

Demand for a two-directional maximum thrust capacity bearing requiring minimum space has resulted in extensive use of the MRC 9000 Series bearings.

**9000-U** is the standard construction. It is an angular contact ball bearing with one-piece outer ring and two-piece inner ring construction. It has maximum ball complement and a one-piece machined ball cage. The cage construction completely retains the balls for unit handling during installation. The bearings of this series have similar internal characteristics and identical external dimensions to bearings in the MRC 7000 Series, which are angular contact, one-direction thrust bearings.

**9000-UP** is similar to the 9000-U, except that its internal characteristics provide greater two-directional thrust capacity for applications in which such capacity is the primary requirement. Can be used in combination with a corresponding duplex ground MRC 7000-P bearing.

**9000-H** has a two-piece outer ring and a one-piece inner ring. Recommended only where the outer ring can be positively clamped. When duplexed, bearing can be used with a corresponding duplex-ground MRC 7000 Series bearing.

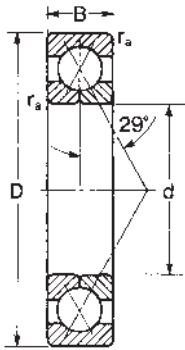
**9000-UH** has two-piece construction of both inner and outer rings. The use of this bearing is confined to those applications where endplay must be held to an absolute minimum.

**9000-S** has one-piece construction of both inner and outer ring. Assembly of the ball complement is accomplished by eccentric displacement of the outer ring. The use of this type is recommended where endplay and tilt must be held to a minimum, but where maximum capacity is not required.

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**9100-UK and 9200-U Series**  
**Split Inner Ring Angular Contact Ball Bearings**

**MRC Bearing Services**



For duplex sets of 7000 and 9000 series bearings see page 237.

MRC Bearing Number	Bore		Outside Diameter D		Width B		Fillet Radius <sup>1)</sup> r <sub>a</sub>		Basic Radial Load Rating <sup>2)</sup>				Speed Rating <sup>3)</sup>	
	d mm	in	mm	in	mm	in	mm	in	Dynamic C <sup>4)</sup>		Static C <sub>0</sub>		Grease RPM	Oil RPM
									N	lbf	N	lbf		
9100-UK	10	.3937	26	1.0236	8	.3150	.30	.012	4 620	1 040	2 080	468	30 000	39 000
9101-UK	12	.4724	28	1.1024	8	.3150	.30	.012	5 070	1 140	2 500	562	25 000	32 000
9102-UK	15	.5906	32	1.2598	9	.3543	.30	.012	5 400	1 210	2 900	652	22 000	28 000
9103-UK	17	.6693	35	1.3780	10	.3937	.30	.012	7 610	1 710	4 250	955	19 000	25 000
9104-UK	20	.7874	42	1.6535	12	.4724	.64	.025	9 560	2 150	5 600	1 260	16 000	21 000
9105-UK	25	.9843	47	1.8504	12	.4724	.64	.025	10 600	2 380	6 950	1 560	12 000	16 000
9106-UK	30	1.1811	55	2.1654	13	.5118	1.0	.04	13 800	3 100	9 650	2 170	11 000	14 000
9107-UK	35	1.3780	62	2.4409	14	.5512	1.0	.04	16 800	3 780	12 000	2 700	9 200	12 000
9108-UK	40	1.5748	68	2.6772	15	.5906	1.0	.04	17 200	3 870	13 200	2 970	8 500	11 000
9109-UK	45	1.7717	75	2.9528	16	.6299	1.0	.04	21 200	4 770	17 000	3 820	7 500	9 800
9110-UK	50	1.9685	80	3.1496	16	.6299	1.0	.04	22 100	4 970	18 300	4 110	6 900	9 000
9111-UK	55	2.1654	90	3.5433	18	.7087	1.0	.04	29 600	6 650	25 500	5 730	6 300	8 200
9112-UK	60	2.3622	95	3.7402	18	.7087	1.0	.04	30 200	6 790	27 000	6 070	5 700	7 400
9113-UK	65	2.5591	100	3.9370	18	.7087	1.0	.04	31 200	7 010	29 000	6 520	5 400	7 000
9114-UK	70	2.7559	110	4.3307	20	.7874	1.0	.04	34 500	7 760	35 500	7 980	5 000	6 500
9115-UK	75	2.9528	115	4.5276	20	.7874	1.0	.04	37 700	8 480	37 500	8 430	4 700	6 100
9116-UK	80	3.1496	125	4.9213	22	.8661	1.0	.04	48 800	11 000	49 000	11 000	4 500	5 800
9117-UK	85	3.3465	130	5.1181	22	.8661	1.0	.04	49 400	11 100	52 000	11 700	4 100	5 300
9118-UK	90	3.5433	140	5.5118	24	.9449	1.5	.06	58 500	13 200	61 000	13 700	3 800	4 900
9119-UK	95	3.7402	145	5.7087	24	.9449	1.5	.06	71 500	16 100	71 000	16 000	3 600	4 700
9120-UK	100	3.9370	150	5.9055	24	.9449	1.5	.06	62 400	14 000	68 000	15 300	3 500	4 500
9121-UK	105	4.1339	160	6.2992	26	1.0236	2.0	.08	74 100	16 700	80 000	18 000	3 300	4 300
9122-UK	110	4.3307	170	6.6929	28	1.1024	2.0	.08	87 100	19 600	91 500	20 600	3 200	3 800

**9200-U**

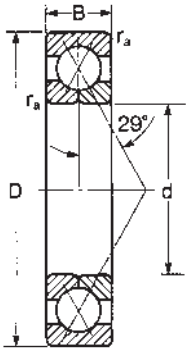
9202-U	15	.5906	35	1.3780	11	.4331	.64	.025	8 060	1 810	4 750	1 070	20 000	26 000
9203-U	17	.6693	40	1.5748	12	.4724	.64	.025	9 950	2 240	6 100	1 370	18 000	23 000
9204-U	20	.7874	47	1.8504	14	.5512	1.0	.04	11 900	2 680	7 100	1 600	15 000	19 000
9205-U	25	.9843	52	2.0472	15	.5906	1.0	.04	14 300	3 210	8 800	1 980	12 000	16 000
9206-U	30	1.1811	62	2.4409	16	.6299	1.0	.04	16 800	3 780	11 800	2 650	10 000	13 000
9207-U	35	1.3780	72	2.8346	17	.6693	1.0	.04	23 400	5 260	17 000	3 820	9 200	12 000
9208-U	40	1.5748	80	3.1496	18	.7087	1.0	.04	30 700	6 900	22 800	5 130	7 700	10 000
9209-U	45	1.7717	85	3.3465	19	.7480	1.0	.04	31 900	7 170	25 000	5 620	7 300	9 500
9210-U	50	1.9685	90	3.5433	20	.7874	1.0	.04	33 200	7 460	27 000	6 070	6 400	8 300
9211-U	55	2.1654	100	3.9370	21	.8268	1.5	.06	48 800	11 000	37 500	8 430	6 000	7 800
9212-U	60	2.3622	110	4.3307	22	.8661	1.5	.06	52 700	11 800	44 000	9 890	5 400	7 000
9213-U	65	2.5591	120	4.7244	23	.9055	1.5	.06	63 700	14 300	54 000	12 100	4 900	6 400
9214-U	70	2.7559	125	4.9213	24	.9449	1.5	.06	63 700	14 300	55 000	12 400	4 600	6 000
9215-U	75	2.9528	130	5.1181	25	.9843	1.5	.06	76 100	17 100	65 500	14 700	4 300	5 600
9216-U	80	3.1496	140	5.5118	26	1.0236	2.0	.08	78 000	17 500	71 000	16 000	4 100	5 300
9217-U	85	3.3465	150	5.9055	28	1.1024	2.0	.08	90 400	20 300	85 000	19 100	3 800	4 900
9218-U	90	3.5433	160	6.2992	30	1.1811	2.0	.08	112 000	25 100	98 000	22 000	3 600	4 700
9219-U	95	3.7402	170	6.6929	32	1.2598	2.0	.08	117 000	26 300	108 000	24 300	3 500	4 500
9220-U	100	3.9370	180	7.0866	34	1.3386	2.0	.08	130 000	29 200	122 000	27 400	3 200	4 100
9221-U	105	4.1339	190	7.4803	36	1.4173	2.0	.08	148 000	33 300	137 000	30 800	3 000	3 900
9222-U	110	4.3307	200	7.8740	38	1.4961	2.0	.08	163 000	36 600	156 000	35 100	2 900	3 800

<sup>1)</sup> Fillet radius indicates maximum fillet radius on shaft or in housing which bearing corner will clear.

