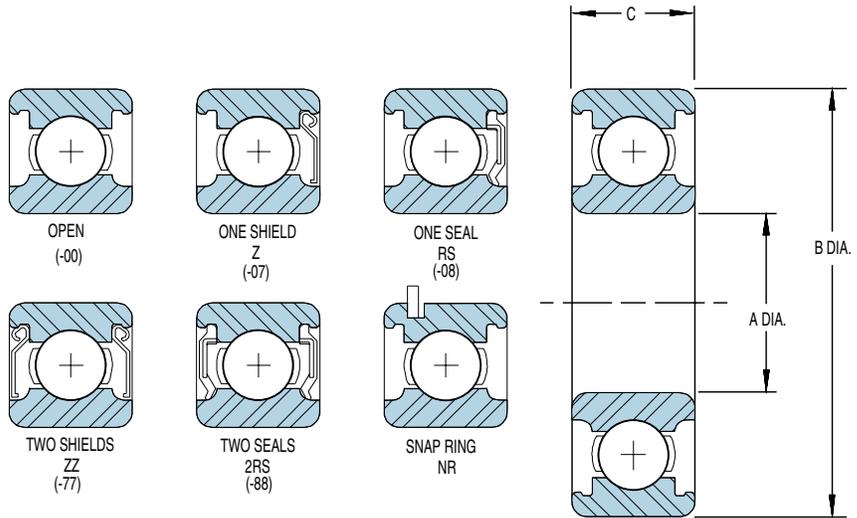
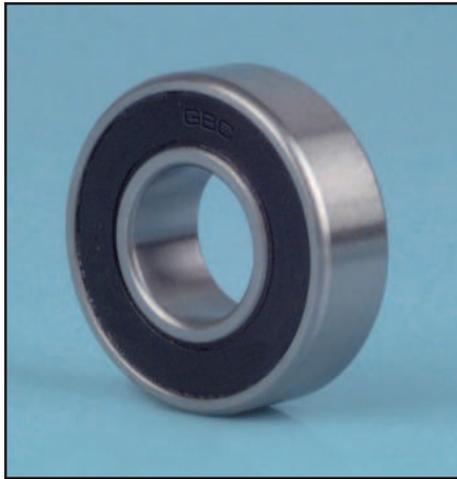
BASIC BEARING NUMBER		BORE A +.0008 -.0000	OUTSIDE DIAMETER B		WIDTH C OUTER RING +.000 -.005	WIDTH D INNER RING +.000 -.005	E	F	G	H	J	BASIC STATIC LOAD (lbs)	BASIC DYNAMIC LOAD ¹ (lbs)	WEIGHT (lbs)
	WITH SNAP RING		inch	tol. +.0000										
8701	S8701	.5000	1.7500	-.0005	.625	1.092	.136	.042	1.921	.405	.233	707	1366	.38
8702	S8702	.6250	1.7500	-.0005	.625	1.092	.136	.042	1.921	.405	.233	707	1366	.34
8703	S8703	.7500	1.7500	-.0005	.625	1.092	.136	.042	1.921	.405	.233	707	1366	.31
8704	S8704	.8750	2.0000	-.0006	.625	1.179	.136	.042	2.156	.492	.261	1096	2040	.43
8706	S8706	1.0000	2.0000	-.0006	.625	1.179	.136	.042	2.156	.492	.261	1096	2040	.36
8709	S8709	1.2500	2.5625	-.0006	.750	1.417	.190	.065	2.843	.605	.261	1831	3070	.76

¹ Dynamic Loads are based on 1 million revolutions.

PART NUMBER NOMENCLATURE EXAMPLE:
8701-88 (7608 DL) – Snap Ring Groove only
S8701-88 (7608 DLG) – Snap Ring

Directly interchangeable with industry standard 7600 series.
Refer to page 39.

20000 Extra Light Inch Series



This extra light inch series is suitable for the majority of ABEC-1 bearing applications. Ground raceways are 52100 chrome steel material with steel retainers. Maximum recommended speed is 5000 RPM. Bearings are available open, shielded or sealed and are factory lubricated with grease.

BASIC BEARING NUMBER	BORE A +.0000 -.0005	OUTSIDE DIAMETER B		WIDTH C +.000 -.005	MAX FILLET RADIUS	BASIC STATIC LOAD (lbs)	BASIC DYNAMIC LOAD ¹ (lbs)	WEIGHT ² (lbs)
		inch	tol. +.0000					
21103	.1875	.6875	-0.005	†.250/.312	.012	201	500	.018
21104	.2500	.6875	-0.005	†.250/.312	.012	201	500	.018
21405	.3125	.8750	-0.005	†.281/.344	.016	318	751	.035
* 21406	.3750	.8750	-0.005	†.281/.344	.016	318	751	.035
21505	.3125	.9062	-0.005	.312	.016	291	607	.035
21506	.3750	.9062	-0.005	.312	.016	291	607	.030
21507	.4375	.9062	-0.005	.312	.016	291	607	.030
21806	.3750	1.1250	-0.005	.375	.016	538	1151	.065
21807	.4375	1.1250	-0.005	.375	.016	538	1151	.060
* 21808	.5000	1.1250	-0.005	.375	.016	538	1151	.055
22207	.4375	1.3750	-0.005	.437	.031	746	1526	.105
* 22208	.5000	1.3750	-0.005	.437	.031	746	1526	.110
22209	.5625	1.3750	-0.005	.437	.031	746	1526	.110
* 22210	.6250	1.3750	-0.005	.437	.031	746	1526	.080
22610	.6250	1.6250	-0.005	.500	.031	1010	1951	.175
22612	.7500	1.6250	-0.005	.500	.031	1010	1951	.160
22810	.6250	1.7500	-0.005	.500	.031	1010	1951	.220
22812	.7500	1.7500	-0.005	.500	.031	1010	1951	.205
23212	.7500	2.0000	-0.006	.562	.031	1565	2914	.280
23214	.8750	2.0000	-0.006	.562	.031	1565	2914	.255
* 23216	1.0000	2.0000	-0.006	.562	.031	1565	2914	.275
24018	1.1250	2.5000	-0.006	.625	.035	2195	3751	.460
24020	1.2500	2.5000	-0.006	.625	.035	2195	3751	.445
24120	1.2500	2.5625	-0.006	.687	.035	2616	4386	.550
24121	1.3125	2.5625	-0.006	.687	.035	2616	4386	.450

†NOTE: When two widths are listed, the first dimension applies for open or shielded bearings. The second dimension applies for sealed bearings.

*Also available: Seals with snap rings – add prefix “S” (Eg. S21406-88)

¹ Dynamic Loads are based on 1 million revolutions.

² Weight is based on an open, oiled bearing.

PART NUMBER NOMENCLATURE EXAMPLE:

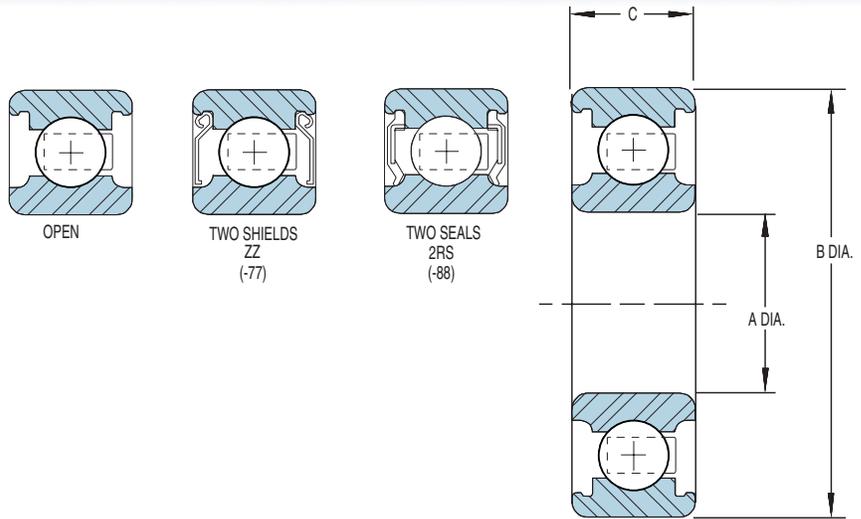
21104-77 – Two Shields

21104-88 – Two Seals

Directly interchangeable with industry standard 1600 series.

Refer to page 38.

20000 Unground Radial Series



The unground radial series is designed to provide inexpensive, anti-friction bearing operation in applications where loads and speeds are moderate. These bearings are manufactured from select carbon steel, are case hardened, and have nylon retainers to insure long life and maximum shock resistance. Bearings are ground on the outside diameter to insure proper housing fit. Since the raceways for these bearings are not ground, maximum recommended speed is 2500 RPM. Bearings are available open, shielded or sealed and are factory lubricated with grease. In addition to the standard sizes shown, specials can be supplied to accommodate a variety of service conditions and housing designs.

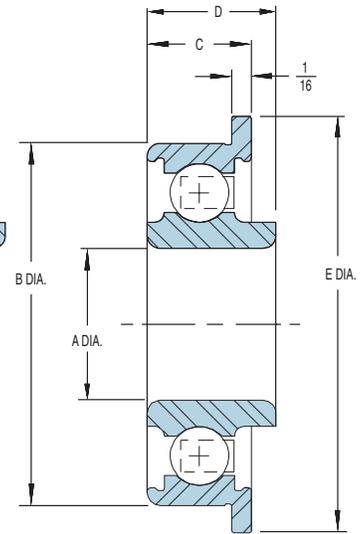
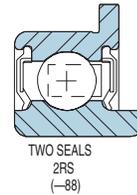
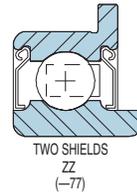
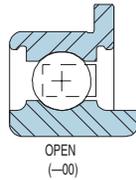
BASIC BEARING NUMBER	BORE A tol. +.005 -.000	OUTSIDE DIAMETER B tol. +.0000 -.0005	WIDTH C tol. ±.005	BASIC DYNAMIC LOAD ¹ (lbs)	WEIGHT ² (lbs)
21161	.187	.6875	†.250/.312	300	.020
21162	.250	.6875	†.250/.312	300	.014
21461	.312	.8750	†.281/.344	450	.028
21462	.375	.8750	†.281/.344	450	.028
21561	.312	.9062	.312	450	.033
21562	.375	.9062	.312	450	.033
21563	.437	.9062	.312	364	.029
21861	.375	1.1250	.375	691	.064
21862	.437	1.1250	.375	691	.059
21863	.500	1.1250	.375	691	.055
22261	.437	1.3750	.437	915	.104
22262	.500	1.3750	.437	915	.101
22263	.562	1.3750	.437	915	.096
22264	.625	1.3750	.437	915	.087
22661	.625	1.6250	.500	1171	.163
22662	.750	1.6250	.500	1171	.145
22861	.625	1.7500	.500	1171	.209
22862	.750	1.7500	.500	1171	.190
23261	.750	2.0000	.562	1749	.283
23262	.875	2.0000	.562	1749	.258
23263	1.000	2.0000	.562	1749	.224

†NOTE: When two widths are listed, the first dimension applies for open or shielded bearings. The second dimension applies for sealed bearings.

¹ Dynamic Loads are based on 1 million revolutions.

² Weight is based on an open, oiled bearing.

30000 Unground Flanged Series



Integral flanges on the 30000 unground flanged series permit through boring of housing, thereby substantially reducing mounting cost. Made of select carbon steel, these bearings are case hardened and have nylon retainers for long life and maximum shock resistance. Maximum recommended speed is 2500 RPM. Bearings may be supplied open or with seals and/or shields, and all units are factory lubricated with grease.

