IN SEARCH of MAXIMUM CAPACITY

The RBC TJ TandemRoller® Bearing

What more capacity will do:

The rating life of roller bearings is given by $L = \left(\frac{C}{P}\right)^{\frac{10}{3}}$ where **L** is the calculated fatigue life, **C**, the dynamic capacity, and **P,** the equivalent radial load. It is easy to see that increasing the capacity will increase the fatigue life under the same load conditions, however, the relationship between life and capacity is not linear.

To see how life changes with improved capacity and constant load, we calculate a fatigue life ratio $\frac{L_2}{L_1}$ for 2 different capacity values C_2 and C_1 using the above equation:

$$\frac{L_2}{L_1} = \frac{\left(\frac{C_2}{P}\right)^{\frac{10}{3}}}{\left(\frac{C_1}{P}\right)^{\frac{10}{3}}} \quad or \quad \frac{L_2}{L_1} = \left(\frac{C_2}{C_1}\right)^{\frac{10}{3}}$$

From this relationship or from fig. 1 we can determine for example that a 10% improvement in capacity yields a 37% improvement in calculated fatigue life, while a 20% higher capacity gives 83% more life.

Increasing the number of rollers

Next we explore the AFBMA formula for the dynamic capacity of radial roller bearings for ways to improve capacity:

$$C = f_c * \left(i * L_{eff} * \cos(\alpha)\right)^{\frac{7}{9}} * Z^{\frac{3}{4}} \; D_w^{\frac{29}{27}}$$

For a given bearing width, changing the number of rows of rolling elements **i** is usually not an option and the effective roller length L_{eff} can rarely be increased any further, for radial bearings $\cos(\alpha) = 1$ and the roller diameter D_w can be increased only so much, before the outer ring wall thickness or the cage bar become too thin. This leaves only the factor f_c and the number of rollers per row **z** for modification to boost capacity.

Full complement of rollers

Although a full complement bearing design has the most rollers, factor f_c is a maximum for a bearing with cage and modified line contact between rollers and raceways. Full complement bearings are more sensitive to misalignment, have a greater coefficient of friction and therefore generate much more heat. Their speed limit is lower and they require re-lubrication more often because they have not only less space for lubricant storage, but use up the smaller amount of lubricant more rapidly than caged designs.

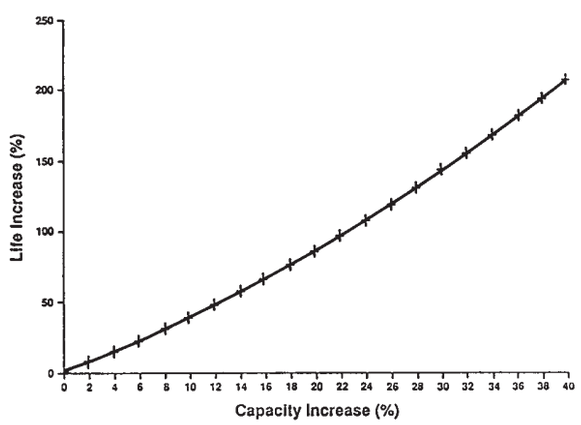
The Tandem Roller Bearing (TJ-series) solutions.

The patented RBC solution to this dilemma has been to design and make a caged bearing with 2 rollers per cage pocket. The tandem rollers are still properly guided, while the cage retains sufficient strength. The improvement in capacity over a bearing with 1 roller per pocket typically ranges from 10% to 40%, giving 37% to 200% greater fatigue life.

This improved bearing performance has been used successfully in many critical applications, for example, helicopter blade bearings, gear and mud pump bearings, suspension bearings, and many others.

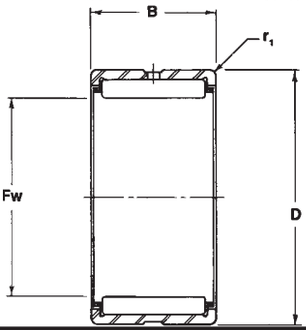
TJ bearing designs are shown in the following pages in this catalog. Contact RBC when applying a TJ bearing in your design.