<sup>2)</sup> For thrust rating multiply C by 1.32 and C<sub>0</sub> by 2.94.

<sup>3)</sup> Listed values are for machined bronze cage, ABEC-1. The values have been determined through historical application and practice. For a more complete explanation, see page 274.

<sup>4)</sup> Rating for one million revolutions or 500 hours at 33 1/3 RPM.



For duplex sets of 7000 and 9000 series bearings see page 237.

MRC Bearing Number	Bore d		Outside Diameter D		Width B		Fillet Radius <sup>1)</sup> r <sub>a</sub>		Basic Radial Load Rating <sup>2)</sup>				Speed Rating <sup>3)</sup>	
									Dynamic C <sup>4)</sup>		Static C <sub>0</sub>		Grease RPM	Oil RPM
									N	lbf	N	lbf		
9302-U	15	.5906	42	1.6535	13	.5118	1.0	.04	9 950	2 240	6 100	1 370	16 000	21 000
9303-U	17	.6693	47	1.8504	14	.5512	1.0	.04	12 100	2 720	7 500	1 690	15 000	19 000
9304-U	20	.7874	52	2.0472	15	.5906	1.0	.04	18 600	4 180	10 600	2 380	13 000	17 000
9305-U	25	.9843	62	2.4409	17	.6693	1.0	.04	21 200	4 770	13 700	3 080	11 000	14 000
9306-U	30	1.1811	72	2.8346	19	.7480	1.0	.04	28 100	6 320	18 600	4 180	9 200	12 000
9307-U	35	1.3780	80	3.1496	21	.8268	1.5	.06	35 800	8 050	24 000	5 400	8 500	11 000
9308-U	40	1.5748	90	3.5433	23	.9055	1.5	.06	44 200	9 940	31 000	7 000	7 300	9 500
9309-U	45	1.7717	100	3.9370	25	.9843	1.5	.06	52 700	11 800	38 000	8 540	6 400	8 300
9310-U	50	1.9685	110	4.3307	27	1.0630	2.0	.08	68 900	15 500	49 000	11 000	5 800	7 500
9311-U	55	2.1654	120	4.7244	29	1.1417	2.0	.08	80 600	18 100	57 000	12 800	5 100	6 600
9312-U	60	2.3622	130	5.1181	31	1.2205	2.0	.08	92 300	20 700	65 500	14 700	4 900	6 400
9313-U	65	2.5591	140	5.5118	33	1.2992	2.0	.08	97 500	21 900	75 000	16 900	4 600	6 000
9314-U	70	2.7559	150	5.9055	35	1.3780	2.0	.08	111 000	25 000	85 000	19 100	4 100	5 300
9315-U	75	2.9528	160	6.2992	37	1.4567	2.0	.08	130 000	29 200	106 000	23 800	3 900	5 000
9316-U	80	3.1496	170	6.6929	39	1.5354	2.0	.08	143 000	32 100	120 000	27 000	3 600	4 700
9317-U	85	3.3465	180	7.0866	41	1.6142	2.5	.10	153 000	34 400	134 000	30 100	3 500	4 500
9318-U	90	3.5433	190	7.4803	43	1.6929	2.5	.10	168 000	37 800	150 000	33 700	3 200	4 200
9319-U	95	3.7402	200	7.8740	45	1.7717	2.5	.10	178 000	40 000	166 000	37 300	3 100	4 000
9320-U	100	3.9370	215	8.4646	47	1.8504	2.5	.10	190 000	42 700	183 000	41 100	3 000	3 900
9321-U	105	4.1339	225	8.8583	49	1.9291	2.5	.10	203 000	45 600	200 000	45 000	2 900	3 800
9322-U	110	4.3307	240	9.4488	50	1.9685	2.5	.10	229 000	51 500	236 000	53 100	2 700	3 500

1) Fillet radius indicates maximum fillet radius on shaft or in housing which bearing corner will clear.

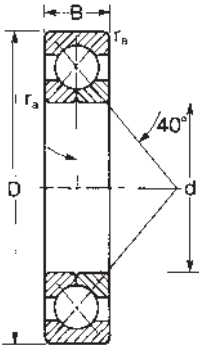
2) For thrust rating multiply C by 1.32 and C<sub>0</sub> by 2.94.

3) Listed values are for machined bronze cage, ABEC-1.

The values have been determined through historical application and practice. For a more complete explanation, see page 274.f

4) Rating for one million revolutions or 500 hours at 33⅓ RPM.





For duplex sets of 7000 and 9000 series bearings see page 237.