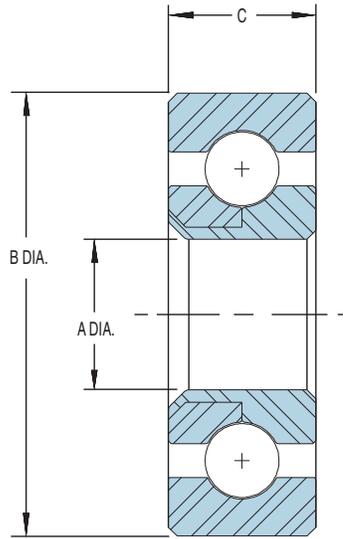
BASIC BEARING NUMBER	BORE A tol. +.005 -.000	OUTSIDE DIAMETER B tol. +.005 -.000	WIDTH C OUTER RING tol. ±.005	WIDTH D INNER RING tol. ±.010	E tol. ±.010	BASIC DYNAMIC LOAD ¹ (lbs)	WEIGHT ² (lbs)
31161	.187	.687	.312	.375	.812	300	.023
31162	.250	.687	.312	.375	.812	300	.021
31461	.312	.875	.344	.406	1.000	450	.036
31462	.375	.875	.344	.406	1.000	450	.032
31561	.312	.906	.344	.406	1.000	450	.037
31562	.375	.906	.344	.406	1.000	450	.037
31861	.375	1.125	.375	.437	1.250	691	.070
31862	.437	1.125	.375	.437	1.250	691	.065
31863	.500	1.125	.375	.437	1.250	691	.061
32261	.437	1.375	.437	.500	1.500	915	.114
32262	.500	1.375	.437	.500	1.500	915	.111
32264	.625	1.375	.437	.500	1.500	915	.094
32661	.625	1.625	.500	.562	1.750	1171	.170
32662	.750	1.625	.500	.562	1.750	1171	.153
32861	.625	1.750	.500	.562	1.875	1171	.217
32862	.750	1.750	.500	.562	1.875	1171	.200
33261	.750	2.000	.562	.625	2.125	1749	.300
33262	.875	2.000	.562	.625	2.125	1749	.265
33263	1.000	2.000	.562	.625	2.125	1749	.239

¹ Dynamic Loads are based on 1 million revolutions.

² Weight is based on an open, oiled bearing.

2000 Unground Radial Series

FULL BALL COMPLEMENT



Full complement unground radial bearings are designed for moderate loads, and speeds up to 1500 RPM. Inner and outer rings are machined from select carbon steel, then carefully hardened for long life and maximum shock resistance. All bearings are zinc plated for protection against corrosion.

These bearings are used in business machines, appliances, conveyors, displays, and many other industrial applications.

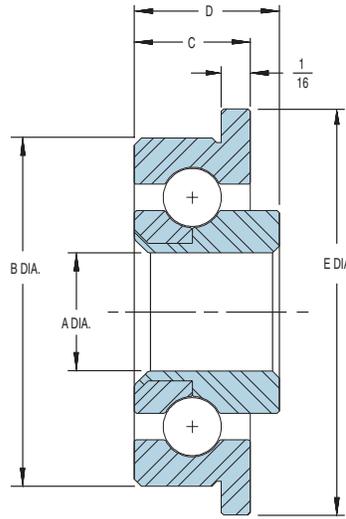
BASIC BEARING NUMBER	BORE A tol. +.005 -.000	OUTSIDE DIAMETER B tol. +.000 -.005	WIDTH C tol. ±.010	BASIC DYNAMIC LOAD ¹ (lbs)	WEIGHT (lbs)
21100-01	.187	.687	.250	287	.021
21101-01	.250	.687	.250	287	.017
21208-01	.250	.750	.250	306	.023
21401-01	.187	.875	.250	397	.038
21404-01	.250	.875	.250	397	.033
21481-01	.375	.875	.250	356	.028
21482-01	.312	.875	.250	356	.030
21485-01	.437	.875	.250	258	.027
21501-01	.375	.906	.312	371	.037
21517-01	.375	.937	.312	371	.042
21518-01	.312	.937	.312	371	.046
21519-01	.437	.937	.312	371	.039
21529-01	.312	.906	.312	371	.043
21556-01	.437	.906	.312	371	.035
21603-01	.250	1.000	.312	484	.050
21604-01	.375	1.000	.312	484	.051
21709-01	.437	1.062	.375	509	.060
21710-01	.250	1.062	.250	484	.060
21712-01	.312	1.062	.250	484	.049
21713-01	.375	1.062	.250	484	.046
21715-01	.375	1.062	.375	484	.066
21737-01	.312	1.062	.375	484	.071

BASIC BEARING NUMBER	BORE A tol. +.005 -.000	OUTSIDE DIAMETER B tol. +.000 -.005	WIDTH C tol. ±.010	BASIC DYNAMIC LOAD ¹ (lbs)	WEIGHT (lbs)
21803-01	.500	1.125	.375	533	.068
21817-01	.437	1.125	.375	533	.071
21846-01	.375	1.125	.375	533	.077
22006-01	.375	1.250	.375	533	.101
22007-01	.500	1.250	.375	533	.093
22107-01	.312	1.281	.312	533	.092
22108-01	.500	1.281	.312	533	.082
22142-01	.375	1.281	.312	533	.090
22211-01	.625	1.375	.437	769	.113
22213-01	.500	1.375	.437	769	.126
22405-01	.500	1.500	.437	769	.164
22407-01	.625	1.500	.437	769	.151
22603-01	.750	1.625	.375	825	.143
22606-01	.687	1.625	.375	825	.153
22607-01	.750	1.625	.500	825	.188
22801-01	.500	1.750	.563	1187	.291
22807-01	.750	1.750	.563	1187	.251
23011-01	.875	1.875	.500	1291	.223
23201-01	.750	2.000	.500	1384	.312
23210-01	1.000	2.000	.500	1384	.267
23601-01	1.125	2.250	.625	1384	.473
23701-01	1.250	2.312	.625	1432	.486

¹ Dynamic Loads are based on 1 million revolutions.

30000 Unground Flanged Series

FULL BALL COMPLEMENT



Unground radial flanged bearings are designed for moderate loads and speeds up to 1500 RPM. The flange positions the bearing during installation eliminating the need for snap rings or counter-boring the housing. Inner and outer rings are machined from select carbon steel, then carefully hardened for long life and maximum shock resistance. All bearings contain a full complement of precision steel balls. All bearings are zinc plated for protection against corrosion.

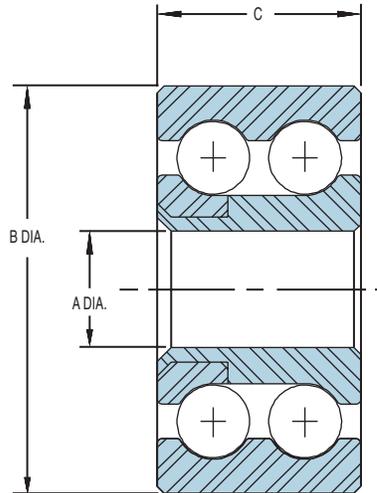
These bearings are used in appliances, business machines, displays, conveyors, and other industrial applications.

BASIC BEARING NUMBER	BORE A tol. +.005 -.000	OUTSIDE DIAMETER B tol. +.005 -.000	WIDTH C OUTER RING tol. ±.010	WIDTH D INNER RING tol. ±.015	E tol. ±.015	BASIC DYNAMIC LOAD ¹ (lbs)	WEIGHT (lbs)
31205-01	.250	.687	.250	.250	.750	287	.019
31206-01	.250	.687	.250	.312	.750	287	.020
31207-01	.187	.625	.187	.203	.750	243	.014
31405-01	.250	.750	.250	.312	.875	287	.027
31616-01	.375	.906	.312	.350	1.000	356	.043
31617-01	.437	.906	.312	.375	1.000	356	.040
31622-01	.250	.875	.250	.312	1.000	356	.040
31623-01	.312	.875	.250	.312	1.000	341	.036
31702-01	.250	.906	.250	.375	1.031	356	.048
31703-01	.315	.906	.312	.375	1.031	356	.051
31704-01	.375	.906	.312	.375	1.031	356	.045
31705-01	.375	.906	.343	.437	1.031	356	.053
31706-01	.437	.906	.343	.437	1.031	356	.044
31910-01	.375	1.062	.375	.437	1.187	509	.076
31911-01	.437	1.062	.375	.437	1.187	509	.072
32004-01	.375	1.125	.375	.437	1.250	533	.087
32017-01	.312	1.125	.375	.437	1.250	533	.092
32018-01	.500	1.125	.375	.437	1.250	533	.078
32020-01	.500	1.187	.375	.437	1.250	533	.089
32212-01	.500	1.250	.375	.437	1.375	707	.099
32213-01	.625	1.250	.375	.437	1.375	594	.086
32418-01	.375	1.375	.437	.468	1.500	769	.150
32420-01	.500	1.375	.437	.468	1.500	769	.140
32421-01	.625	1.375	.437	.468	1.500	769	.126
32423-01	.750	1.375	.437	.468	1.500	650	.118
32703-01	.500	1.500	.437	.687	1.656	769	.211
32704-01	.625	1.500	.437	.484	1.656	769	.165
32705-01	.500	1.578	.500	.593	1.687	1000	.220
32707-01	.625	1.562	.437	.562	1.687	798	.193
32708-01	.750	1.562	.437	.468	1.687	798	.171
32807-01	.500	1.625	.500	.562	1.750	1187	.236
33006-01	.500	1.750	.562	.625	1.875	1187	.313
33103-01	.750	1.750	.562	.578	1.937	1187	.260
33206-01	.500	1.875	.500	.625	2.000	1291	.341
33207-01	.750	1.875	.500	.562	2.000	1291	.278
33408-01	.750	2.000	.500	.562	2.125	1384	.345
33409-01	1.000	2.000	.500	.625	2.125	1384	.307

¹ Dynamic Loads are based on 1 million revolutions.

20000 Unground Radial Series

DOUBLE ROW FULL BALL COMPLEMENT



Unground double row bearings are recommended for applications where the load capacity of a single row bearing is insufficient, and because of space restrictions, a larger, single row bearing cannot be used. The bore and outside diameter are generally interchangeable with single row radial bearings.

The inner and outer rings are machined from select carbon steel, then carefully hardened for long life and maximum shock resistance. They contain a full complement of precision steel balls. The two rows of balls provide stability. All bearings are zinc plated for protection against corrosion.

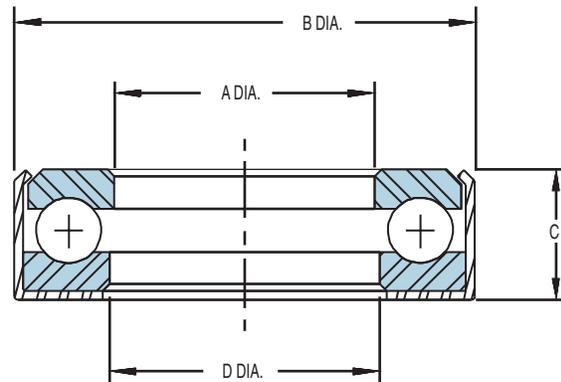
These bearings are suitable for heavy duty work loads in wheels, conveyor rollers, cam followers, etc.

BASIC BEARING NUMBER	BORE A tol. +.005 -.000	OUTSIDE DIAMETER B tol. +.000 -.005	WIDTH C tol. ±.010	BASIC DYNAMIC LOAD ¹ (lbs)	WEIGHT (lbs)
21139-01	.250	.687	.437	466	.030
21486-01	.250	.875	.437	645	.061
21487-01	.312	.875	.437	579	.053
21488-01	.375	.875	.437	579	.046
21489-01	.437	.875	.437	419	.045
21557-01	.312	.937	.500	602	.067
21558-01	.375	.937	.500	602	.062
21559-01	.437	.937	.500	602	.058
21738-01	.375	1.062	.562	827	.093
21739-01	.437	1.062	.562	827	.091
21850-01	.375	1.125	.562	865	.119
21851-01	.500	1.125	.562	865	.093
21852-01	.562	1.125	.562	900	.084
22143-01	.375	1.281	.531	865	.107
22295-01	.625	1.375	.625	1249	.160
22458-01	.500	1.500	.750	1249	.209
22459-01	.625	1.500	.750	1249	.194
22618-01	.750	1.625	.625	1928	.217
22816-01	.750	1.750	.937	1928	.388
23012-01	.875	1.875	.875	2097	.372
23211-01	1.000	2.000	.875	2249	.450

¹ Dynamic Loads are based on 1 million revolutions.

Unground Banded Thrust Series

FULL BALL COMPLEMENT



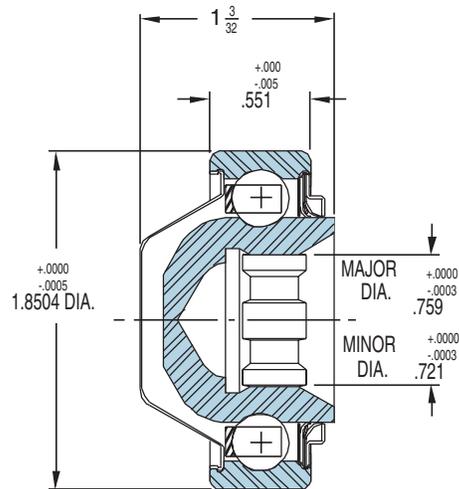
Unground banded thrust bearings are designed for moderate speeds and loads. They contain a full complement of hardened steel balls. Races are cold formed then carefully hardened for high resistance to wear. The soft steel housing acts as a shield to help keep lubricant in and contaminants out. Banded thrust bearings are especially suited for such applications as jacks, hoists, hinges, display stands, revolving doors and automotive steering mechanisms.