Fig. 1. Effect of Capacity Increases on Fatigue Life



Heavy Duty TJ TandemRoller® Bearings

TJ TandemRoller® Bearing



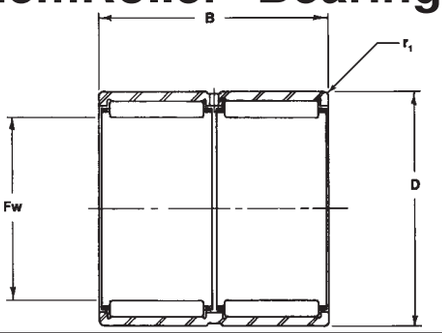
BEARING PART NUMBER 1)	Fw Inside Diameter			D Outside Diameter		B Width +.000 –.005	r_1 Housing Fillet Max.	Housing Shoulder Dia. +/– 1/64"	Dynamic Capacity C (lbs.)	Static Capacity C_O (lbs.)	
	Nominal	Min.	Max.	Max.	Min.						
TJ 75317	7/8	.8759	.8768	1.5000	1.4995	1.063	.015	1 1/4	7,300	10,800	
TJ 7194	1	1.0009	1.0018	1.5000	1.4995	1.000	.015	1 5/16	8,000	13,700	
TJ 74765	1 1/16	1.0640	1.0649	1.6875	1.6870	1.000	.015	1 7/16	9,500	13,900	
TJ 7214	1 1/8	1.1259	1.1268	1.6250	1.6245	1.000	.040	1 3/8	8,500	15,500	
TJ 7215	1 1/8	1.1259	1.1268	1.6250	1.6245	1.250	.040	1 3/8	10,600	20,400	
TJ 7235	1 1/4	1.2510	1.2519	1.7500	1.7495	1.250	.040	1 9/16	11,300	22,700	
TJ 75117	1 3/8	1.3760	1.3769	2.0625	2.0619	1.000	.015	1 3/4	10,100	17,900	
TJ 75129	1 1/2	1.5010	1.5019	2.2500	2.2494	1.000	.015	1 7/8	11,300	18,900	
TJ 75318	1 1/2	1.5010	1.5019	2.3750	2.3744	1.250	.060	2	15,000	24,400	
DTJ 75319	1 1/2	1.5010	1.5019	2.3750	2.3744	2.500	.060	2	25,800	48,900	
TJ 7314	1 3/4	1.7510	1.7520	2.3125	2.3119	1.000	.060	2 1/16	11,500	23,900	
TJ7315	1 3/4	1.7510	1.7520	2.3125	2.3119	1.250	.060	2 1/16	14,300	31,800	
TJ7354	2	2.0011	2.0021	2.5625	2.5619	1.000	.060	2 5/16	12,500	27,700	
TJ 7355	2	2.0011	2.0021	2.5625	2.5619	1.250	.060	2 5/16	15,600	36,800	
TJ 8446	2 1/2	2.5011	2.5021	3.2500	3.2494	1.500	.080	2 7/8	19,000	46,600	
TJ 8447	2 1/2	2.5011	2.5021	3.2500	3.2494	1.750	.080	2 7/8	22,200	56,900	
TJ 8476	2 3/4	2.7511	2.7521	3.5000	3.4992	1.500	.080	3 1/8	19,500	49,800	
TJ 8477	2 3/4	2.7511	2.7521	3.5000	3.4992	1.750	.080	3 1/8	22,800	60,900	
TJ 8516	3	3.0011	3.0023	3.7500	3.7492	1.500	.080	3 3/8	20,900	56,000	
TJ 8517	3	3.0011	3.0023	3.7500	3.7492	1.750	.080	3 3/8	24,400	68,500	
DTJ 75168	3 1/4	3.2512	3.2524	4.2500	4.2492	4.000	.060	3 3/4	54,500	164,500	
TJ 75310	3 5/16	3.3151	3.3160	4.0000	3.9992	1.500	.060	3 5/8	20,900	64,400	
TJ 75309	3 5/16	3.3151	3.3160	4.0000	3.9992	1.650	.060	3 5/8	22,900	72,600	
TJ 9608	3 1/2	3.5012	3.5014	4.5000	4.4992	2.000	.060	3 7/8	32,800	87,900	
TJ 75177	3 13/16	3.8143	3.8157	4.3750	4.3742	1.500	.060	4	18,400	76,000	
TJ 75311	4	4.0012	4.0024	4.8125	4.8118	2.125	.060	4 3/8	34,100	116,000	
TJ 75176	4 1/16	4.0643	4.0657	4.6250	4.6242	1.500	.060	4 5/16	18,900	81,000	
TJ 75312	4 1/2	4.5012	4.5026	5.3125	5.3118	2.080	.060	4 7/8	36,200	127,000	
TJ 6769	4 1/2	4.5012	4.5026	6.0000	5.9990	2.250	.100	5 1/4	49,600	119,000	
TJ 6770	4 1/2	4.5012	4.5026	6.0000	5.9990	2.500	.100	5 1/4	55,400	137,000	
DTJ 75169	4 1/2	4.5012	4.5026	6.0000	5.9990	4.500	.100	5 1/4	85,800	236,000	
TJ 74986	5	5.0013	5.0027	6.0000	5.9990	2.000	.100	5 1/2	39,000	135,000	
TJ 6849	5	5.0013	5.0027	6.5000	6.4990	2.250	.100	5 3/4	54,000	137,000	
TJ 6918	5 1/2	5.5013	5.5027	7.0000	6.9990	2.500	.100	6 1/4	62,000	169,000	
TJ 6919	5 1/2	5.5013	5.5027	7.0000	6.9990	3.000	.100	6 1/4	74,200	213,000	
DTJ 75170	5 1/2	5.5013	5.5027	7.0000	6.9990	6.000	.100	6 1/4	127,000	425,000	
TJ 6926	6	6.0013	6.5029	7.5000	7.4988	3.000	.120	6 5/8	79,300	239,000	
TJ 6935	6 1/2	6.5013	6.5029	8.0000	7.9988	2.500	.120	7 1/8	67,500	200,000	
DTJ 75166	8	8.0014	8.0032	10.1250	10.1236	7.750	.160	9 1/4	260,000	830,000	