MRC Bearing Number	Bore d		Outside Diameter D		Width B		Fillet Radius <sup>1)</sup> r <sub>a</sub>		Basic Radial Load Rating <sup>2)</sup>				Speed Rating <sup>3)</sup>	
									Dynamic C <sup>4)</sup>		Static C <sub>0</sub>		Grease RPM	Oil RPM
	mm	in	mm	in	mm	in	mm	in	N	lbf	N	lbf		
9202-UP	15	.5906	35	1.3780	11	.4331	.64	.025	8 840	1 990	4 250	955	17 000	24 000
9203-UP	17	.6693	40	1.5748	12	.4724	.64	.025	11 700	2 630	6 000	1 350	15 000	20 000
9204-UP	20	.7874	47	1.8504	14	.5512	1.0	.04	14 800	3 330	8 300	1 870	12 000	17 000
9205-UP	25	.9843	52	2.0472	15	.5906	1.0	.04	16 800	3 780	10 400	2 340	10 000	15 000
9206-UP	30	1.1811	62	2.4409	16	.6299	1.0	.04	21 200	4 770	12 700	2 860	8 500	12 000
9207-UP	35	1.3780	72	2.8346	17	.6693	1.0	.04	29 100	6 540	19 300	4 340	8 000	11 000
9208-UP	40	1.5748	80	3.1496	18	.7087	1.0	.04	32 500	7 310	22 400	5 040	7 000	9 500
9209-UP	45	1.7717	85	3.3465	19	.7480	1.0	.04	39 000	8 770	27 500	6 180	6 700	9 000
9210-UP	50	1.9685	90	3.5433	20	.7874	1.0	.04	40 300	9 060	30 000	6 740	6 000	8 000
9211-UP	55	2.1654	100	3.9370	21	.8268	1.5	.06	48 800	11 000	37 500	8 430	5 600	7 500
9212-UP	60	2.3622	110	4.3307	22	.8661	1.5	.06	58 500	13 200	45 500	10 200	5 000	6 700
9213-UP	65	2.5591	120	4.7244	23	.9055	1.5	.06	63 700	14 300	51 000	11 500	4 500	6 000
9214-UP	70	2.7559	125	4.9213	24	.9449	1.5	.06	68 900	15 500	56 000	12 600	4 300	5 600
9215-UP	75	2.9528	130	5.1181	25	.9843	1.5	.06	71 500	16 100	60 000	13 500	4 000	5 300
9216-UP	80	3.1496	140	5.5118	26	1.0236	2.0	.08	83 200	18 700	71 000	16 000	3 800	5 000
9217-UP	85	3.3465	150	5.9055	28	1.1024	2.0	.08	95 600	21 500	83 000	18 700	3 600	4 800
9218-UP	90	3.5433	160	6.2992	30	1.1811	2.0	.08	108 000	24 300	95 000	21 400	3 400	4 500
9219-UP	95	3.7402	170	6.6929	32	1.2598	2.0	.08	124 000	27 900	110 000	24 700	3 200	4 300
9220-UP	100	3.9370	180	7.0866	34	1.3386	2.0	.08	130 000	29 200	125 000	28 100	3 000	4 000
9221-UP	105	4.1339	190	7.4803	36	1.4173	2.0	.08	143 000	32 100	129 000	29 000	2 800	3 800
9222-UP	110	4.3307	200	7.8740	38	1.4961	2.0	.08	153 000	34 400	156 000	35 100	2 600	3 600
<b>9300-UP</b>														
9302-UP	15	.5906	42	1.6535	13	.5118	1.0	.04	12 700	2 860	6 100	1 370	15 000	20 000
9303-UP	17	.6693	47	1.8504	14	.5512	1.0	.04	16 800	3 780	8 500	1 910	13 000	18 000
9304-UP	20	.7874	52	2.0472	15	.5906	1.0	.04	18 600	4 180	9 500	2 140	11 000	16 000
9305-UP	25	.9843	62	2.4409	17	.6693	1.0	.04	24 200	5 440	13 400	3 010	9 000	13 000
9306-UP	30	1.1811	72	2.8346	19	.7480	1.0	.04	32 500	7 310	19 600	4 410	8 000	11 000
9307-UP	35	1.3780	80	3.1496	21	.8268	1.5	.06	39 700	8 920	24 500	5 510	7 500	10 000
9308-UP	40	1.5748	90	3.5433	23	.9055	1.5	.06	47 500	10 700	30 500	6 860	6 700	9 000
9309-UP	45	1.7717	100	3.9370	25	.9843	1.5	.06	59 200	13 300	40 000	8 990	6 000	8 000
9310-UP	50	1.9685	110	4.3307	27	1.0630	2.0	.08	68 900	15 500	52 000	11 700	5 300	7 000
9311-UP	55	2.1654	120	4.7244	29	1.1417	2.0	.08	79 300	17 800	56 000	12 600	4 800	6 300
9312-UP	60	2.3622	130	5.1181	31	1.2205	2.0	.08	90 400	20 300	64 000	14 400	4 500	6 000
9313-UP	65	2.5591	140	5.5118	33	1.2992	2.0	.08	101 000	22 700	80 000	18 000	4 300	5 600
9314-UP	70	2.7559	150	5.9055	35	1.3780	2.0	.08	117 000	26 300	93 000	20 900	3 800	5 000
9315-UP	75	2.9528	160	6.2992	37	1.4567	2.0	.08	127 000	28 600	100 000	22 500	3 600	4 800
9316-UP	80	3.1496	170	6.6929	39	1.5354	2.0	.08	138 000	31 000	110 000	24 700	3 400	4 500
9317-UP	85	3.3465	180	7.0866	41	1.6142	2.5	.10	148 000	33 300	122 000	27 400	3 200	4 300
9318-UP	90	3.5433	190	7.4803	43	1.6929	2.5	.10	159 000	35 700	137 000	30 800	3 000	4 000
9319-UP	95	3.7402	200	7.8740	45	1.7717	2.5	.10	168 000	37 800	150 000	33 700	2 800	3 800
9320-UP	100	3.9370	215	8.4646	47	1.8504	2.5	.10	190 000	42 700	190 000	42 700	2 600	3 600
9321-UP	105	4.1339	225	8.8583	49	1.9291	2.5	.10	203 000	45 600	196 000	44 100	2 400	3 400
9322-UP	110	4.3307	240	9.4488	50	1.9685	2.5	.10	212 000	47 700	228 000	51 300	2 200	3 200

<sup>1)</sup> Fillet radius indicates maximum fillet radius on shaft or in housing which bearing corner will clear.

<sup>2)</sup> For thrust rating multiply C by 1.75 and C<sub>0</sub> by 3.85.

<sup>3)</sup> Listed values are for machined bronze cage, ABEC-1.

The values have been determined through historical application and practice. For a more complete explanation, see page 274.

<sup>4)</sup> Rating for one million revolutions or 500 hours at 33 1/3 RPM.

**9000-U Series**  
**Split Inner Ring**  
**29° Angular Contact Ball Bearings**  
**Single Bearing**

**Dynamic and static equivalent radial load and life rating**

**Dynamic equivalent radial load**  
 $P = F_R$  when  $F_A/F_R \leq 0.80$   
 or  
 $P = 0.39 F_R + 0.76 F_A$  when  $F_A/F_R > 0.80$

$P$  = Dynamic equivalent radial load  
 $F_R$  = Radial load  
 $F_A$  = Thrust load

Consult MRC Bearing Services when  
 $F_R/F_A > 1.0$

**Life rating**

$L_{10} = \left(\frac{C}{P}\right)^3$  (millions of revolutions)  
 or  
 $L_{10h} = \frac{10^6}{60n} \left(\frac{C}{P}\right)^3$  (Hours)

$C$  = Basic dynamic radial load rating  
 (from single bearing tables)  
 $P$  = Dynamic equivalent radial load  
 $n$  = Speed in rpm

**Minimum Thrust Load For Angular Contact Ball Bearings**

Satisfactory operation of angular contact ball bearings requires sufficient traction forces between the balls and races to minimize damage caused by sliding or skidding. This is particularly important at high speeds where the inertia forces of the balls and cage and the viscous drag in the lubricant can have a detrimental influence on the rolling conditions.

The minimum required thrust load can be determined from the following formula.

$$F_A = A \left(\frac{n}{1000}\right)^2 \text{ Newtons}$$

OR

$$F_A = 0.2248 A \left(\frac{n}{1000}\right)^2 \text{ Pounds}$$

Where,  $F_A$  = Minimum thrust load  
 $A$  = Bearing design factor  
 listed in the following tables  
 $n$  = Speed in RPM

**Static equivalent radial load**

$$P_0 = 0.50 F_R + 0.34 F_A$$

$P_0$  is always  $\geq F_R$

$P_0$  = Static equivalent radial load  
 $F_R$  = Radial load  
 $F_A$  = Thrust load