BASIC BEARING NUMBER	UPPER RACE A tol. +.010 -.000	OUTSIDE DIAMETER B tol. ±.010	WIDTH C tol. ±.010	LOWER RACE D tol. ±.010	BASIC DYNAMIC LOAD ¹ (lbs)	WEIGHT (lbs)
4450-00	.250	.843	.328	.275	570	.032
4451-00	.375	1.047	.360	.400	660	.057
4452-00	.438	1.047	.360	.462	651	.042
4453-00	.453	.859	.281	.478	443	.024
4454-00	.500	1.266	.438	.525	1325	.093
4455-00	.500	1.000	.344	.525	859	.042
4456-00	.563	1.344	.438	.587	1380	.102
4457-00	.625	1.125	.344	.656	492	.048
4458-00	.625	1.422	.453	.650	1432	.118
4459-00	.750	1.656	.547	.775	1582	.195
4460-00	.875	1.891	.594	.900	1650	.265
4462-00	1.000	2.016	.640	1.025	2256	.299
4463-00	1.000	1.969	.625	1.031	1678	.275
4464-00	1.015	1.750	.625	1.031	1943	.209
4465-00	1.063	1.969	.625	1.094	1668	.262
4469-00	1.250	2.344	.625	1.275	1867	.384

¹ Dynamic Loads are based on 1 million revolutions.

Special Ball Bearings

4541-00 TROUGHING CONVEYOR BEARING

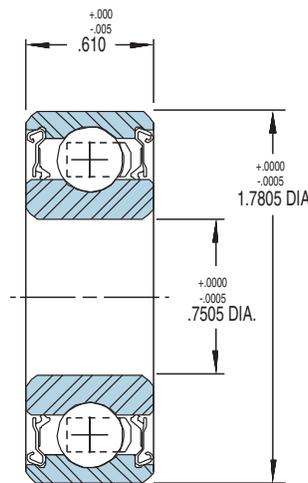


Conveyor bearings are used in the bulk handling conveyors of mining and quarrying equipment, in cement and concrete production installations, and in similar bulk materials handling conveyors. The splined, hexagonal bore is specially designed to be used with a hexagonal stub shaft. These parts are used

in a ball and socket type of arrangement that is very useful in applications with both large and small trough angles.

Directly interchangeable with industry standards; New Departure CB504B and Schatz CS3574X6.

8504-88 HEAVY DUTY TYPE RADIAL BALL BEARING



Basic Static Load
1460 lbs

Basic Dynamic Load
2860 lbs

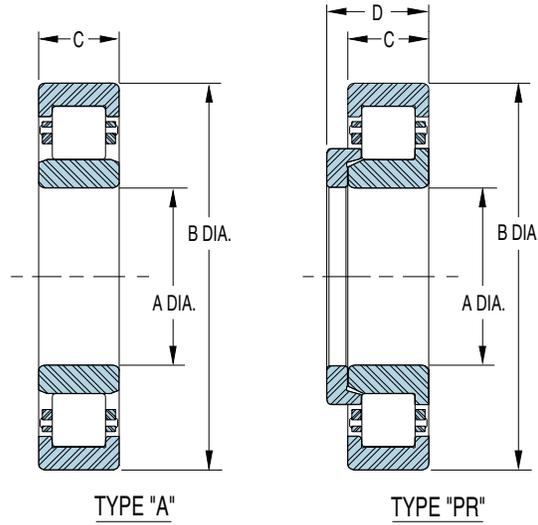
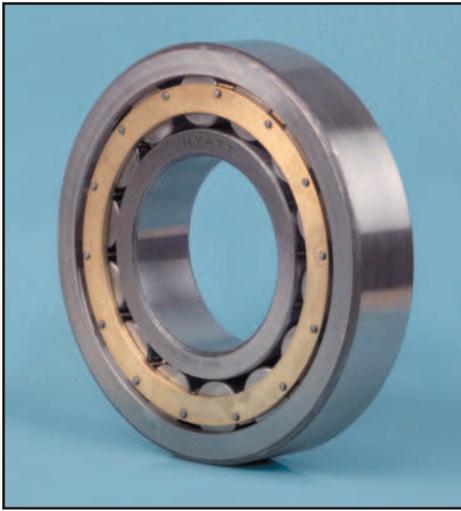
The 8504-88 heavy duty radial ball bearing is designed for use in the spindle housing of commercial and riding mowers and in through-shaft idlers for bulk handling conveyors.

The bearing is factory lubricated with grease. The prelubrication and double seals eliminate the need for relubrication and field servicing.

Two trash guard, land riding seals, which are standard on this bearing, insure protection from contaminants (soil, grass and moisture). Each trash guard seal consists of a carbon steel shield to which a Buna N seal is bonded. The seals are crimped into the outer ring with the rubber lip riding on the ground land of the inner ring. Any slight misalignment of this bearing will not affect the sealing effectiveness of the land riding seals.

The nylon retainer's shock resistance and longevity are a match for the rough conditions and maintenance demands of most applications. Interchange: New Departure Z9504B, BCA 204BBAR, Fafnir P204RR6, NTN SC0440LLC3.

Traction Motor Armature Bearings



HYATT®

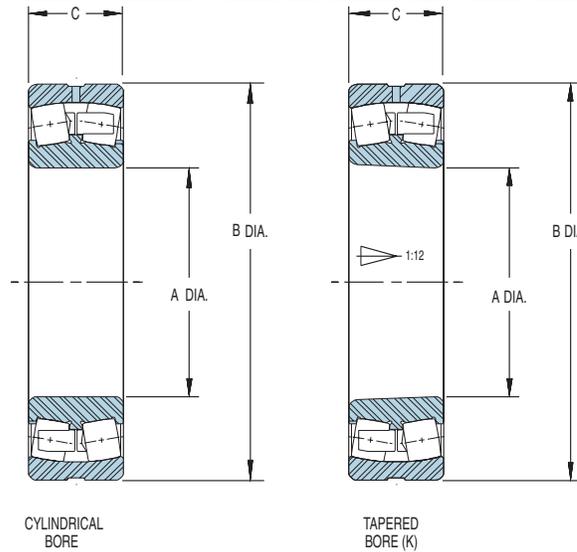
STANDARD BEARING ASSEMBLY NUMBER	CAPACITY 3000 Hrs. B10 @500 RPM	BORE A		OUTSIDE DIAMETER B		WIDTH C		WIDTH D		WEIGHT (lbs)
		mm	inch	mm	inch	mm	inch	mm	inch	
PR-0315-WB-16	11,300	75	2.9528	160	6.2992	37	1.4567	48	1.8897	9.5
PR-0320-WB-22	17,300	100	3.9370	215	8.4646	47	1.8504	60	2.3624	22.0
A-0322-WABD	22,000	110	4.3307	240	9.4491	50	1.9685	N/A		27.0
A-0326-WAB-30	34,700	130	5.1181	280	11.0240	58	2.2835	N/A		41.0
A-0330-WB-18	42,000	150	5.9043	320	12.5984	65	2.5591	N/A		59.0

RECOMMENDED FITTING PRACTICE

BASIC BEARING SIZE	BEARING BORE	SHAFT DIAMETER	SHAFT FIT	BEARING O.D.	HOUSING BORE	HOUSING FIT
0315	2.9528	2.9539	.0006T	6.2992	6.2981	.0004T
	2.9522	2.9534	.0017T	6.2985	6.2976	.0016T
0320	3.9370	3.9383	.0008T	8.4646	8.4635	.0004T
	3.9362	3.9378	.0021T	8.4639	8.4629	.0017T
0322	4.3307	4.3324	.0010T	9.4491	9.4481	.0000T
	4.3299	4.3317	.0025T	9.4481	9.4471	.0017T
0326	5.1181	5.1200	.0014T	11.0240	11.0230	.0000T
	5.1171	5.1195	.0029T	11.0230	11.0219	.0021T
0330	5.9043	5.9077	.0029T	12.5984	12.5976	.0001T
	5.9033	5.9072	.0044T	12.5975	12.5965	.0019T

Spherical Roller Bearings

SERIES 222



HYATT[®]

BASIC BEARING NUMBER		BORE A		OUTSIDE DIAMETER B		WIDTH C		MAX FILLET RADIUS	BASIC STATIC LOAD (lbs)	BASIC DYNAMIC LOAD ¹ (lbs)	WEIGHT ² (lbs)	LIMITING SPEED ² (rpm)
CYLINDRICAL BORE	TAPERED BORE (K)	mm	tol.	mm	tol.	mm	tol.					
22208	22208K	40	-0.013	80	-0.015	23	-0.127	1.0	18000	16300	1.28	6100
		1.5748	-.0005	3.1496	-.0006	.9055	-.005	.039				
22209	22209K	45	-0.013	85	-0.015	23	-0.127	1.0	19600	16900	1.37	5600
		1.7717	-.0005	3.3465	-.0006	.9055	-.005	.039				
22210	22210K	50	-0.015	90	-0.015	23	-0.152	1.0	21800	18200	1.52	5200
		1.9685	-.0006	3.5433	-.0006	.9055	-.006	.039				
22211	22211K	55	-0.015	100	-0.015	25	-0.152	1.5	26200	22000	2.10	4700
		2.1654	-.0006	3.9370	-.0006	.9843	-.006	.059				
22212	22212K	60	-0.015	110	-0.015	28	-0.152	1.5	32400	27500	2.77	4300
		2.3622	-.0006	4.3307	-.0006	1.1024	-.006	.059				
22213	22213K	65	-0.015	120	-0.015	31	-0.152	1.5	39500	32300	3.79	4000
		2.5591	-.0006	4.7244	-.0006	1.2205	-.006	.059				
22214	22214K	70	-0.015	125	-0.020	31	-0.152	1.5	42500	33600	3.99	3700
		2.7559	-.0006	4.9213	-.0008	1.2205	-.006	.059				
22215	22215K	75	-0.015	130	-0.020	31	-0.203	1.5	46200	35400	4.23	3500
		2.9528	-.0006	5.1181	-.0008	1.2205	-.008	.059				
22216	22216K	80	-0.020	140	-0.020	33	-0.203	2.0	50400	38100	4.70	3300
		3.1496	-.0008	5.5118	-.0008	1.2992	-.008	.079				
22217	22217K	85	-0.020	150	-0.025	36	-0.203	2.0	57100	44300	6.49	3100
		3.3465	-.0008	5.9055	-.0010	1.4173	-.008	.079				
22218	22218K	90	-0.020	160	-0.025	40	-0.203	2.0	77200	57000	7.69	2800
		3.5433	-.0008	6.2992	-.0010	1.5748	-.008	.079				
22219	22219K	95	-0.020	170	-0.025	43	-0.203	2.0	86400	65000	9.37	2700
		3.7402	-.0008	6.6929	-.0010	1.6929	-.008	.079				
22220	22220K	100	-0.020	180	-0.031	46	-0.203	2.0	100600	74200	11.33	2500
		3.9370	-.0008	7.0866	-.0012	1.8110	-.008	.079				
22222	22222K	110	-0.020	200	-0.031	53	-0.203	2.0	122600	91100	16.07	2300
		4.3307	-.0008	7.8740	-.0012	2.0866	-.008	.079				
22224	22224K	120	-0.025	215	-0.031	58	-0.254	2.0	148600	108500	19.78	2100
		4.7244	-.0010	8.4646	-.0012	2.2835	-.010	.079				
22226	22226K	130	-0.025	230	-0.031	64	-0.254	2.5	185000	129000	25.35	2000
		5.1181	-.0010	9.0551	-.0012	2.5197	-.010	.098				
22228	22228K	140	-0.025	250	-0.036	68	-0.254	2.5	207900	146900	31.97	1800
		5.5118	-.0010	9.8425	-.0014	2.6772	-.010	.098				
22230	22230K	150	-0.025	270	-0.036	73	-0.254	2.5	234200	161800	39.90	1700
		5.9055	-.0010	10.6299	-.0014	2.8740	-.010	.098				
22232	22232K	160	-0.025	290	-0.036	80	-0.254	2.5	268600	186200	50.93	1600
		6.2992	-.0010	11.4173	-.0014	3.1496	-.010	.098				
22234	22234K	170	-0.025	310	-0.036	86	-0.254	3.0	313900	216600	60.19	1500
		6.6929	-.0010	12.2047	-.0014	3.3858	-.010	.118				
22236	22236K	180	-0.031	320	-0.041	86	-0.305	3.0	329600	221200	66.14	1400
		7.0866	-.0012	12.5984	-.0016	3.3858	-.012	.118				

¹ Dynamic Loads are based on 1 million revolutions.