All dimensions in inches.
Inquire for sizes not listed.

See pages **10-12** for available inner rings.
Inner rings must be ordered separately.
1) Prefix DTJ denotes a double row bearing.

Heavy Duty TJ TandemRoller® Bearings

DTJ Double Row TandemRoller® Bearing



	Limit Speed (rpm)	Recommended Shaft Diameter				Recommended Housing Bore						BEARING PART NUMBER 1)
		ISO h6, use with H7 hsg fit		ISO f6, use with N7 hsg fit		Slip Fit ISO H7			Press Fit ISO N7			
		Max.	Min.	Max.	Min.	Min.	Max.	Mean Fit	Min.	Max.	Mean Fit	
	13,000	.8750	.8745	.8742	.8737	1.5000	1.5010	.0007L	1.4987	1.4997	.0006T	TJ 75317
	11,800	1.0000	.9995	.9992	.9987	1.5000	1.5010	.0007L	1.4987	1.4997	.0006T	TJ 7194
	11,000	1.0625	1.0620	1.0617	1.0612	1.6875	1.6885	.0007L	1.6862	1.6872	.0006T	TJ 74765
	10,500	1.1250	1.1245	1.1242	1.1237	1.6250	1.6260	.0007L	1.6237	1.6247	.0006T	TJ 7214
	10,500	1.1250	1.1245	1.1242	1.1237	1.6250	1.6260	.0007L	1.6237	1.6247	.0006T	TJ 7215
	9,400	1.2500	1.2494	1.2490	1.2484	1.7500	1.7510	.0007L	1.7487	1.7497	.0006T	TJ 7235
	8,500	1.3750	1.3744	1.3740	1.3734	2.0625	2.0637	.0009L	2.0610	2.0621	.0006T	TJ 75117
	7,800	1.5000	1.4994	1.4990	1.4984	2.2500	2.2512	.0009L	2.2485	2.2496	.0006T	TJ 75129
	7,800	1.5000	1.4994	1.4990	1.4984	2.3750	2.3762	.0009L	2.3735	2.3746	.0006T	TJ 75318
	7,100	1.5000	1.4994	1.4990	1.4984	2.3750	2.3762	.0009L	2.3735	2.3746	.0006T	DTJ 75319
	6,700	1.7500	1.7494	1.7490	1.7484	2.3125	2.3137	.0009L	2.3110	2.3121	.0006T	TJ 7314
	6,700	1.7500	1.7494	1.7490	1.7484	2.3125	2.3137	.0009L	2.3110	2.3121	.0006T	TJ 7315
	5,900	2.0000	1.9993	1.9988	1.9981	2.5625	2.5637	.0009L	2.5610	2.5621	.0006T	TJ 7354
	5,900	2.0000	1.9993	1.9988	1.9981	2.5625	2.5637	.0009L	2.5610	2.5621	.0006T	TJ 7355
	4,700	2.5000	2.4993	2.4988	2.4981	3.2500	3.2514	.0011L	3.2482	3.2496	.0006T	TJ 8446
	4,700	2.5000	2.4993	2.4988	2.4981	3.2500	3.2514	.0011L	3.2482	3.2496	.0006T	TJ 8447
	4,300	2.7500	2.7493	2.7488	2.7481	3.5000	3.5014	.0011L	3.4982	3.4996	.0007T	TJ 8476