**Minimum Thrust Load A Factor**

Size	A	Size	A	Size	A
9100UK	0.06	9202U	0.19	9202UP	0.42
9101UK	0.08	9203U	0.30	9203UP	0.74
9102UK	0.11	9204U	0.42	9204UP	1.32
9103UK	0.20	9205U	0.94	9205UP	1.90
9104UK	0.37	9206U	1.41	9206UP	3.45
9105UK	0.52	9207U	2.82	9207UP	6.73
9106UK	0.95	9208U	4.95	9208UP	9.28
9107UK	1.50	9209U	5.46	9209UP	13.13
9108UK	1.83	9210U	6.87	9210UP	15.48
9109UK	2.88	9211U	13.36	9211UP	23.88
9110UK	3.37	9212U	17.51	9212UP	35.31
9111UK	6.14	9213U	25.86	9213UP	44.55
9112UK	7.02	9214U	27.74	9214UP	53.74
9113UK	7.97	9215U	40.59	9215UP	61.15
9114UK	11.45	9216U	41.61	9216UP	84.07
9115UK	12.79	9217U	61.05	9217UP	112.90
9116UK	20.43	9218U	95.12	9218UP	148.50
9117UK	22.59	9219U	108.60	9219UP	191.90
9118UK	32.62	9220U	141.50	9220UP	224.10
9119UK	44.04	9221U	169.80	9221UP	282.70
9120UK	39.28	9222U	212.20	9222UP	352.10
9121UK	54.28				
9122UK	72.46	9302U	0.29	9302UP	0.85
		9303U	0.63	9303UP	1.53
		9304U	1.19	9304UP	1.91
		9305U	1.85	9305UP	3.85
		9306U	3.45	9306UP	7.39
		9307U	5.77	9307UP	11.66
		9308U	9.31	9308UP	17.31
		9309U	14.26	9309UP	29.08
		9310U	26.44	9310UP	36.26
		9311U	36.89	9311UP	57.36
		9312U	50.17	9312UP	77.30
		9313U	64.73	9313UP	111.40
		9314U	73.28	9314UP	144.60
		9315U	110.90	9315UP	182.70
		9316U	131.40	9316UP	215.80
		9317U	178.20	9317UP	269.40
		9318U	205.60	9318UP	332.30
		9319U	252.80	9319UP	405.70
		9320U	314.00	9320UP	629.40
		9321U	378.20	9321UP	673.40
		9322U	516.40	9322UP	904.70

Note: For Duplex Bearings mounted in tandem, multiply the single-bearing thrust value by the number of bearings in tandem.

**9000-U Series**  
**Split Inner Ring**  
**29° Angular Contact Ball Bearings**  
**Single Bearing**

**Dynamic equivalent radial load**  
**and life calculation examples**

Bearing size: 9309 U  
Speed: 2000 RPM  
Basic dynamic radial load rating (C) = 11800

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**Case 1**

Radial load ( $F_R$ ) = 1750  
Thrust load ( $F_A$ ) = 1310  
Equivalent load (P) =  $F_R$  or  $0.39 F_R + 0.76 F_A$   
 $F_A/F_R = 1310/1750 = 0.75$   
Since  $F_A/F_R < 0.80$ ,  $P = F_R = 1750$

$$\text{Life (L10)} = \left(\frac{C}{P}\right)^3 = \left(\frac{11800}{1750}\right)^3 = 307 \times 10^6 \text{ Rev.}$$

or

$$\text{Life (L10h)} = \frac{10^6 (C)^3}{60n(P)} = \frac{10^6}{60 \times 2000} \left(\frac{11800}{1750}\right)^3$$
$$= 2555 \text{ Hrs}$$

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**Case 2**

Radial load ( $F_R$ ) = 1750  
Thrust load ( $F_A$ ) = 2100  
Equivalent load (P) =  $F_R$  or  $0.39 F_R + 0.76 F_A$   
 $F_A/F_R = 2100/1750 = 1.20$   
Since  $F_A/F_R > 0.80$ ,  $P = 0.39 \times 1750 + 0.76 \times 2100 = 2279$

$$\text{Life (L10)} = \left(\frac{C}{P}\right)^3 = \left(\frac{11800}{2279}\right)^3 = 139 \times 10^6 \text{ Rev.}$$

or

$$\text{Life (L10h)} = \frac{10^6 (C)^3}{60n(P)} = \frac{10^6}{60 \times 2000} \left(\frac{11800}{2279}\right)^3$$
$$= 1157 \text{ Hrs}$$

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**Case 3**

Thrust load ( $F_A$ ) = 2100  
Equivalent load (P) =  $0.39 F_R + 0.76 F_A$   
 $F_A/F_R = 2100/0 = \infty$   
Since  $F_A/F_R > 0.80$ ,  $P = 0.76 \times 2100 = 1596$

$$\text{Life (L10)} = \left(\frac{C}{P}\right)^3 = \left(\frac{11800}{1596}\right)^3 = 404 \times 10^6 \text{ Rev.}$$

or

$$\text{Life (L10h)} = \frac{10^6 (C)^3}{60n(P)} = \frac{10^6}{60 \times 2000} \left(\frac{11800}{1596}\right)^3$$
$$= 3368 \text{ Hrs}$$

**9000-UP Series**  
**Split Inner Ring**  
**40° Angular Contact Ball Bearings**  
**Single Bearing**

**Dynamic and static equivalent radial load and life rating**

**Dynamic equivalent radial load**

$$P = F_R \quad \text{when } F_A/F_R \leq 1.14$$

or

$$P = 0.35 F_R + 0.57 F_A \quad \text{when } F_A/F_R > 1.14$$

P = Dynamic equivalent radial load

$F_R$  = Radial load

$F_A$  = Thrust load

Consult MRC Bearing Services when

$$F_R/F_A > 1.0$$

**Static equivalent radial load**

$$P_0 = 0.5 F_R + 0.26 F_A$$

$P_0$  is always  $\geq F_R$

$P_0$  = Static equivalent radial load

$F_R$  = Radial load

$F_A$  = Thrust load

**Life rating**

$$L_{10} = \left(\frac{C}{P}\right)^3 \quad (\text{millions of revolutions})$$

or

$$L_{10h} = \frac{10^6}{60n} \left(\frac{C}{P}\right)^3 \quad (\text{Hours})$$

C = Basic dynamic radial load rating  
(from single bearing tables)

P = Dynamic equivalent radial load

n = Speed in rpm



## ***9000-UP Series Split Inner Ring 40° Angular Contact Ball Bearings Single Bearing***

### ***Dynamic equivalent radial load and life calculation examples***

Bearing size: 9309 UP  
Speed: 2000 RPM  
Basic dynamic radial load rating (C) = 13300

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#### **Case 1**

Radial load ( $F_R$ ) = 1750  
Thrust load ( $F_A$ ) = 1960  
 $F_A/F_R = 1960/1750 = 1.12$   
Since  $F_A/F_R < 1.14$ , equivalent load ( $P$ ) =  $F_R = 1750$

$$\text{Life (L10)} = \left(\frac{C}{P}\right)^3 = \left(\frac{13300}{1750}\right)^3 = 439 \times 10^6 \text{ Rev.}$$

or

$$\begin{aligned} \text{Life (L10h)} &= \frac{10^6}{60n} \left(\frac{C}{P}\right)^3 = \frac{10^6}{60 \times 2000} \left(\frac{13300}{1750}\right)^3 \\ &= 3658 \text{ Hrs} \end{aligned}$$

---

#### **Case 2**

Radial load ( $F_R$ ) = 1750  
Thrust load ( $F_A$ ) = 2450  
 $F_A/F_R = 2450/1750 = 1.40$   
Since  $F_A/F_R > 1.14$ , equivalent load ( $P$ ) =  $0.35 F_R + 0.57 F_A$   
 $P = 0.35 \times 1750 + 0.57 \times 2450 = 2009$

$$\text{Life (L10)} = \left(\frac{C}{P}\right)^3 = \left(\frac{13300}{2009}\right)^3 = 290 \times 10^6 \text{ Rev.}$$

or

$$\begin{aligned} \text{Life (L10h)} &= \frac{10^6}{60n} \left(\frac{C}{P}\right)^3 = \frac{10^6}{60 \times 2000} \left(\frac{13300}{2009}\right)^3 \\ &= 2418 \text{ Hrs} \end{aligned}$$

---

#### **Case 3**

Thrust load ( $F_A$ ) = 2450  
 $F_A/F_R = 2450/0 = \infty$   
Since  $F_A/F_R > 1.14$ , equivalent load ( $P$ ) =  $0.35 F_R + 0.57 F_A$   
 $P = 0.57 \times 2450 = 1397$