² Weight and Limiting Speed are based on an open, oiled bearing.

C3 Internal Clearance standard. Available in C2, C0, & C4 Internal Clearance upon request.

Spherical Roller Bearings

SERIES 223

Spherical roller bearings are made in a full size range, in two load bearing types (222 Series and 223 Series). All sizes are available with either a straight cylindrical bore or with the industry standard 1:12 tapered bore. They are used in applications where high radial loads exist and there is initial misalignment or substantial shaft deflection during operation. A machined bronze cage and W-33 re-lubrication features are standard.

Load carrying abilities are enhanced by the following features:

- Critical feature dimensions such as roller diameter, inner and outer race pathway diameters, relative runouts, as well as bore, outside diameter and others are carefully controlled, checked, and matched to ensure best possible performance.

- Two rows of large diameter, super-finished rollers.
- Heavy bronze cages counter vibration.
- Standard W-33 relubrication, together with special ground spherical roller-ends for the best lubricant distribution.

The positive roller guidance feature makes these spherical bearings the best choice for tough moment load applications that require self-aligning capability.

Suggested applications include vibratory systems, speed reducers, conveyors, and other heavy machinery used in process industries.

For high axial loading applications, consult the General Bearing Engineering Department.

BASIC BEARING NUMBER		BORE A		OUTSIDE DIAMETER B		WIDTH C		MAX FILLET RADIUS	BASIC STATIC LOAD (lbs)	BASIC DYNAMIC LOAD ¹ (lbs)	WEIGHT ² (lbs)	LIMITING SPEED ² (rpm)
CYLINDRICAL BORE	TAPERED BORE (K)	mm inch	tol. +.0000	mm inch	tol. +.0000	mm inch	tol. +.0000	mm inch				
22308	22308K	40 1.5748	-0.013 -.0005	90 3.5433	-0.015 -.0006	33 1.2992	-0.127 -.005	1.5 .059	27800	25800	2.34	5500
22309	22309K	45 1.7717	-0.013 -.0005	100 3.9370	-0.015 -.0006	36 1.4173	-0.127 -.005	1.5 .059	35300	32600	3.09	4900
22310	22310K	50 1.9685	-0.015 -.0006	110 4.3307	-0.015 -.0006	40 1.5748	-0.152 -.006	2.0 .079	45700	40300	4.12	4400
22311	22311K	55 2.1654	-0.015 -.0006	120 4.7244	-0.020 -.0008	43 1.6929	-0.152 -.006	2.0 .079	51000	45800	5.11	4100
22312	22312K	60 2.3622	-0.015 -.0006	130 5.1181	-0.020 -.0008	46 1.8110	-0.152 -.006	2.0 .079	57700	51600	6.53	3800
22313	22313K	65 2.5591	-0.015 -.0006	140 5.5118	-0.020 -.0008	48 1.8898	-0.152 -.006	2.0 .079	64800	56500	8.91	3500
22314	22314K	70 2.7559	-0.015 -.0006	150 5.9055	-0.025 -.0010	51 2.0079	-0.152 -.006	2.0 .079	75100	65400	9.55	3200
22315	22315K	75 2.9528	-0.015 -.0006	160 6.2992	-0.025 -.0010	55 2.1654	-0.152 -.006	2.0 .079	91700	75300	11.84	3000
22316	22316K	80 3.1496	-0.020 -.0008	170 6.6929	-0.025 -.0010	58 2.2835	-0.203 -.008	2.0 .079	105100	86200	14.15	2800
22317	22317K	85 3.3465	-0.020 -.0008	180 7.0866	-0.031 -.0012	60 2.3622	-0.203 -.008	2.5 .098	115400	93900	16.50	2700
22318	22318K	90 3.5433	-0.020 -.0008	190 7.4803	-0.031 -.0012	64 2.5197	-0.203 -.008	2.5 .098	122700	97200	19.07	2500
22319	22319K	95 3.7402	-0.020 -.0008	200 7.8740	-0.031 -.0012	67 2.6378	-0.203 -.008	2.5 .098	141500	113700	22.62	2400
22320	22320K	100 3.9370	-0.020 -.0008	215 8.4646	-0.031 -.0012	73 2.8740	-0.203 -.008	2.5 .098	164300	132100	28.66	2200
22322	22322K	110 4.3307	-0.020 -.0008	240 9.4488	-0.031 -.0012	80 3.1496	-0.203 -.008	2.5 .098	211100	167100	44.91	2000
22324	22324K	120 4.7244	-0.025 -.0010	260 10.2362	-0.036 -.0014	86 3.3858	-0.254 -.010	2.5 .098	239600	189400	52.91	1900
22326	22326K	130 5.1181	-0.025 -.0010	280 11.0236	-0.036 -.0014	93 3.6614	-0.254 -.010	3.0 .118	278600	212500	63.71	1700
22328	22328K	140 5.5118	-0.025 -.0010	300 11.8110	-0.036 -.0014	102 4.0157	-0.254 -.010	3.0 .118	332200	254700	79.37	1600
22330	22330K	150 5.9055	-0.025 -.0010	320 12.5984	-0.041 -.0016	108 4.2520	-0.254 -.010	3.0 .118	373300	284600	96.12	1500

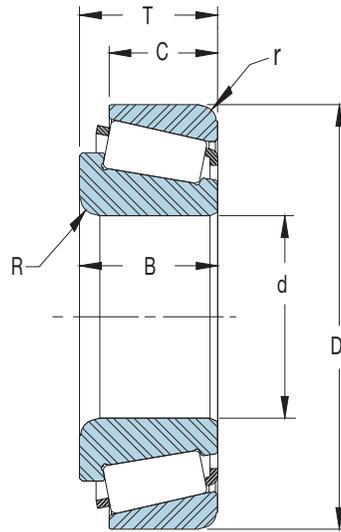
¹ Dynamic Loads are based on 1 million revolutions.

² Weight and Limiting Speed are based on an open, oiled bearing.

C3 Internal Clearance standard. Available in C2, C0, & C4 Internal Clearance upon request.

Tapered Roller Bearings

INCH DIMENSIONS



HYATT®

PART NUMBER		INCH DIMENSIONS							WEIGHTS (lbs)	
CONE	CUP	BORE d	OUTSIDE DIAMETER D	BEARING WIDTH T	CONE WIDTH B	CUP WIDTH C	SHAFT MAX FILLET RADIUS R	HOUSING MAX FILLET RADIUS r	CONE WEIGHT	CUP WEIGHT
LM11749	LM11710	0.6875	1.5700	0.5450	0.5750	0.4200	0.05	0.05	0.12	0.06
LM11949	LM11910	0.7500	1.7810	0.6100	0.6550	0.4750	0.05	0.05	0.17	0.10
M12649	M12610	0.8437	1.9687	0.6900	0.7200	0.5500	0.05	0.05	0.24	0.13
L44649	L44610	1.0625	1.9800	0.5600	0.5800	0.4200	0.14	0.05	0.17	0.08
15123	15245	1.2500	2.4409	0.7150	0.7500	0.5625	*	0.05	0.33	0.20
LM67048	LM67010	1.2500	2.3280	0.6250	0.6600	0.4650	*	0.05	0.25	0.14
14125A	14276	1.2500	2.7170	0.7813	0.7710	0.6250	0.14	0.05	0.48	0.29
LM48548	LM48510	1.3750	2.5625	0.7100	0.7200	0.5500	*	0.05	0.35	0.19
25877	25820	1.3750	2.8750	0.9375	0.9688	0.7500	0.06	0.09	0.69	0.36
L68149	L68111	1.3775	2.3612	0.6250	0.6600	0.4700	*	0.05	0.24	0.14
LM501349	LM501314	1.6250	2.8910	0.8437	0.7800	0.6537	0.14	0.03	0.50	0.28
25580	25520	1.7500	3.2650	0.9375	1.0000	0.7500	0.14	0.03	0.77	0.44
3782	3720	1.7500	3.6718	1.1875	1.1930	0.9375	0.14	0.13	1.48	0.62
45280	45220	1.7500	4.1250	1.1875	1.2188	0.9375	0.03	0.13	2.20	0.76
JM205149A	JM205110	1.9685	3.5433	1.1024	1.1024	0.9055	0.20	0.10	1.11	0.53
LM104949	LM104911	2.0000	3.2500	0.8500	0.8750	0.6500	0.14	0.05	0.64	0.29
JM207049A	JM207010	2.1654	3.7402	1.1417	1.1417	0.9252	0.24	0.10	1.24	0.56
387A	382A	2.2500	3.8125	0.8268	0.8640	0.6250	0.14	0.03	0.89	0.39
28682	28622	2.2500	3.8437	0.9688	0.9688	0.7656	0.14	0.03	1.02	0.59
39581	39520	2.2500	4.4375	1.1875	1.1875	0.9375	0.31	0.13	2.18	0.79
555S	552A	2.2500	4.8750	1.5000	1.4440	1.1875	0.14	0.13	3.09	1.65
557A	552A	2.3750	4.8750	1.5000	1.4440	1.1875	0.31	0.13	2.81	1.65
39585	39520	2.5000	4.4375	1.1875	1.1875	0.9375	0.14	0.13	1.95	0.79
HM212047	HM212011	2.5000	4.8125	1.5000	1.5100	1.1700	0.28	0.13	2.99	1.32
3984	3920	2.6250	4.4375	1.1875	1.1830	0.9375	0.14	0.13	1.55	0.98
39590	39520	2.6250	4.4375	1.1875	1.1875	0.9375	0.14	0.13	1.80	0.79
HM212049	HM212011	2.6250	4.8125	1.5000	1.5100	1.1700	0.14	0.13	2.80	1.32
HM212049X	HM212011	2.6250	4.8125	1.5000	1.5100	1.1700	0.28	0.13	2.77	1.32

* Special Radius

METRIC DIMENSIONS

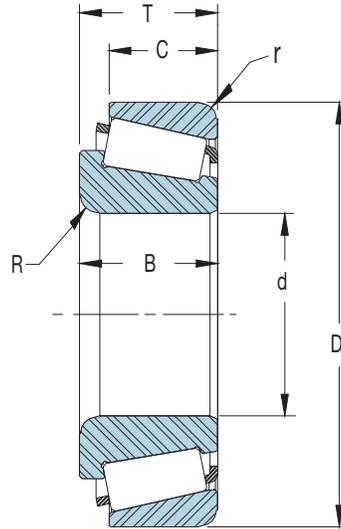
Tapered Roller Bearings consist of four basic components: the cone (inner ring), the cup (outer ring), the tapered rollers (rolling elements), and the cage (roller retainer). The cone has a shoulder called the cone rib, which makes contact with the end of the roller to ensure alignment and resist axial loads.

Due to the tapered races, the bearing will handle any combination of radial and thrust loads, and increasing the bearing cup angle will increase the ratio of thrust to radial capacity. Proper use of tapered roller bearings requires two opposed bearings, where each applies a thrust load toward the other. The internal clearance in the bearing is controlled by adjustment during installation.