	4,300	2.7500	2.7493	2.7488	2.7481	3.5000	3.5014	.0011L	3.4982	3.4996	.0007T	TJ 8477
	3,900	3.0000	2.9993	2.9988	2.9981	3.7500	3.7514	.0011L	3.7482	3.7496	.0007T	TJ 8516
	3,900	3.0000	2.9993	2.9988	2.9981	3.7500	3.7514	.0011L	3.7482	3.7496	.0007T	TJ 8517
	3,300	3.2500	3.2491	3.2486	3.2477	4.2500	4.2514	.0011L	4.2482	4.2496	.0007T	DTJ 75168
	3,500	3.3125	3.3116	3.3111	3.3102	4.0000	4.0014	.0011L	3.9982	3.9996	.0007T	TJ 75310
	3,500	3.3125	3.3116	3.3111	3.3102	4.0000	4.0014	.0011L	3.9982	3.9996	.0007T	TJ 75309
	3,300	3.5000	3.4991	3.4986	3.4977	4.5000	4.5014	.0011L	4.4982	4.4996	.0007T	TJ 9608
	3,100	3.8125	3.8116	3.8111	3.8102	4.3750	4.3764	.0011L	4.3732	4.3746	.0007T	TJ 75177
	3,000	4.0000	3.9991	3.9986	3.9977	4.8125	4.8141	.0011L	4.8105	4.8120	.0008T	TJ 75311
	2,900	4.0625	4.0616	4.0611	4.0602	4.6250	4.6266	.0012L	4.6230	4.6245	.0008T	TJ 75176
	2,600	4.5000	4.4991	4.4986	4.4977	5.3125	5.3141	.0011L	5.3105	5.3120	.0008T	TJ 75312
	2,600	4.5000	4.4991	4.4986	4.4977	6.0000	6.0016	.0013L	5.9980	5.9995	.0008T	TJ 6769
	2,600	4.5000	4.4991	4.4986	4.4977	6.0000	6.0016	.0013L	5.9980	5.9995	.0008T	TJ 6770
	2,300	4.5000	4.4991	4.4986	4.4977	6.0000	6.0016	.0013L	5.9980	5.9995	.0008T	DTJ 75169
	2,400	5.0000	4.9990	4.9983	4.9973	6.0000	6.0016	.0013L	5.9980	5.9995	.0008T	TJ 74986
	2,400	5.0000	4.9990	4.9983	4.9973	6.5000	6.5016	.0013L	6.4980	6.4995	.0008T	TJ 6849
	2,100	5.5000	5.4990	5.4983	5.4973	7.0000	7.0016	.0013L	6.9980	6.9995	.0008T	TJ 6918
	2,100	5.5000	5.4990	5.4983	5.4973	7.0000	7.0016	.0013L	6.9980	6.9995	.0008T	TJ 6919
	1,900	5.5000	5.4990	5.4983	5.4973	7.0000	7.0016	.0013L	6.9980	6.9995	.0008T	DTJ 75170
	2,000	6.0000	5.9990	5.9983	5.9973	7.5000	7.5018	.0015L	7.4976	7.4994	.0009T	TJ 6926
	1,800	6.5000	6.4990	6.4983	6.4973	8.0000	8.0018	.0015L	7.9976	7.9994	.0009T	TJ 6935
	1,350	8.0000	7.9989	7.9980	7.9969	10.1250	10.1270	.0017L	10.1224	10.1244	.0009T	DTJ 75166

1) Location and number of lubricating holes may differ