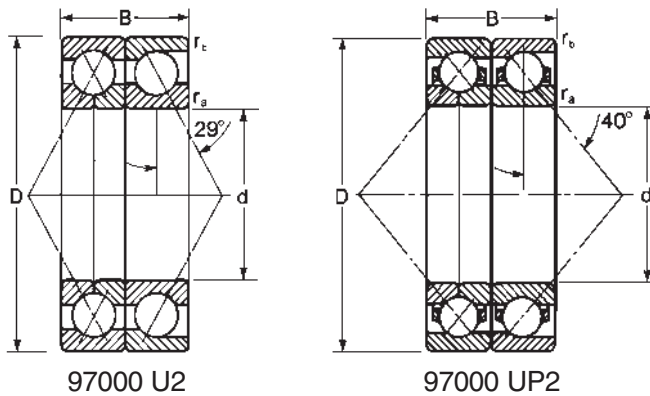
$$\text{Life (L10)} = \left(\frac{C}{P}\right)^3 = \left(\frac{13300}{1397}\right)^3 = 863 \times 10^6 \text{ Rev.}$$

or

$$\begin{aligned} \text{Life (L10h)} &= \frac{10^6}{60n} \left(\frac{C}{P}\right)^3 = \frac{10^6}{60 \times 2000} \left(\frac{13300}{1397}\right)^3 \\ &= 7191 \text{ Hrs} \end{aligned}$$

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### 97000U and 97000H Series

The 97000U Series consists of a matched set of 9000UDT and 7000DT flush ground bearings having a 29° contact angle. The 97000H Series consists of a matched set of 9000HDT (split outer ring) and 7000DT flush ground bearings.

### 97000UP and 97000HP Series

The 97000UP Series consists of a matched set of 9000 UPDT and 7000PDT flush ground bearings having a 40° contact angle. The 97000HP Series consists of a matched set of 9000HPDT (split outer ring) and 7000PDT flush ground bearings.

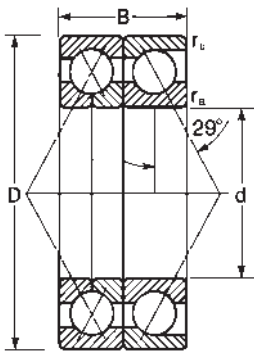
### Typical Mountings

The bearings are usually mounted in pairs. This arrangement divides the thrust load in one direction while accommodating reversing thrust load. To increase thrust capacity in one direction it is possible to mount additional 7000DT or 7000PDT bearings in tandem.

### Cage Types and Materials

Furnished in one-piece, inner ring land-guided, machined brass or special material.

Size	Series	Page
<b>97200 U2</b>	Light—29° Contact Angle	<b>178</b>
<b>97300 U2</b>	Medium—29° Contact Angle	<b>179</b>
<b>97200 UP2</b>	Light—40° Contact Angle	<b>180</b>
<b>97300 UP2</b>	Medium—40° Contact Angle	<b>181</b>
<b>97000 U</b>	Equivalent Load and Life	<b>182</b>
<b>97000 U</b>	Life Calculation Examples	<b>183</b>
<b>97000 UP</b>	Equivalent Load and Life	<b>184</b>
<b>97000 UP</b>	Life Calculation Examples	<b>185</b>



This series consists of a matched set of 9200UDT and 7200DT flush ground bearings having a 29° contact angle. One-piece, inner ring land-guided, machined brass cages are standard for this series.

These bearings are mounted in pairs in applications where substantial thrust loads are present. This arrangement divides the thrust load in one direction while accommodating reversing thrust load. To increase thrust capacity in one direction additional 7200DT bearings may be mounted in tandem.

For proper mounting orientation refer to page 237.

MRC Bearing Number	Bore		Outside Diameter D		Width B		Fillet Radius <sup>1)</sup>				Basic Radial Load Rating <sup>2)</sup>				Speed Rating <sup>3)</sup>	
											Dynamic C <sup>4)</sup>		Static C <sub>0</sub>		Grease	Oil
	d	in	mm	in	mm	in	mm	in	mm	in	N	lbf	N	lbf	RPM	RPM
97207U2	35	1.3780	72	2.8346	34	1.3386	1.0	.04	.60	.024	37 700	8 480	34 000	7 640	7 400	9 600
97208U2	40	1.5748	80	3.1496	36	1.4173	1.0	.04	.60	.024	49 400	11 100	45 500	10 200	6 200	8 000
97209U2	45	1.7717	85	3.3465	38	1.4961	1.0	.04	.60	.024	49 400	11 100	46 500	10 500	5 800	7 600
97210U2	50	1.9685	90	3.5433	40	1.5748	1.0	.04	.60	.024	54 000	12 100	54 000	12 100	5 100	6 600
97211U2	55	2.1654	100	3.9370	42	1.6535	1.5	.06	1.0	.040	79 300	17 800	75 000	16 900	4 800	6 200
97212U2	60	2.3622	110	4.3307	44	1.7323	1.5	.06	1.0	.040	85 200	19 100	88 000	19 800	4 300	5 600
97213U2	65	2.5591	120	4.7244	46	1.8110	1.5	.06	1.0	.040	104 000	23 400	110 000	24 700	3 900	5 100
97214U2	70	2.7559	125	4.9213	48	1.8898	1.5	.06	1.0	.040	104 000	23 400	110 000	24 700	3 700	4 800
97215U2	75	2.9528	130	5.1181	50	1.9685	1.5	.06	1.0	.040	130 000	29 200	140 000	31 500	3 400	4 500
97216U2	80	3.1496	140	5.5118	52	2.0472	2.0	.08	1.0	.040	121 000	27 200	134 000	30 100	3 300	4 200
97217U2	85	3.3465	150	5.9055	56	2.2047	2.0	.08	1.0	.040	148 000	33 300	166 000	37 300	3 000	3 900
97218U2	90	3.5433	160	6.2992	60	2.3622	2.0	.08	1.0	.040	190 000	42 700	236 000	53 100	2 900	3 800
97219U2	95	3.7402	170	6.6929	64	2.5197	2.0	.08	1.0	.040	199 000	44 700	228 000	51 300	2 800	3 600
97220U2	100	3.9370	180	7.0866	68	2.6772	2.0	.08	1.0	.040	225 000	50 600	260 000	58 500	2 600	3 300
97221U2	105	4.1339	190	7.4803	72	2.8346	2.0	.08	1.0	.040	242 000	54 400	295 000	66 300	2 400	3 100
97222U2	110	4.3307	200	7.8740	76	2.9921	2.0	.08	1.0	.040	265 000	59 600	310 000	69 700	2 300	3 000
97224U2	120	4.7244	215	8.4646	80	3.1496	2.0	.08	1.0	.040	281 000	63 200	355 000	79 800	2 200	2 800
97226U2	130	5.1181	230	9.0551	80	3.1496	2.5	.10	1.0	.040	319 000	71 700	415 000	93 300	2 000	2 600
97228U2	140	5.5118	250	9.8425	84	3.3071	2.5	.10	1.0	.040	338 000	76 000	465 000	105 000	1 800	2 400
97230U2	150	5.9055	270	10.6299	90	3.5433	2.5	.10	1.0	.040	397 000	89 200	560 000	126 000	1 700	2 200
97232U2	160	6.2992	290	11.4173	96	3.7795	2.5	.10	1.0	.040	442 000	99 400	670 000	135 000	1 600	2 100
97234U2	170	6.6929	310	12.2047	104	4.0945	3.0	.12	1.0	.040	468 000	105 000	735 000	165 000	1 500	2 000
97236U2	180	7.0866	320	12.5984	104	4.0945	3.0	.12	1.0	.040	494 000	111 000	780 000	175 000	1 500	1 900

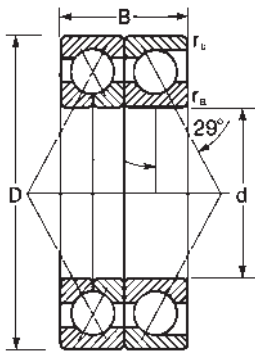
<sup>1)</sup> Fillet radius indicates maximum fillet radius on shaft or in housing which bearing corner will clear.