METRIC DIMENSIONS							PART NUMBER	
BORE d	OUTSIDE DIAMETER D	BEARING WIDTH T	CONE WIDTH B	CUP WIDTH C	SHAFT MAX FILLET RADIUS R	HOUSING MAX FILLET RADIUS r	CONE	CUP
17.462	39.878	13.843	14.605	10.668	1.3	1.3	LM11749	LM11710
19.050	45.237	15.494	16.637	12.065	1.3	1.3	LM11949	LM11910
21.430	50.005	17.526	18.288	13.970	1.3	1.3	M12649	M12610
26.988	50.292	14.224	14.732	10.668	*	1.3	L44649	L44610
31.750	62.000	18.161	19.050	14.288	*	1.3	15123	15245
31.750	59.131	15.875	16.764	11.811	3.5	1.3	LM67048	LM67010
31.750	69.012	19.845	19.583	15.875	3.5	1.3	14125A	14276
34.925	65.088	18.034	18.288	13.970	*	1.3	LM48548	LM48510
34.925	73.025	23.813	24.608	19.050	1.5	2.3	25877	25820
34.987	59.975	15.875	16.764	11.938	*	1.3	L68149	L68111
41.275	73.431	21.430	19.812	16.604	3.5	0.8	LM501349	LM501314
44.450	82.931	23.813	25.400	19.050	3.5	0.8	25580	25520
44.450	93.264	30.163	30.302	23.812	3.5	3.3	3782	3720
44.450	104.775	30.163	30.958	23.812	0.8	3.3	45280	45220
50.000	90.000	28.001	28.000	23.000	5.0	2.5	JM205149A	JM205110
50.800	82.550	21.590	22.225	16.510	3.5	1.3	LM104949	LM104911
55.000	95.000	28.999	29.000	23.500	6.0	2.5	JM207049A	JM207010
57.150	96.838	21.001	21.946	15.875	3.5	0.8	387A	382A
57.150	97.630	24.608	24.608	19.446	3.5	0.8	28682	28622
57.150	112.712	30.163	30.162	23.812	8.0	3.3	39581	39520
57.150	123.825	38.100	36.678	30.162	3.5	3.3	555S	552A
60.325	123.825	38.100	36.678	30.162	8.0	3.3	557A	552A
63.500	112.712	30.163	30.162	23.812	3.5	3.3	39585	39520
63.500	122.238	38.100	38.354	29.718	7.0	3.3	HM212047	HM212011
66.675	112.712	30.163	30.048	23.812	3.5	3.3	3984	3920
66.675	112.712	30.163	30.162	23.812	3.5	3.3	39590	39520
66.675	122.238	38.100	38.354	29.718	3.5	3.3	HM212049	HM212011
66.675	122.238	38.100	38.354	29.718	7.0	3.3	HM212049X	HM212011

Tapered Roller Bearings

INCH DIMENSIONS (continued)



HYATT®

PART NUMBER		INCH DIMENSIONS							WEIGHTS (lbs)	
CONE	CUP	BORE d	OUTSIDE DIAMETER D	BEARING WIDTH T	CONE WIDTH B	CUP WIDTH C	SHAFT MAX FILLET RADIUS R	HOUSING MAX FILLET RADIUS r	CONE WEIGHT	CUP WEIGHT
29675	29630	2.7500	4.7500	1.0000	1.0000	0.7500	0.06	0.13	1.52	1.05
576	572	2.8750	5.5115	1.4375	1.4212	1.1250	0.14	0.13	3.75	1.70
33287	33462	2.8750	4.6250	1.1875	1.1875	0.9375	0.14	0.13	1.62	0.95
567	563	2.8750	5.0000	1.4735	1.4240	1.1250	0.14	0.13	2.54	1.42
575	572	3.0000	5.5115	1.4375	1.4212	1.1250	0.14	0.13	3.52	1.70
6461A	6420	3.0000	5.8750	2.1250	2.1350	1.7500	0.38	0.13	6.14	3.56
47679	47620	3.0000	5.2500	1.3125	1.3125	1.0313	0.14	0.13	2.95	1.24
496	493	3.1875	5.3750	1.1875	1.1720	0.8750	0.14	0.13	2.47	1.18
580	572	3.2500	5.5115	1.4375	1.4212	1.1250	0.14	0.13	3.02	1.70
663	653	3.2500	5.7500	1.6250	1.6250	1.2500	0.14	0.13	4.14	1.92
582	572	3.2500	5.5115	1.4375	1.4212	1.1250	0.27	0.13	2.94	1.70
HM516449C	HM516410	3.2500	5.2500	1.5625	1.5625	1.2813	0.14	0.13	3.09	1.68
47687	47620	3.2500	5.2500	1.3125	1.3125	1.0313	0.27	0.13	2.42	1.24
47686	47620	3.2500	5.2500	1.3125	1.3125	1.0313	0.14	0.13	2.50	1.24
749	742	3.3475	5.9090	1.7500	1.8375	1.4375	0.14	0.13	4.78	2.35
497	493	3.3750	5.3750	1.1875	1.1720	0.8750	0.14	0.13	2.15	1.18
HM518445	HM518410	3.5000	6.0000	1.5625	1.5625	1.1875	0.25	0.13	4.52	1.68
6580	6535	3.5000	6.3750	2.1250	2.1693	1.6875	0.14	0.13	6.65	3.64
HM218248	HM218210	3.5423	5.7864	1.5748	1.5748	1.2795	0.28	0.14	3.91	1.75
598A	592A	3.6250	6.0000	1.5625	1.4300	1.1875	0.25	0.13	3.40	2.42
594A	592A	3.7500	6.0000	1.5625	1.4300	1.1875	0.20	0.13	3.14	2.29
864	854	3.7500	7.5000	2.2500	2.2650	1.7500	0.31	0.13	10.14	5.85
52400	52618	4.0000	6.1875	1.4375	1.4219	1.0313	0.14	0.13	3.80	1.52
687	672	4.0000	6.6250	1.6250	1.6250	1.1875	0.14	0.13	4.72	2.69
780	772	4.0000	7.1250	1.8750	1.8900	1.5000	0.14	0.13	6.85	4.24
782	772	4.1250	7.1250	1.8750	1.8900	1.5000	0.14	0.13	6.42	4.24

* Special Radius

METRIC DIMENSIONS (continued)

Hyatt Tapered Roller Bearings are made to the highest design and quality levels, and include such features as:

- Super clean steel for rollers and races
- Superior dimensional and surface finish controls
- Optimum geometry, including roundness, profile and angle
- Crowned rollers and race pathways
- Extremely close roller diameter variation within any assembly
- High strength steel cages
- Low vibration levels tested 100%

Applications include truck front wheels, truck driven wheels, trailer axles and truck axle differentials.

METRIC DIMENSIONS							PART NUMBER	
BORE d	OUTSIDE DIAMETER D	BEARING WIDTH T	CONE WIDTH B	CUP WIDTH C	SHAFT MAX FILLET RADIUS R	HOUSING MAX FILLET RADIUS r	CONE	CUP
69.850	120.650	25.400	25.400	19.050	1.5	3.3	29675	29630
73.025	139.992	36.513	36.098	28.575	3.5	3.3	576	572
73.025	117.475	36.163	36.162	23.812	3.5	3.3	33287	33462
73.025	127.000	36.513	30.170	28.575	3.5	3.3	567	563
76.200	139.992	36.513	36.098	28.575	3.5	3.3	575	572
76.200	149.225	53.975	54.229	44.450	9.7	3.3	6461A	6420
76.200	133.350	33.338	33.338	26.195	3.5	3.3	47679	47620
80.962	136.525	30.163	29.769	22.225	3.5	3.3	496	493
82.550	139.992	36.513	36.098	28.575	3.5	3.3	580	572
82.550	146.050	41.275	41.275	31.750	3.5	3.3	663	653
82.550	139.992	36.513	36.098	28.575	6.8	3.3	582	572
82.550	133.350	39.688	39.688	32.545	3.5	3.3	HM516449C	HM516410
82.550	133.350	33.338	33.338	26.195	6.8	3.3	47687	47620
82.550	133.350	33.338	33.338	26.195	3.5	3.3	47686	47620
85.026	150.089	44.450	46.672	36.512	3.5	3.3	749	742
85.725	136.525	30.163	29.769	22.225	3.5	3.3	497	493
88.900	152.400	39.688	39.688	30.162	6.4	3.3	HM518445	HM518410
89.900	161.925	53.975	55.100	42.862	3.5	3.3	6580	6535
89.975	146.975	40.000	40.000	32.500	7.0	3.5	HM218248	HM218210
92.075	152.400	39.688	36.322	30.162	6.4	3.3	598A	592A
95.250	152.400	39.688	36.322	30.162	5.0	3.3	594A	592A
95.250	190.500	57.150	57.531	44.450	8.0	3.3	864	854
101.600	157.162	36.513	36.116	26.195	3.5	3.3	52400	52618
101.600	168.275	41.275	41.275	30.162	3.5	3.3	687	672
101.600	180.975	47.625	48.006	38.100	3.5	3.3	780	772
104.775	180.975	47.625	48.006	38.100	3.5	3.3	782	772

Ball Transfers

HIGH CAPACITY

General Bearing Ball Transfers are manufactured to the high standards required by the Engineering and Scientific Industries. They are available in a wide range of sizes, application styles, and load capacities. They will function efficiently whether mounted “Ball Up,” “Ball Down,” or in any angle of inclination as long as the applied load passes through the center line of the unit. For heavy loads where uneven load or track conditions exist, or where shock loading may occur, they can be supplied with spring mounting. This type of mounting is also available where full retraction of the ball is required after final positioning of load. Allow for any known unevenness of load and/or track when considering capacity and number of units to be used. Standard units come with a carbon steel housing and first quality chrome steel balls. Optional units can come with a stainless steel housing, main ball, and/or support balls.

Felt seals are standard except for the 1/2" ball diameter units which have no seal. The standard finish is zinc plating with gold passivation or black oxide. Lubrication is not required. The maximum recommended surface speed is 60 feet per minute and the operating coefficient of friction is 0.5%. The size tolerance is 1/64" unless otherwise specified. The maximum operating temperature at the listed capacities is 250°F. These ball transfers can operate at up to 480°F at reduced capacities as described below:

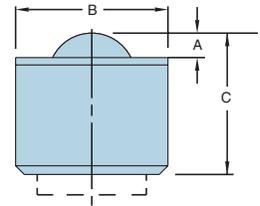
Temperature (°F): 260° 300° 350° 390° 440° 480°
Load % Decrease: 5% 10% 15% 25% 35% 40%

Applications include: Sheet Steel Handling, Jig and Tool Handling, Air Cargo, Conveyor Transfer Points, Atomic Research, Tube Handling and Inspection, Ball Tables and Moveable Acoustic Walls.



41000 Series

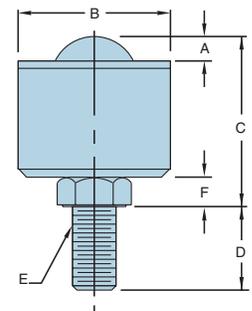
Part Number	Capacity (lbs)	Ball Diameter	A	B	C	Weight (lbs)
41051	75	1/2	5/32	7/8	7/8	0.08
41061	350	1	9/32	1 3/4	1 5/8	0.84
41062	700	1	1/4	2	1 3/4	1.16
41063	2240	1 1/2	1/2	2 3/8	2 3/8	2.38
41064	4480	2	5/8	4	3 7/8	11.93



41100 Series — Threaded Stud Units

Part Number	Capacity (lbs)	Ball Diameter	A	B	C	D	E	F	Weight (lbs)
41151*	75	1/2	5/32	7/8	0.875	1	1/2 - 24	0.000	0.09
41161	350	1	9/32	1 3/4	1.851	1	1/2 - 20	0.236	0.95
41162	700	1	1/4	2	1.986	1	1/2 - 20	0.236	1.38
41163	2240	1 1/2	1/2	2 3/8	2.769	1 1/2	3/4 - 16	0.394	2.75
41164	4480	2	5/8	4	4.347	2	1 - 12	0.472	11.81

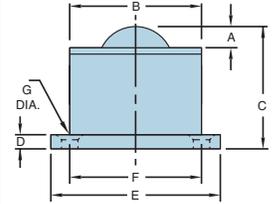
* No hex head.



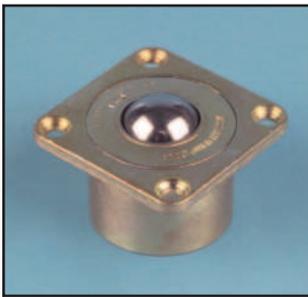


41200 Series — Flange Mounted Units

Part Number	Capacity (lbs)	Ball Diameter	A	B	C	D	E	F x F	G	Weight (lbs)
41251*	75	1/2	5/32	.9375	7/8	5/64	1 7/8 x 1 1/4	1 3/8	2 x 5/32	0.17
41261	350	1	9/32	1 3/4	1 5/8	3/16	2 1/4 x 2 1/4	1 3/4	4 x 7/32	0.98
41262	700	1	1/4	2	1 3/4	1/4	3 x 3	2 9/32	4 x 9/32	1.69
41263	2240	1 1/2	1/2	2 3/8	2 3/8	1/2	3 x 3	2 9/32	4 x 9/32	2.75
41264†	4480	2	5/8	4.13†	3 7/8	1/2	5 x 5	4	4 x 7/16	13.38

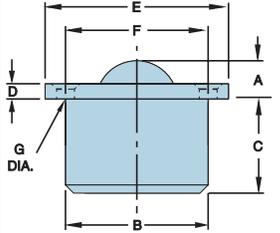


*41251 - Oval Flange
 †41264 - Tapered 4.13-4.37



41300 Series — Flange Socket Mounted

Part Number	Capacity (lbs)	Ball Diameter	A	B	C	D	E	F x F	G	Weight (lbs)
41351*	75	1/2	5/16	.9375	5/8	5/64	1 7/8 x 1 1/4	1 3/8	2 x 5/32	0.17
41361	350	1	15/32	1 3/4	1 5/32	3/16	2 1/4 x 2 1/4	1 3/4	4 x 7/32	0.98
41362	700	1	1/2	2	1 1/4	1/4	3 x 3	2 9/32	4 x 9/32	1.69
41363	2240	1 1/2	1	2 3/8	1 3/8	1/2	3 x 3	2 9/32	4 x 9/32	2.75
41364	4480	2	1 7/16	4 1/4	2 7/16	7/8	5 x 5	4	4 x 7/16	12.75

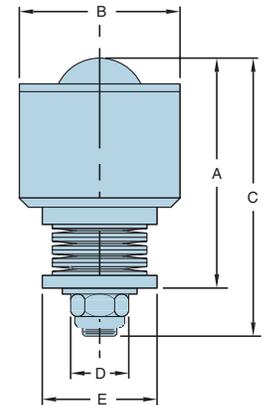


*41351 - Oval Flange



41400 Series — Spring Loaded Ball Transfer Units

Part Number	Load before spring deflect	Load to max. deflection (lbs)	Max. recom. deflection	Ball Diameter	A	B	C	D	E
41451-15	15	70	0.08	1/2	1.534	7/8	1 7/8	.571	.787
41451-30	30	77	0.08		1.518				
41451-50	50	83	0.08		1.534				
41461-15	15	225	0.125	1	2.44	1 3/4	3 1/32	3/4	1 1/4
41461-50	50	240	0.125		2.42				
41461-100	100	265	0.125		2.39				
41461-150	150	275	0.125		2.44				
41462-200	200	460	0.125	1	3.18	2	3 7/8	3/4	1 1/2
41462-300	300	540	0.125		3.19				
41462-400	400	600	0.125		3.17				
41462-500	500	680	0.125		3.19				
41463-1250	1250	1825	0.218	1 1/2	5.38	2 3/8	6 11/32	1 9/8	2 11/32
41463-1650	1650	2203	0.218		6.16				
41464-1680	1680	3080	0.08	2	5.47	4	6 5/16	2	4



All dimensions in inches.