<sup>2)</sup> For thrust rating multiply C by 1.32 and C<sub>0</sub> by 2.94.

<sup>3)</sup> Listed values are for machined brass cage.

Values have been determined through historical application and practice.

<sup>4)</sup> Rating for one million revolutions or 500 hours at 33 1/3 rpm.



This series consists of a matched set of 9300UDT and 7300DT flush ground bearings having a  $29^\circ$  contact angle. One-piece, inner ring land-guided, machined brass cages are standard for this series.

These bearings are mounted in pairs in applications where substantial thrust loads are present. This arrangement divides the thrust load in one direction while accommodating reversing thrust load. To increase thrust capacity in one direction additional 7300DT bearings may be mounted in tandem.

For proper mounting orientation refer to page 237.

MRC Bearing Number	Bore		Outside Diameter D		Width B		Fillet Radius <sup>1)</sup>				Basic Radial Load Rating <sup>2)</sup>				Speed Rating <sup>3)</sup>	
											Dynamic C <sup>4)</sup>		Static C <sub>0</sub>		Grease RPM	Oil RPM
	d mm	in	mm	in	mm	in	r <sub>a</sub> mm	in	r <sub>b</sub> mm	in	N	lbf	N	lbf		
97307U2	35	1.3780	80	3.1496	42	1.6535	1.5	.06	1.0	.040	58 500	13 200	48 000	10 800	6 800	8 800
97308U2	40	1.5748	90	3.5433	46	1.8110	1.5	.06	1.0	.040	71 500	16 100	61 000	13 700	5 800	7 600
97309U2	45	1.7717	100	3.9370	50	1.9685	1.5	.06	1.0	.040	85 200	19 200	75 000	16 900	5 100	6 600
97310U2	50	1.9685	110	4.3307	54	2.1260	2.0	.08	1.0	.040	121 000	27 200	106 000	23 800	4 600	6 000
97311U2	55	2.1654	120	4.7244	58	2.2835	2.0	.08	1.0	.040	140 000	31 500	125 000	28 100	4 100	5 300
97312U2	60	2.3622	130	5.1181	62	2.4409	2.0	.08	1.0	.040	159 000	35 700	146 000	32 800	3 900	5 100
97313U2	65	2.5591	140	5.5118	66	2.5984	2.0	.08	1.0	.040	178 000	40 000	173 000	38 900	3 700	4 800
97314U2	70	2.7559	150	5.9055	70	2.7559	2.0	.08	1.0	.040	182 000	40 900	170 000	38 200	3 300	4 200
97315U2	75	2.9528	160	6.2992	74	2.9134	2.0	.08	1.0	.040	225 000	50 600	228 000	51 300	3 100	4 000
97316U2	80	3.1496	170	6.6929	78	3.0709	2.0	.08	1.0	.040	234 000	52 600	240 000	54 000	2 900	3 800
97317U2	85	3.3465	180	7.0866	82	3.2283	2.5	.10	1.0	.040	265 000	59 600	285 000	64 100	2 800	3 600
97318U2	90	3.5433	190	7.4803	86	3.3858	2.5	.10	1.0	.040	276 000	62 000	300 000	67 400	2 600	3 400
97319U2	95	3.7402	200	7.8740	90	3.5433	2.5	.10	1.0	.040	291 000	65 400	325 000	73 100	2 500	3 200
97320U2	100	3.9370	215	8.4646	94	3.7008	2.5	.10	1.0	.040	312 000	70 100	365 000	82 100	2 400	3 100
97321U2	105	4.1339	225	8.8583	98	3.8583	2.5	.10	1.0	.040	332 000	74 600	400 000	89 900	2 300	3 000
97322U2	110	4.3307	240	9.4488	100	3.9370	2.5	.10	1.0	.040	371 000	83 400	475 000	107 000	2 200	2 800
97324U2	120	4.7244	260	10.2362	110	4.3307	2.5	.10	1.0	.040	423 000	95 100	560 000	126 000	2 000	2 600
97326U2	130	5.1181	280	11.0236	116	4.5669	3.0	.12	1.0	.040	468 000	105 000	640 000	144 000	1 800	2 400
97328U2	140	5.5118	300	11.8110	124	4.8819	3.0	.12	1.0	.040	507 000	114 000	735 000	165 000	1 800	2 200
97330U2	150	5.9055	320	12.5984	130	5.1181	3.0	.12	1.0	.040	559 000	126 000	865 000	194 000	1 600	2 100
97332U2	160	6.2992	340	13.3858	136	5.3543	3.0	.12	1.0	.040	618 000	139 000	965 000	217 000	1 500	2 000
97334U2	170	6.6929	360	14.1732	144	5.6693	3.0	.12	1.0	.040	650 000	146 000	1 040 000	234 000	1 500	1 900
97336U2	180	7.0866	380	14.9606	150	5.9055	3.0	.12	1.0	.040	689 000	155 000	1 160 000	261 000	1 400	1 800

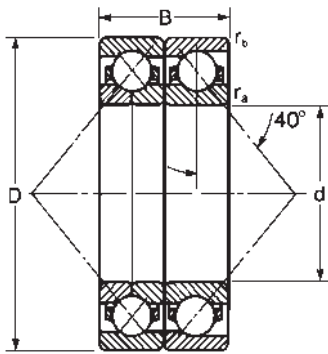
<sup>1)</sup> Fillet radius indicates maximum fillet radius on shaft or in housing which bearing corner will clear.

<sup>2)</sup> For thrust rating multiply C by 1.32 and C<sub>0</sub> by 2.94.

<sup>3)</sup> Listed values are for machined brass cage.

Values have been determined through historical application and practice.

<sup>4)</sup> Rating for one million revolutions or 500 hours at 33½ rpm.



This series consists of a matched set of 9200UPDT and 7200PDT flush ground bearings having a 40° contact angle. One-piece, inner ring land-guided, machined brass cages are standard for this series.

These bearings are mounted in pairs in applications where substantial thrust loads are present. This arrangement divides the thrust load in one direction while accommodating reversing thrust load. To increase thrust capacity in one direction additional 7200PDT bearings may be mounted in tandem.

For proper mounting orientation refer to page 237.

MRC Bearing Number	Bore		Outside Diameter D		Width B		Fillet Radius <sup>1)</sup>				Basic Radial Load Rating <sup>2)</sup>				Speed Rating <sup>3)</sup>	
	d mm	in	mm	in	mm	in	ra		rb		Dynamic C <sup>4)</sup>		Static C <sub>0</sub>		Grease RPM	Oil RPM
							mm	in	mm	in	N	lbf	N	lbf		
97207UP2	35	1.3780	72	2.8346	34	1.3386	1.0	.04	.60	.024	47 500	10 700	39 000	8 770	6 300	8 500
97208UP2	40	1.5748	80	3.1496	36	1.4173	1.0	.04	.60	.024	52 700	11 800	45 000	10 100	5 600	7 500
97209UP2	45	1.7717	85	3.3465	38	1.4961	1.0	.04	.60	.024	62 400	14 000	55 000	12 400	5 300	7 000
97210UP2	50	1.9685	90	3.5433	40	1.5748	1.0	.04	.60	.024	65 000	14 600	60 000	13 500	4 800	6 300
97211UP2	55	2.1654	100	3.9370	42	1.6535	1.5	.06	1.0	.040	79 300	17 800	75 000	16 900	4 500	6 000
97212UP2	60	2.3622	110	4.3307	44	1.7323	1.5	.06	1.0	.040	95 600	21 500	91 600	20 600	4 000	5 300
97213UP2	65	2.5591	120	4.7244	46	1.8110	1.5	.06	1.0	.040	104 000	23 400	100 000	22 500	3 600	4 800
97214UP2	70	2.7559	125	4.9213	48	1.8898	1.5	.06	1.0	.040	112 000	25 200	112 000	25 200	3 400	4 500
97215UP2	75	2.9528	130	5.1181	50	1.9685	1.5	.06	1.0	.040	117 000	26 300	120 000	27 000	3 200	4 300
97216UP2	80	3.1496	140	5.5118	52	2.0472	2.0	.08	1.0	.040	135 000	30 300	140 000	31 500	3 000	4 000
97217UP2	85	3.3465	150	5.9055	56	2.2047	2.0	.08	1.0	.040	156 000	35 100	166 000	37 300	2 800	3 800
97218UP2	90	3.5433	160	6.2992	60	2.3622	2.0	.08	1.0	.040	178 000	40 000	190 000	42 700	2 600	3 600
97219UP2	95	3.7402	170	6.6929	64	2.5197	2.0	.08	1.0	.040	199 000	44 700	220 000	49 500	2 400	3 400
97220UP2	100	3.9370	180	7.0866	68	2.6772	2.0	.08	1.0	.040	212 000	47 700	250 000	56 200	2 200	3 200
97221UP2	105	4.1339	190	7.4803	72	2.8346	2.0	.08	1.0	.040	229 000	51 500	260 000	58 500	2 000	3 000
97222UP2	110	4.3307	200	7.8740	76	2.9921	2.0	.08	1.0	.040	251 000	56 400	310 000	69 700	1 900	2 800
97224UP2	120	4.7244	215	8.4646	80	3.1496	2.0	.08	1.0	.040	270 000	60 700	325 000	73 100	1 700	2 400
97226UP2	130	5.1181	230	9.0551	80	3.1496	2.5	.10	1.0	.040	302 000	67 900	390 000	87 700	1 700	2 400
97228UP2	140	5.5118	250	9.8425	84	3.3071	2.5	.10	1.0	.040	319 000	71 700	430 000	96 700	1 600	2 200
97230UP2	150	5.9055	270	10.6299	90	3.5433	2.5	.10	1.0	.040	351 000	78 900	520 000	117 000	1 500	2 000
97232UP2	160	6.2992	290	11.4173	96	3.7795	2.5	.10	1.0	.040	390 000	87 700	560 000	126 000	1 300	1 700
97234UP2	170	6.6929	310	12.2047	104	4.0945	3.0	.12	1.0	.040	436 000	98 000	655 000	147 000	1 200	1 600
97236UP2	180	7.0866	320	12.5984	104	4.0945	3.0	.12	1.0	.040	449 000	101 000	710 000	160 000	1 100	1 500

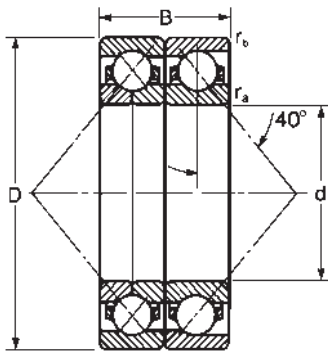
<sup>1)</sup> Fillet radius indicates maximum fillet radius on shaft or in housing which bearing corner will clear.

<sup>2)</sup> For thrust rating multiply C by 1.76 and C<sub>0</sub> by 3.86.

<sup>3)</sup> Listed values are for machined brass cage.

Values have been determined through historical application and practice.

<sup>4)</sup> Rating for one million revolutions or 500 hours at 33 1/3 rpm.



This series consists of a matched set of 9300UPDT and 7300PDT flush ground bearings having a 40° contact angle. One-piece, inner ring land-guided, machined brass cages are standard for this series.

These bearings are mounted in pairs in applications where substantial thrust loads are present. This arrangement divides the thrust load in one direction while accommodating reversing thrust load. To increase thrust capacity in one direction additional 7300PDT bearings may be mounted in tandem.

For proper mounting orientation refer to page 237.

MRC Bearing Number	Bore		Outside Diameter D		Width B		Fillet Radius <sup>1)</sup>				Basic Radial Load Rating <sup>2)</sup>				Speed Rating <sup>3)</sup>	
	d mm	in	mm	in	mm	in	ra		rb		Dynamic C <sup>4)</sup>		Static C <sub>0</sub>		Grease RPM	Oil RPM
							mm	in	mm	in	N	lbf	N	lbf		
97307UP2	35	1.3780	80	3.1496	42	1.6535	1.5	.06	1.0	.040	63 700	14 300	49 000	11 000	6 000	8 000
97308UP2	40	1.5748	90	3.5433	46	1.8110	1.5	.06	1.0	.040	76 100	17 100	61 000	13 700	5 300	7 000
97309UP2	45	1.7717	100	3.9370	50	1.9685	1.5	.06	1.0	.040	97 500	21 900	80 000	18 000	4 800	6 300
97310UP2	50	1.9685	110	4.3307	54	2.1260	2.0	.08	1.0	.040	112 000	25 200	104 000	23 400	4 300	5 600
97311UP2	55	2.1654	120	4.7244	58	2.2835	2.0	.08	1.0	.040	130 000	29 200	112 000	25 200	3 800	5 000
97312UP2	60	2.3622	130	5.1181	62	2.4409	2.0	.08	1.0	.040	148 000	33 300	129 000	29 000	3 600	4 800
97313UP2	65	2.5591	140	5.5118	66	2.5984	2.0	.08	1.0	.040	165 000	37 100	160 000	36 000	3 200	4 300
97314UP2	70	2.7559	150	5.9055	70	2.7559	2.0	.08	1.0	.040	190 000	42 700	186 000	41 800	3 000	4 000
97315UP2	75	2.9528	160	6.2992	74	2.9134	2.0	.08	1.0	.040	208 000	46 800	200 000	45 000	2 800	3 800
97316UP2	80	3.1496	170	6.6929	78	3.0709	2.0	.08	1.0	.040	225 000	50 600	220 000	49 500	2 600	3 600
97317UP2	85	3.3465	180	7.0866	82	3.2283	2.5	.10	1.0	.040	238 000	53 500	245 000	55 100	2 400	3 400
97318UP2	90	3.5433	190	7.4803	86	3.3858	2.5	.10	1.0	.040	255 000	57 300	270 000	60 700	2 200	3 200
97319UP2	95	3.7402	200	7.8740	90	3.5433	2.5	.10	1.0	.040	276 000	62 000	300 000	67 400	2 000	3 000
97320UP2	100	3.9370	215	8.4646	94	3.7008	2.5	.10	1.0	.040	307 000	69 000	380 000	85 400	1 900	2 800
97321UP2	105	4.1339	225	8.8583	98	3.8583	2.5	.10	1.0	.040	325 000	73 100	390 000	87 700	1 800	2 600
97322UP2	110	4.3307	240	9.4488	100	3.9370	2.5	.10	1.0	.040	345 000	77 600	455 000	102 000	1 700	2 400
97324UP2	120	4.7244	260	10.2362	110	4.3307	2.5	.10	1.0	.040	390 000	87 700	530 000	119 000	1 600	2 200
97326UP2	130	5.1181	280	11.0236	116	4.5669	3.0	.12	1.0	.040	449 000	101 000	610 000	137 000	1 500	2 000
97328UP2	140	5.5118	300	11.8110	124	4.8819	3.0	.12	1.0	.040	488 000	110 000	695 000	156 000	1 400	1 900
97330UP2	150	5.9055	320	12.5984	130	5.1181	3.0	.12	1.0	.040	540 000	121 000	780 000	175 000	1 200	1 700
97332UP2	160	6.2992	340	13.3858	136	5.3543	3.0	.12	1.0	.040	553 000	124 000	850 000	191 000	1 200	1 600
97334UP2	170	6.6929	360	14.1732	144	5.6693	3.0	.12	1.0	.040	605 000	136 000	965 000	217 000	1 000	1 500
97336UP2	180	7.0866	380	14.9606	150	5.9055	3.0	.12	1.0	.040	650 000	146 000	1 100 000	247 000	950	1 400

<sup>1)</sup> Fillet radius indicates maximum fillet radius on shaft or in housing which bearing corner will clear.