Ball Transfers

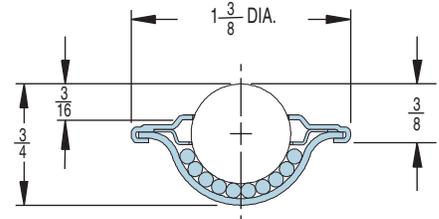
LIGHT CAPACITY



4040 Free Ball

The 5/8" diameter main ball of this compact unit is supported by 3/32" balls in a hardened cup. This unit is engineered for ball-up mounting. Load rating, 40 lbs.

Part No.	Ball & Support Cup Material	Housing Material
4040-02	Carbon Steel	C.R.S. Zinc Plate

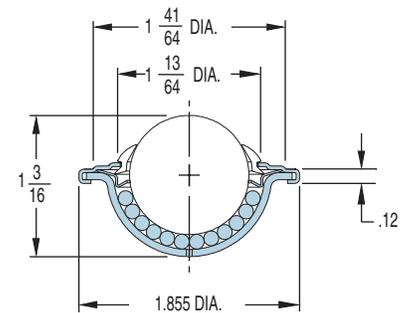


4180 Free Ball

This versatile unit consists of a 1" diameter main ball which rotates on 1/8" support balls in a hardened cup. This unit is engineered for ball-up mounting. Load rating, 125 lbs.

Part No.	Ball & Support Cup Material	Housing Material
4180-02	Carbon Steel	C.R.S. Zinc Plate
4180-32	Stainless Steel	C.R.S. Zinc Plate

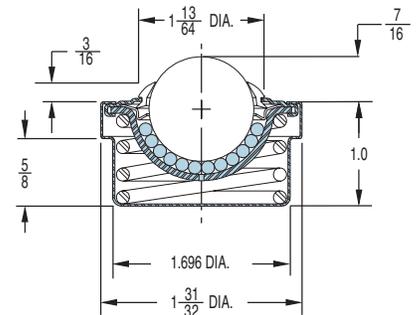
Carbon steel flange with two-hole mounting is also available.
55270-92 Carbon Steel C.R.S. Cad Plate



4233 Spring Loaded

A pre-loaded spring (65 lb. load) to allow 1/4" vertical ball deflection is built in this sealed, self-contained unit. A molded nylon seal on the 1" diameter main ball is standard and is positively retained. Engineered for ball-up applications only. Load rating, 125 lbs.

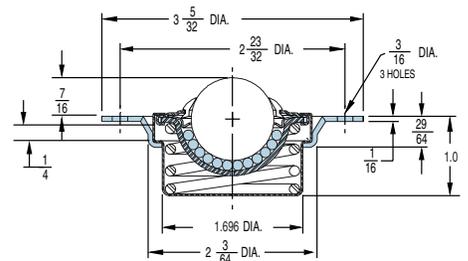
Part No.	Ball & Support Cup Material	Housing Material
4233-01	Carbon Steel	C.R.S. Zinc Plate
4233-32	Stainless Steel	C.R.S. Zinc Plate



4232 Spring Loaded

A pre-loaded spring (65 lb. load) to allow 1/4" vertical ball deflection is built in this sealed, self-contained unit. A molded nylon seal on the 1" diameter main ball is standard and is positively retained. Engineered for ball-up applications only. Load rating, 125 lbs. Equivalent to 4233, with a flange.

Part No.	Ball & Support Cup Material	Housing Material
4232-01	Carbon Steel	C.R.S. Zinc Plate
4232-32	Stainless Steel	C.R.S. Zinc Plate



Ball Transfer

Absolute load sharing in applications where the load rests on many ball transfers is seldom, if ever, achieved. Pallet flatness, ball transfer installed heights and system deflections will cause uneven load distribution. As a general rule of thumb, a safety factor of 3 may be used, but the user should be attentive to load sharing consideration in their application. Note that spring loaded units tend to minimize load sharing problems.

Mounting and spacing recommendations are available on request.

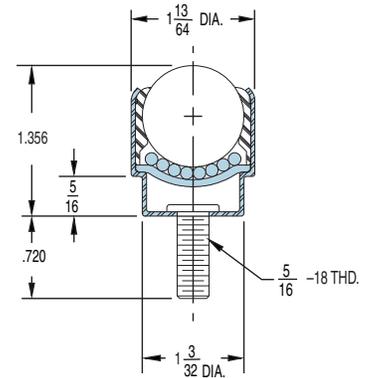


4240 Stud Mounted

This Ball Transfer consists of a 1" diameter carbon steel main ball, fitted with a molded nylon wiper seal, rotating on 1/8" support balls. Load rating, 125 lbs.

Part No.	Ball & Support Cup Material	Housing Material
4240-03	Carbon Steel	C.R.S. Black Oxide Finish
*4242-03	Carbon Steel	C.R.S. Black Oxide Finish

Recommended for ball-up mounting only.
*Equivalent to 4240, without threaded stud.

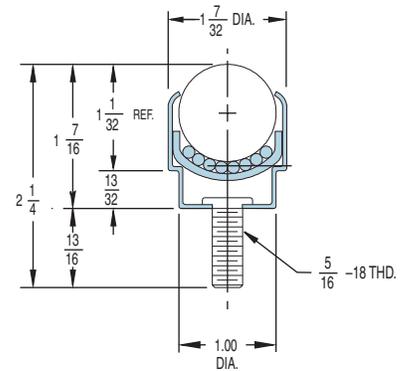


4550 Stud Mounted

This all steel Ball Transfer has a 1" diameter carbon steel main ball rotating on 1/8" support balls. Load rating, 125 lbs.

Part No.	Ball & Support Cup Material	Housing Material
4550-03	Carbon Steel	C.R.S. Black Oxide Finish

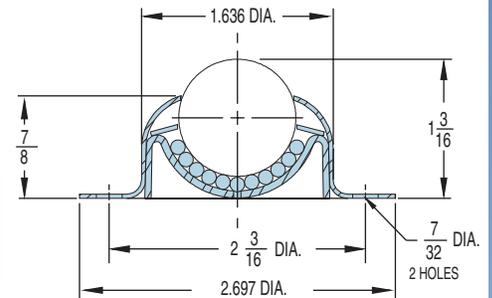
Engineered for ball-up or ball-down mounting.



4230 Flange Mounted

This all steel ball transfer has a two-hole flanged base for easy mounting and is designed for ball-up applications only. The 1" diameter main ball rotates on 1/8" support balls in a hardened steel cup. Load rating, 125 lbs.

Part No.	Ball & Support Cup Material	Housing Material
4230-01	Carbon Steel	C.R.S. Zinc Plate
4230-38	Stainless Steel	Stainless Steel

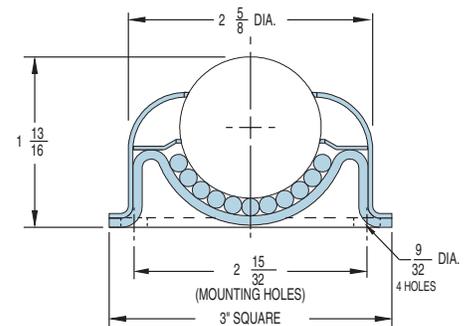


4260 Heavy Duty, Flanged Mounted

This heavy duty ball transfer has a 1 1/2" diameter main ball and four-hole flange base. The main ball rotates on 3/16" hardened and ground support balls in a precision formed and hardened ball cup. Load rating, 250 lbs.

Part No.	Ball & Support Cup Material	Housing Material
4260-01	Carbon Steel	C.R.S. Zinc Plate
4260-38	Stainless Steel	Stainless Steel

Engineered for ball-up mounting only.



Balls



CHROME AISI 52100 Chrome Alloy Steel

Materials Analysis

Carbon.....	0.98 to 1.10%
Chromium.....	1.30 to 1.60%
Manganese.....	0.25 to 0.45%
Silicon.....	0.20 to 0.35%
Phosphorus.....	0.025% Max.
Sulphur.....	0.025% Max.

Mechanical Properties

Tensile Strength.....	325,000 psi (2240 Mpa)
Yield Strength.....	295,000 psi (2030 Mpa)
Compression Yield Strength.....	375,000 psi (2584 Mpa)
Elongation in 2".....	5%
Reduction in area.....	8%
Modulus of elasticity.....	29,500,000 psi (203300 Mpa)
Density.....	0.283 lbs/cu.in. (7.74 g/cc)

Hardness

52100 Chrome alloy steel balls and rollers have a uniform hardness of HRC 60-66 regardless of size or grade.

Applicability

52100 Chrome alloy steel balls and rollers offer high hardness and excellent resistance to wear and deformation. They are made from the finest bearing quality steel. 52100 material is specified by precision bearing manufacturers where precise Spherical and tolerance accuracy are required.

Material Specifications

Material conforms to AMS 6440, ASTM A295, AISI 52100, 100 Cr6, DIN 1.3505, JIS SUJ 2, Federal QQ-5-6243 and Federal Standard 66b.

General Bearing currently offers balls in three different materials: 52100 Chrome Alloy, AISI 1010-1020 low carbon and 440C stainless. We manufacture precision balls in a variety of tolerances, grades and sizes. Using state-of-the-art manufacturing, process controls and inspection technology, we are able to provide precision balls globally that meet the requirements of most automotive and industrial bearing applications.

Our current global distribution of products includes Argentina, Brazil, China, Canada, Mexico, India, Korea, Japan, Taiwan, Philippines, Malaysia, France, Germany, Italy and the US.

CARBON AISI 1010-1020 Low Carbon Steel

Materials Analysis

Carbon.....	0.12 to 0.20%
Manganese.....	0.30 to 0.70%
Silicon.....	< 0.30%
Sulphur.....	< 0.045%
Phosphorus.....	< 0.050%

Mechanical Properties

Tensile Strength.....	53,000 psi
Yield Strength.....	44,000 psi
Elongation in 2".....	26%
Reduction in area.....	50%
Modulus of elasticity.....	28,000,000 psi
Density.....	0.284 lbs/cu.in.

Size		Case Depth	
MM	Inch	MM	Inch
3.175	1/8	0.6	0.025
3.969	5/32	0.6	0.025
4.763	3/16	0.8	0.030
5.556	7/32	0.9	0.035
6.350	1/4	1.1	0.045
7.144	9/32	1.1	0.045
7.938	5/16	1.1	0.045
8.731	11/32	1.1	0.045
9.525	3/8	1.4	0.055
10.319	13/32	1.4	0.055
11.113	7/16	1.7	0.065
11.906	15/32	1.7	0.065
12.700	1/2	1.8	0.070
13.494	17/32	1.8	0.070
14.288	9/16	1.9	0.075
15.875	5/8	1.9	0.075
17.463	11/16	1.9	0.075
19.050	3/4	2.0	0.080
20.636	13/16	2.0	0.080
22.225	7/8	2.0	0.080
25.400	1	2.0	0.080

Bearing Lubrication

Lubrication is essential to prevent premature ball bearing failure. Probably the most critical factor in maintaining operating conditions, the lubricant functions to:

- 1) minimize friction between balls and raceways,
- 2) act as a preventative against rust and corrosion,
- 3) dissipate heat build-up, and
- 4) provide a barrier against the entry of foreign matter.

The type of lubricant used also plays a critical factor in

operating efficiency. Conventional types fall into the classifications of oil or grease, each with specific properties correct for different bearing applications. Generally, grease is the preferred choice due to its ease of application and maintenance, performing well in the 0°F to 300°F operating range. Oil, however, does function better in extreme temperature conditions, below -40°F or above 350°F.

The following chart recommends the ten key lubricants used by General Bearing Corporation.

CHARACTERISTICS OF GREASE LUBRICANTS USED IN GENERAL BEARING PRODUCTS

COMPANY TRADEMARK	MIL SPEC	BASE OIL	THICKENER	OPERATING RANGE	CHARACTERISTICS
Dow Corning DC41		Silicon	Carbon	-0° to 550°F	Worked penetration of 280. Excellent for high temperature requirements.
DuPont Krytox 240AC	MIL-G-27617A	Fluorocarbon	Udax	-30° to 550°F	Worked penetration of 295. Excellent for both high and low temperature applications.
Exxon Beacon 325	MIL-G-3278	Diester	Lithium	-65° to 250°F	Excellent for low temperature applications.
Exxon Polyrex EM		Mineral	Polyurea	-20° to 350°F	Long performance life. Excellent for high speeds and high temperature.
Kyodo Yushi Multemp SB-M		Synthetic Hydrocarbon	Diurea	-40° to 400°F	Long performance life. Excellent for high and low temperature applications.
Kyodo Yushi Multemp SRL		Synthetic Hydrocarbon	Lithium	-40° to 300°F	Long performance life. Excellent for high and low temperature applications.
Mobil 28	MIL-PRF-81322F	Synthetic Hydrocarbon	Clay Bentonite	-65° to 350°F	Excellent for high and low temperature applications.
Shell Aeroshell 7	MIL-G-23827B	Diester	Microgel	-100° to 300°F	Worked penetration of 288. Excellent for low temperature lubrication qualities.
Shell Alvania 2	MIL-G-18709	Mineral	Lithium	-20° to 250°F	Worked penetration of 287. General purpose lubrication.

Shaft and Housing Fits

FOR METRIC RADIAL BALL AND ROLLER BEARINGS

To select the proper fits, it is necessary to consider the type and extent of the load, bearing type, and certain other design and performance requirements.

The required shaft and housing fits are indicated in Tables 1 and 3. The terms “Light”, “Normal” and “Heavy” loads refer to radial loads that are generally within the following limits (C being the Basic Dynamic Load Rating computed in accordance with ABMA-ANSI Standards).

<u>Radial Load</u>	<u>Ball Bearings</u>	<u>Roller Bearings</u>
Light	up to 0.07C	up to 0.08C
Normal	from 0.07C to 0.15C	from 0.08C to 0.18C
Heavy	over 0.15C	over 0.18C

Shaft Fits. Table 1 indicates the initial approach to shaft fit selection. Note that for most normal applications where the shaft rotates and the radial load direction is constant, an interference fit should be used. Also, the heavier the load, the greater is the required interference. For stationary shaft conditions and constant radial load direction, the inner ring may be moderately loose on the shaft.

Note that for pure thrust (axial) loading, heavy interference fits are not necessary as a moderately loose to tight shaft fit only is needed.

Table 2 shows how the tolerance ranges of the various classifications deviate from the basic bore diameters.

Housing Fits. Table 3 indicates the initial approach to housing fit selection. Note that the use of clearance or interference fits is mainly dependent upon which bearing ring rotates in relation to the radial load. For indeterminate or varying load directions, avoid clearance fits. Clearance fits are preferred in axially split housings to avoid distorting bearing outer rings. The extent of the radial load also influences the choice of fit.

Table 4 shows how the tolerance ranges of the various classifications deviate from the basic outside diameters.

Example:

Bearing No. 6203 (17mm x 40mm x 12mm).

Application: Electric motor (shaft and bearing inner ring rotating).

Load 20 lbs. radial

Per catalog Page 5: Basic Dynamic Load Rating (c) = 2153 lbs.

$$\frac{\text{Load}}{c} = \frac{20 \text{ lbs.}}{2153 \text{ lbs.}} = .009$$

Radial load is less than .07 of Dynamic Load rating (c); therefore, load is “light”.

Table 1: Inner ring rotating, light radial load, 17 mm inner diameter: Tolerance classification should be h5.

Table 2: 17mm inner diameter (.6693”) and h5 tolerance: Shaft diameter tolerance is +0”, –.0003”. Shaft diameter should be .6693” max., .6690” min.

Table 3: Outer ring stationary, light load, housing not split axially: Tolerance classification should be H6.

Table 4: 40mm outer diameter (1.5748”) and H6 tolerance: Housing bore diameter tolerance is +0”, +.0006”. Housing bore diameter should be 1.5754” max., 1.5748” min.

TABLE 1 – SELECTION OF SHAFT TOLERANCE CLASSIFICATIONS
For Metric Radial Ball and Roller Bearings of Tolerance Classes ABEC-1, RBEC-1

DESIGN & OPERATING CONDITIONS			BALL BEARINGS					CYLINDRICAL ROLLER BEARINGS					SPHERICAL ROLLER BEARINGS							
Rotational Conditions	Inner Ring Axial Displaceability	Radial Loading	BORE d				Tolerance Classification ¹	BORE d				Tolerance Classification ¹	BORE d				Tolerance Classification ¹			
			mm		inch			mm		inch			mm		inch					
			Over	Incl.	Over	Incl.		Over	Incl.	Over	Incl.		Over	Incl.	Over	Incl.				
Inner Ring Rotating in relation to load direction or Load Direction indeterminate	Light	Normal	0	18	0	0.71	h5 j6 ²	0	40	0	1.57	j6 ² k6 ² m6 ² n6 p6	0	40	0	1.57	j6 ² k6 ² m6 ² n6 p6			
			18	All	0.71	All		40	140	1.57	5.51		40	100	1.57	3.94				
			320	500	12.6	19.7		140	320	5.51	12.6		320	500	12.6	19.7				
			500	All	19.7	All		320	500	12.6	19.7		500	500	12.6	19.7				
								500	All	19.7	All		500	All	19.7	All				
													500	All	19.7	All				
	Normal	Heavy	All	0	18	0	0.71	j5 k5	0	40	0	1.57	k5 m5 m6 n6 p6 r6	0	40	0	1.57	k5 m5 m6 n6 p6 r6 r7		
				18	All	0.71	All		40	100	1.57	3.94		40	65	1.57	2.56			
				100	140	3.94	5.51		100	140	3.94	5.51		65	100	2.56	3.94			
				140	320	5.51	12.6		140	320	5.51	12.6		100	140	3.94	5.51			
				320	500	12.6	19.7		320	500	12.6	19.7		140	280	5.51	11.0			
				500	All	19.7	All		500	All	19.7	All		280	500	11.0	19.7			
Heavy	All	All	18	100	0.71	3.94	k5 m5	0	40	0	1.57	m5 m6 n6 p6 r6 r7	0	40	0	1.57	m5 m6 n6 p6 r6 r7			
			100	All	0.71	3.94		40	65	1.57	2.56		40	65	1.57	2.56				
			200	200	7.87	19.7		65	140	2.56	5.51		65	100	2.56	3.94				
			500	500	7.87	19.7		140	200	5.51	7.87		100	140	3.94	5.51				
								200	500	7.87	19.7		140	200	5.51	7.87				
								500	All	19.7	All		200	All	7.87	All				
Inner Ring Stationary in relation to load direction	Inner Ring must be easily axially displaceable	Light	All Sizes				g6	All Sizes				g6	All Sizes				g6			
		Normal	All Sizes					h6	All Sizes				h6	All Sizes				h6		
		Heavy	All Sizes						h6	All Sizes				h6	All Sizes				h6	
Inner Ring need not be easily axially displaceable	Light	All Sizes				h6	All Sizes				h6	All Sizes				h6				
	Normal	All Sizes					h6	All Sizes				h6	All Sizes				h6			
	Heavy	All Sizes						h6	All Sizes				h6	All Sizes				h6		
Pure Thrust (Axial) Load			All Sizes						j6	Consult Bearing Manufacturer										

TABLE 2 – SHAFT DIAMETER TOLERANCE LIMITS
For Metric Radial Ball and Roller Bearings of Tolerance Classes ABEC-1, RBEC-1
 Dimensions and deviations in inches and millimeters. Tolerance Limits in Inches.

BORE d						TOLERANCE CLASSIFICATIONS											
inch			mm			g6	h6	h5	j5	j6	k5	k6	m5	m6	n6	p6	r6
Over	Incl.	Dev.	Over	Incl.	Dev.												
0.1181		0	3			-0.002	0	0	+0.001	+0.002	+0.002		+0.004				
	0.2362	-0.003		6	-0.08	-0.005	-0.003	-0.002	-0.001	-0.001	0		+0.002				
0.2362		0	6			-0.002	0	0	+0.002	+0.003	+0.003		+0.005				
	0.3937	-0.003		10	-0.08	-0.006	-0.004	-0.002	-0.001	-0.001	0		+0.002				
0.3937		0	10			-0.002	0	0	+0.002	+0.003	+0.004		+0.006				
	0.7087	-0.003		18	-0.08	-0.007	-0.004	-0.003	-0.001	-0.001	0		+0.003				
0.7087		0	18			-0.003	0		+0.002	+0.004	+0.004		+0.007				
	1.1811	-0.004		30	-0.10	-0.008	-0.005		-0.002	-0.002	+0.001		+0.003				
1.1811		0	30			-0.004	0		+0.002	+0.004	+0.005	+0.007	+0.008	+0.010			
	1.9685	-0.0045		50	-0.14	-0.010	-0.006		-0.002	-0.002	+0.001	+0.001	+0.004	+0.004			
1.9685		0	50			-0.004	0		+0.002	+0.005	+0.006	+0.008	+0.009	+0.012	+0.015		
	3.1496	-0.006		80	-0.15	-0.011	-0.007		-0.003	-0.003	+0.001	+0.001	+0.004	+0.004	+0.008		
3.1496		0	80			-0.005	0		+0.002	+0.005	+0.007	+0.010	+0.011	+0.014	+0.018	+0.023	
	4.7244	-0.008		120	-0.20	-0.013	-0.009		-0.004	-0.004	+0.001	+0.001	+0.005	+0.005	+0.009	+0.015	
4.7244		0	120			-0.006	0		+0.003	+0.006	+0.008	+0.011	+0.013	+0.016	+0.020	+0.027	+0.035
	7.0866	-0.010		180	-0.25	-0.015	-0.010		-0.004	-0.004	+0.001	+0.001	+0.006	+0.006	+0.011	+0.017	+0.026

¹ Tolerance classifications shown are for solid steel shafts. Numerical values are listed in Table 2. For hollow or non-ferrous shafts, tighter fits may be needed.

² If greater accuracy is needed, substitute j5, k5 and m5 for j6, k6 and m6 respectively.

Shaft and Housing Fits (continued)

FOR METRIC RADIAL BALL AND ROLLER BEARINGS

TABLE 3 – SELECTION OF HOUSING TOLERANCE CLASSIFICATIONS
For Metric Radial Ball and Roller Bearings of Tolerance Classes ABEC-1, RBEC-1

DESIGN AND OPERATING CONDITIONS				TOLERANCE CLASSIFICATION ¹
Rotational Conditions	Loading	Other Conditions	Outer Ring Axial Displaceability	
Outer Ring Stationary in relation to load direction	Normal or Heavy	Heat input through shaft	Outer Ring easily axially displaceable	G7 ³
		Housing split axially		H7 ²
	Shock with temporary complete unloading	Housing not split axially		Transitional Range ⁴
Light		Split not recommended	J6 ²	
	Normal or Heavy		Thin wall housing not split	K6 ²
Heavy Shock	Outer Ring not easily axially displaceable	M6 ²		
Outer Ring Rotating in relation to load direction		Light	Heavy	N6 ²
	Normal or Heavy	P6 ²		

¹ For cast iron steel housings, numerical values are listed in Table 4. For housings of non-ferrous alloys tighter fits may be needed.

² Where wider tolerances are permissible, use tolerance classifications H8, H7, J7, K7, M7, N7 and P7 in place of H7, H6, J6, K6, M6, N6 and P6 respectively.