<sup>2)</sup> For thrust rating multiply C by 1.76 and C<sub>0</sub> by 3.86.

<sup>3)</sup> Listed values are for machined brass cage.

Values have been determined through historical application and practice.

<sup>4)</sup> Rating for one million revolutions or 500 hours at 33 1/3 rpm.

## ***97000 U2 Series 29° Angular Contact Ball Bearings Duplex***

### ***Dynamic and static equivalent load and life rating***

#### **Dynamic equivalent radial load**

$$P = F_R \quad \text{when } \frac{F_A}{F_R} \leq 0.80$$

$$P = 0.39 F_R + 0.76 F_A \quad \text{when } \frac{F_A}{F_R} > 0.80$$

P = Dynamic equivalent radial load  
F<sub>R</sub> = Radial load  
F<sub>A</sub> = Thrust load

#### **Static equivalent radial load**

$$P_0 = 1.0 F_R + 0.66 F_A$$

P<sub>0</sub> is always  $\geq F_R$

P<sub>0</sub> = Static equivalent radial load  
F<sub>R</sub> = Radial load  
F<sub>A</sub> = Thrust load

#### **Life rating**

$$L_{10} = \left(\frac{C}{P}\right)^3 \quad (\text{millions of revolutions})$$

or

$$L_{10h} = \frac{10^6}{60n} \left(\frac{C}{P}\right)^3 \quad (\text{Hours})$$

C = Dynamic radial load rating  
P = Dynamic equivalent radial load  
n = Speed in rpm



## 97000 U2 Series 29° Angular Contact Ball Bearings Duplex

### *Dynamic equivalent radial load and life calculation examples*

Bearing size: 97313 U2

Speed: 1750 RPM

Basic Dynamic Radial Load Rating (C) = 40000

---

#### **Case 1**

Thrust load ( $F_A$ ) = 5000

$$\frac{F_A}{F_R} = \frac{5000}{0} = \infty$$

Since  $\frac{F_A}{F_R} > 0.80$ ,

$$P = 0.39 F_R + 0.76 F_A = 0.76 \times 5000$$

$$P = 3800$$

$$C = 40000$$

$$\text{Life (L}_{10}) = \left(\frac{C}{P}\right)^3 = \left(\frac{40000}{3800}\right)^3 = 1166 \times 10^6 \text{ Rev.}$$

or

$$\begin{aligned} \text{Life (L}_{10}\text{h)} &= \frac{10^6}{60n} \left(\frac{C}{P}\right)^3 = \frac{10^6}{60 \times 1750} \left(\frac{40000}{3800}\right)^3 \\ &= 11108 \text{ Hours} \end{aligned}$$

---

#### **Case 2**

Radial load ( $F_R$ ) = 3000

Thrust load ( $F_A$ ) = 5000

$$\frac{F_A}{F_R} = \frac{5000}{3000} = 1.67$$

Since  $\frac{F_A}{F_R} > 0.80$ ,

$$P = 0.39 F_R + 0.76 F_A = 0.39 \times 3000 + 0.76 \times 5000$$

$$P = 4970$$

$$C = 40000$$

$$\text{Life (L}_{10}) = \left(\frac{C}{P}\right)^3 = \left(\frac{40000}{4970}\right)^3 = 521 \times 10^6 \text{ Rev.}$$

or

$$\begin{aligned} \text{Life (L}_{10}\text{h)} &= \frac{10^6}{60n} \left(\frac{C}{P}\right)^3 = \frac{10^6}{60 \times 1750} \left(\frac{40000}{4970}\right)^3 \\ &= 4965 \text{ Hours} \end{aligned}$$

---

**97000 UP2 Series**  
**40° Angular Contact Ball Bearings**  
**Duplex**

**Dynamic and static equivalent load**  
**and life rating**

**Dynamic equivalent radial load**

$$P = F_R \quad \text{when } \frac{F_A}{F_R} \leq 1.14$$

$$P = 0.35 F_R + 0.57 F_A \quad \text{when } \frac{F_A}{F_R} > 1.14$$

P = Dynamic equivalent radial load

F<sub>R</sub> = Radial load

F<sub>A</sub> = Thrust load

**Static equivalent radial load**

$$P_0 = 1.0 F_R + 0.52 F_A$$

P<sub>0</sub> is always  $\geq F_R$

P<sub>0</sub> = Static equivalent radial load

F<sub>R</sub> = Radial load

F<sub>A</sub> = Thrust load

**Life rating**

$$L_{10} = \left(\frac{C}{P}\right)^3 \quad (\text{millions of revolutions})$$

or

$$L_{10h} = \frac{10^6}{60n} \left(\frac{C}{P}\right)^3 \quad (\text{Hours})$$

C = Dynamic radial load rating

P = Dynamic equivalent radial load

n = Speed in rpm

## 97000 UP2 Series 40° Angular Contact Ball Bearings Duplex

### *Dynamic equivalent radial load and life calculation examples*

Bearing size: 97314 UP2

Speed: 1750 RPM

Basic dynamic radial load rating (C) = 42700

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#### **Case 1**

Thrust load ( $F_A$ ) = 5000

$$\frac{F_A}{F_R} = \frac{5000}{0} = \infty$$

Since  $\frac{F_A}{F_R} > 1.14$ ,

$$P = 0.35 F_R + 0.57 F_A = 0.57 \times 5000$$

$$P = 2850$$

$$C = 42700$$

$$\text{Life (L10)} = \left(\frac{C}{P}\right)^3 = \left(\frac{42700}{2850}\right)^3 = 3363 \times 10^6 \text{ Rev.}$$

or

$$\begin{aligned} \text{Life (L10h)} &= \frac{10^6}{60n} \left(\frac{C}{P}\right)^3 = \frac{10^6}{60 \times 1750} \left(\frac{42700}{2850}\right)^3 \\ &= 32030 \text{ Hours} \end{aligned}$$

---

#### **Case 2**

Radial load ( $F_R$ ) = 3000

Thrust load ( $F_A$ ) = 5000

$$\frac{F_A}{F_R} = \frac{5000}{3000} = 1.67$$

Since  $\frac{F_A}{F_R} > 1.14$ ,

$$P = 0.35 F_R + 0.57 F_A = 0.35 \times 3000 + 0.57 \times 5000$$

$$P = 3900$$

$$C = 42700$$

$$\text{Life (L10)} = \left(\frac{C}{P}\right)^3 = \left(\frac{42700}{3900}\right)^3 = 1312 \times 10^6 \text{ Rev.}$$

or

$$\begin{aligned} \text{Life (L10h)} &= \frac{10^6}{60n} \left(\frac{C}{P}\right)^3 = \frac{10^6}{60 \times 1750} \left(\frac{42700}{3900}\right)^3 \\ &= 12500 \text{ Hours} \end{aligned}$$

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