³ For large bearings and temperature differences between outer ring and housings greater than 10°C, F7 may be used instead of G7.

⁴ The tolerance zones are such that outer ring may be either tight or loose in the housing.

TABLE 4 – HOUSING BORE TOLERANCE LIMITS
For Metric Radial Ball and Roller Bearings of Tolerance Classes ABEC-1, RBEC-1

OUTER DIAMETER D						TOLERANCE CLASSIFICATIONS														
Over	inch Incl.	Dev.	Over	mm Incl.	Dev.	F7	G7	H8	H7	H6	J6	J7	K6	K7	M6	M7	N6	N7	P6	P7
.3937		0	10		+0	+0.006	+0.002	0	0	0	-0.002	-0.003	-0.004	-0.005	-0.006	-0.007	-0.008	-0.009	-0.010	-0.011
	.7087	-0.003		18	-0.08	+0.013	+0.009	+0.011	+0.007	+0.004	+0.002	+0.004	+0.001	+0.002	-0.002	0	-0.004	-0.002	-0.006	-0.004
.7087		0	18		+0	+0.008	+0.003	0	0	0	-0.002	-0.004	-0.004	-0.006	-0.007	-0.008	-0.009	-0.011	-0.012	-0.014
	1.1811	-0.035		30	-0.09	+0.016	+0.011	+0.013	+0.008	+0.005	+0.003	+0.005	+0.001	+0.002	-0.002	0	-0.004	-0.003	-0.007	-0.006
1.1811		0	30		+0	+0.010	+0.004	0	0	0	-0.002	-0.004	-0.005	-0.007	-0.008	-0.010	-0.011	-0.013	-0.015	-0.017
	1.9685	-0.045		50	-0.11	+0.020	+0.013	+0.015	+0.010	+0.006	+0.004	+0.006	+0.001	+0.003	-0.002	0	-0.005	-0.003	-0.008	-0.007
1.9685		0	50		+0	+0.012	+0.004	0	0	0	-0.002	-0.005	-0.006	-0.008	-0.009	-0.012	-0.013	-0.015	-0.018	-0.020
	3.1496	-0.005		80	-0.13	+0.024	+0.016	+0.018	+0.012	+0.007	+0.005	+0.007	+0.002	+0.004	-0.002	0	-0.006	-0.004	-0.010	-0.008
3.1496		0	80		+0	+0.014	+0.005	0	0	0	-0.002	-0.005	-0.007	-0.010	-0.011	-0.014	-0.015	-0.018	-0.020	-0.023
	4.7244	-0.006		120	-0.15	+0.028	+0.019	+0.021	+0.014	+0.009	+0.006	+0.009	+0.002	+0.004	-0.002	0	-0.006	-0.004	-0.012	-0.009
4.7244		0	120		+0	+0.017	+0.006	0	0	0	-0.003	-0.006	-0.008	-0.011	-0.013	-0.016	-0.018	-0.020	-0.024	-0.027
	5.9055	-0.007		150	-0.18	+0.033	+0.021	+0.025	+0.016	+0.010	+0.007	+0.010	+0.002	+0.005	-0.003	0	-0.008	-0.005	-0.014	-0.011
5.9055		0	150		+0	+0.017	+0.006	0	0	0	-0.003	-0.006	-0.008	-0.011	-0.013	-0.016	-0.018	-0.020	-0.024	-0.027
	7.0866	-0.010		180	-0.25	+0.033	+0.021	+0.025	+0.016	+0.010	+0.007	+0.010	+0.002	+0.005	-0.003	0	-0.008	-0.005	-0.014	-0.011
7.0866		0	180		+0	+0.020	+0.006	0	0	0	-0.003	-0.006	-0.009	-0.013	-0.015	-0.018	-0.020	-0.024	-0.028	-0.031
	9.8425	-0.012		250	-0.30	+0.038	+0.024	+0.028	+0.018	+0.011	+0.009	+0.012	+0.002	+0.005	-0.003	0	-0.009	-0.006	-0.016	-0.013
9.8425		0	250		+0	+0.022	+0.007	0	0	0	-0.003	-0.006	-0.011	-0.014	-0.016	-0.020	-0.022	-0.026	-0.031	-0.035
	12.4016	-0.014		315	-0.35	+0.043	+0.027	+0.032	+0.020	+0.013	+0.010	+0.014	+0.002	+0.006	-0.004	0	-0.010	-0.006	-0.019	-0.014

Bearing Life and Load Ratings

How long a ball bearing will last under load depends on two groups of variables. First, there are the bearing's physical characteristics, which include how it is designed, the material from which it is made, and how it is manufactured. Secondly, there are the conditions under which it is applied, such as load, operating speed and temperature, the way it is mounted, and the way it is lubricated.

Even if a ball bearing is operated under ideal conditions — where it has been properly mounted, lubricated, protected from foreign particles, and not subjected to extreme temperature or speed — it will ultimately fail due to either material fatigue or wear. Fatigue failure results from the repeated stresses that are developed in the contact areas between the balls and raceways. Failure shows up as spalling of the load-carrying surfaces. Excessive wear occurs when operating conditions are other than ideal. These conditions are generally those which cause high friction and/or heat within the bearing.

PREDICTING BEARING LIFE

It is not possible to predict the exact fatigue life of an individual bearing. Instead, the designer of a system incorporating ball bearings must rely on the results of extensive research and testing done on the life of groups of identical bearings operated under identical conditions. Tests show that lifetimes of such operated bearings vary due to intricate differences between individual bearings. These lifetimes, however, follow definite statistical distributions. Load ratings, boundary dimensions, and tolerances for ball bearings and cylindrical roller bearings are computed from ABMA and ISO standards.

Such statistical distributions can be represented by equations which relate predicted bearing life to factors like the load it must bear, its operating speed, and the bearing's physical characteristics. It is up to the designer to then determine which bearing is best for a particular application by use of these equations.

L_{10} , or *rating life*, is the life most commonly used in load calculations. It is the life in units of either hours or millions of revolutions that 90% of a group of apparently identical ball bearings will complete or exceed. Another accepted form is L_{50} , or *median life*. It is the life which 50% of a group of bearings will complete or exceed. L_{50} is usually not more than five times L_{10} .

Another important definition is that of the *basic dynamic load rating* "C". For a radial ball bearing, the basic dynamic load rating is the constant radial load which a group of identical bearings with a stationary outer ring can theoretically endure for 500 hours at $33\frac{1}{3}$ RPM (1,000,000 revolutions).

The relationship between bearing life and applied load can be expressed as:

Life in Revolutions:

$$L_{10} = \left(\frac{C}{P}\right)^3 \times 10^6$$

Life in Hours:

$$L_{10} = \left(\frac{C}{P}\right)^3 \frac{16667}{N}$$

Where:

- L_{10} = The rating life
- C = The basic dynamic capacity as shown in the catalog
- P = The equivalent radial load on the bearing in pounds
- N = Speed in RPM

Consult the factory for other life factors.

EQUIVALENT RADIAL LOAD

Bearings often must carry a combination of radial and thrust loads. The equations stated in the previous section are based solely on radially loaded bearings. Therefore, when radial and axial loads are present, an *equivalent radial load* (P) must be calculated. The equivalent radial load is the greater of:

$$P = XF_r + YF_a$$

$$P = F_r$$

Where:

- P = Equivalent radial load in pounds
- F_r = Applied radial load in pounds
- F_a = Applied axial load in pounds
- X = Radial load factor = 0.56
- Y = Axial load factor dependent on the magnitude of F_a/C_0
- C_0 = Catalog static load rating in pounds (definition to follow:

F_a/C_0	Y
0.014	2.30
0.028	1.99
0.056	1.71
0.084	1.55
0.11	1.45
0.17	1.31
0.28	1.15
0.42	1.04
0.56	1.00

Bearing Life and Load Ratings

C_0 , the *static load rating*, is the non-rotating radial load which produces a maximum contact stress of 667,000 pounds per square inch at any point within the bearing.

When static load exceeds the catalog rating, a significant decrease in bearing smoothness and life can be expected when rotation is resumed.

As with dynamic load ratings, static loads are usually a combination of radial and thrust loads. Equivalent static load must therefore be calculated.

The static equivalent load for radial ball bearings is the greater of:

$$P_0 = .6 F_r + .5 F_a$$

$$P_0 = F_r$$

Where:

- P_0 = Equivalent static radial load in pounds
- F_r = Applied radial load in pounds
- F_a = Applied axial load in pounds

EXAMPLES OF LIFE AND LOAD CALCULATIONS

Example 1:

Determine the L_{10} life hours of a 6203 ball bearing operating at 800 RPM with a radial load of 250 lbs.

The Basic Dynamic capacity from the catalog is $C = 2153$ lbs.

- L_{10} = Unknown
- $C = 2153$ lbs.
- $F_r = P = 250$ lbs.
- $N = 800$ RPM

$$L_{10} = \left(\frac{C}{P} \right)^3 \left(\frac{16667}{N} \right)$$

$$L_{10} = \left(\frac{2153}{250} \right)^3 \left(\frac{16667}{800} \right)$$

$$L_{10} = 13307 \text{ hours}$$

Example 2:

Determine the minimum static and dynamic load ratings required to carry a 300 pound radial load, and 75 pound axial load for 3500 hours at 650 RPM.

- $C =$ Unknown
- $P =$ Unknown
- $Y =$ Unknown
- $F_r = 300$ lbs.
- $N = 650$ RPM
- $C_0 =$ Unknown
- $P_0 =$ Unknown
- $X = .56$
- $F_a = 75$ lbs.
- $L = 3500$ hrs.

$$P_0 = .6 F_r + .5 F_a = 217.5 \text{ lbs.}$$

$$\text{or } P_0 = F_r = 300 \text{ lbs.}$$

Therefore $P_0 = C_0$ minimum = 300 lbs.

$$F_a/C_0 = 75/300 = 0.25$$

Then by interpolation $Y = 1.19$

Equivalent radial load

$$P = XF_r + YF_a = .56 (300) + 1.19 (75) = 257.3 \text{ lbs.}$$

or $P = F_r = 300$ lbs. Therefore $P = 300$ lbs.

$$L_{10} = \left(\frac{C}{P} \right)^3 \left(\frac{16667}{N} \right)$$

$$\text{or } C = \left(\frac{L_{10}N}{16667} \right)^{1/3} P$$

$$\text{or } C = \left(\frac{(3500)(650)}{16667} \right)^{1/3} 300 = 1545 \text{ lbs.}$$

Answer: C_0 minimum = 300 lbs., C minimum = 1545 lbs.

Radial Internal Clearance Chart

Radial internal clearance is a measure of the radial looseness, or play between the inner and outer rings. Precision bearings are available in five classes of looseness. The amount of looseness necessary is dependent on many factors such as shaft

alignment, shaft and housing fits, bearing speed, etc. As RPM, shaft misalignment, and press fits increase in magnitude, so should radial play.

RADIAL INTERNAL CLEARANCE, SINGLE ROW, RADIAL CONTACT, BALL BEARINGS

Tolerance Limits for Radial Internal Clearance of Single Row, Radial Contact Ball Bearings Under No Load

(Applicable to Bearings of ABEC-1, ABEC-5, ABEC-7 and ABEC-9 Tolerance Classes)

TOLERANCE LIMITS IN .0001 INCH

BASIC BORE DIAMETER		ACCEPTANCE LIMITS									
d – mm		C-2		STANDARD		C-3		C-4		C-5	
Over	Incl.	Low	High	Low	High	Low	High	Low	High	Low	High
2.5	6	0	3	1	5	3	9	—	—	—	—
6	10	0	3	1	5	3	9	6	11	8	15
10	18	0	3.5	1	7	4.5	10	7	13	10	18
18	24	0	4	2	8	5	11	8	14	11	19
24	30	0.5	4.5	2	8	5	11	9	16	12	21
30	40	0.5	4.5	2.5	8	6	13	11	18	16	25
40	50	0.5	4.5	2.5	9	7	14	12	20	18	29
50	65	0.5	6	3	11	9	17	15	24	22	35
65	80	0.5	6	4	12	10	20	18	28	26	41
80	100	0.5	7	4.5	14	12	23	21	33	30	47
100	120	1	8	6	16	14	26	24	38	35	55
120	140	1	9	7	19	16	32	28	45	41	63
140	160	1	9	7	21	18	36	32	51	47	71
160	180	1	10	8	24	21	40	36	58	53	79
180	200	1	12	10	28	25	46	42	64	59	91

For additional information concerning mounting procedures, lubrication, variable speeds and loads, safety or service factors, and other technical data necessary for proper bearing selection, contact our Engineering Department.