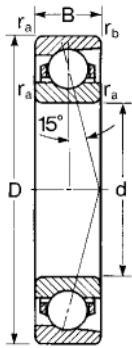


XLS Type Single-Row Inch Size 15 Degree Angular Contact

MRC Bearing Services



MRC XLS Series bearings are single-row 15 degree angular contact bearings made to inch dimensions. They are similar to MRC R-type bearings and 7000 Series bearings. The XLS Series bearing is made with a heavy race shoulder and one counterbored race shoulder on the outer ring. MRC XLS Series bearings have ample radial and thrust capacity for the majority of applications involving light radial loads, light thrust loads in one direction, or combinations of these. They are used in such applications where space limitations exist.

MRC Bearing Number	Bore		Outside Diameter D		Width B		Fillet Radius ¹⁾				Basic Radial Load Rating				Speed Rating ²⁾	
											Dynamic C ³⁾		Static C ₀		Grease RPM	Oil RPM
	d mm	d in	D mm	D in	B mm	B in	r _a mm	r _a in	r _b mm	r _b in	ZD ² mm	ZD ² in	N	lbf	N	lbf
XLS-1 ³ / ₈	34.9	1.3750	65.1	2.5625	14.3	.5625	1.0	.04	.60	.024	1 060	1.65	22 500	5 060	15 600	3 510
XLS-1 ¹ / ₂	38.1	1.5000	68.3	2.6875	14.3	.5625	1.0	.04	.60	.024	1 140	1.77	23 800	5 350	17 000	3 820
XLS-1 ¹ / ₄	41.3	1.6250	73.0	2.8750	14.3	.5625	1.0	.04	.60	.024	1 220	1.89	24 200	5 400	18 600	4 180
XLS-1 ³ / ₄	44.5	1.7500	76.2	3.0000	14.3	.5625	1.0	.04	.60	.024	1 300	2.01	25 100	5 640	20 000	4 500
XLS-1 ⁷ / ₈	47.6	1.8750	80.1	3.1875	15.9	.625	1.0	.04	.60	.024	1 540	2.39	29 600	6 650	23 600	5 310
XLS-2	50.8	2.0000	84.1	3.3125	15.9	.625	1.0	.04	.60	.024	1 630	2.53	32 000	6 790	25 500	5 730
XLS-2 ¹ / ₈	54.0	2.1250	87.3	3.4375	15.9	.625	1.5	.06	.60	.024	1 630	2.53	30 200	6 790	25 500	5 730
XLS-2 ¹ / ₄	57.2	2.2500	90.5	3.5625	15.9	.625	1.5	.06	.60	.024	1 720	2.67	31 200	7 010	27 000	6 070
XLS-2 ¹ / ₂ -S	63.5	2.5000	98.4	3.8750	17.5	.6875	1.5	.06	.60	.024	1 360	2.11	26 000	5 850	22 000	4 950
XLS-2 ³ / ₄	66.7	2.6250	105	4.1250	17.5	.6875	1.5	.06	.60	.024	2 470	3.83	42 300	9 510	39 000	8 770
XLS-2 ⁷ / ₈	70.0	2.7500	105	4.1250	17.5	.6875	1.5	.06	.60	.024	2 470	3.83	42 300	9 510	39 000	8 770
XLS-3	76.2	3.0000	114	4.5000	19.1	.750	2.0	.08	1.0	.040	2 720	4.21	44 200	9 940	44 000	9 890
XLS-3 ¹ / ₄	82.6	3.2500	121	4.7500	19.1	.750	2.0	.08	1.0	.040	2 840	4.40	44 900	10 100	46 500	10 500
XLS-3 ¹ / ₂	88.9	3.5000	127	5.0000	19.1	.750	2.0	.08	1.0	.040	3 090	4.79	47 500	10 700	51 000	11 500
XLS-3 ³ / ₄	95.3	3.7500	133	5.2500	19.1	.750	2.0	.08	1.0	.040	3 210	4.98	47 500	10 700	53 000	11 900
XLS-4 ¹ / ₄	108	4.2500	152	6.0000	22.2	.875	2.0	.08	1.0	.040	4 190	6.50	61 800	13 900	69 500	15 600
XLS-4 ¹ / ₂	114	4.5000	159	6.2500	22.2	.875	2.0	.08	1.0	.040	4 350	6.75	61 800	13 900	73 500	16 500
XLS-4 ³ / ₄	121	4.7500	165	6.5000	22.2	.875	2.0	.08	1.0	.040	4 520	7.00	63 700	14 300	76 500	17 200
XLS-5	127	5.0000	178	7.0000	25.4	1.000	2.0	.08	1.0	.040	5 510	8.54	78 000	17 500	91 500	20 600
XLS-5 ¹ / ₂	140	5.5000	191	7.5000	25.4	1.000	2.5	.10	1.0	.040	5 920	9.18	79 300	17 800	100 000	22 500
XLS-6	152	6.0000	203	8.0000	25.4	1.000	2.5	.10	1.0	.040	6 330	9.81	81 900	18 400	108 000	24 300
XLS-6 ¹ / ₄	159	6.2500	216	8.5000	28.6	1.125	2.5	.10	1.0	.040	7 550	11.7	97 500	21 900	129 000	29 000
XLS-6 ¹ / ₂	165	6.5000	222	8.7500	28.6	1.125	2.5	.10	1.0	.040	7 800	12.0	99 500	22 400	134 000	30 100
XLS-7	178	7.0000	241	9.5000	31.8	1.250	3.0	.12	1.5	.060	9 480	14.7	119 000	26 800	160 000	36 000
XLS-7 ¹ / ₄	184	7.2500	248	9.7500	31.8	1.250	3.0	.12	1.5	.060	9 740	15.1	121 000	27 200	166 000	37 300
XLS-7 ¹ / ₂	197	7.7500	267	10.5000	34.9	1.375	3.0	.12	1.5	.060	11 200	17.4	138 000	31 000	193 000	43 400
XLS-8	203	8.0000	273	10.7500	34.9	1.375	3.0	.12	1.5	.060	11 600	18.0	140 000	31 500	200 000	45 000
XLS-8 ¹ / ₄	210	8.2500	279	11.0000	34.9	1.375	3.0	.12	1.5	.060	12 000	18.6	140 000	31 500	204 000	45 900
XLS-8 ¹ / ₂	216	8.5000	292	11.5000	38.1	1.500	3.0	.12	1.5	.060	13 600	21.0	163 000	36 600	232 000	52 200
XLS-9	229	9.0000	305	12.0000	38.1	1.500	3.0	.12	1.5	.060	15 300	23.7	182 000	40 900	260 000	58 500
XLS-10	254	10.0000	337	13.2500	41.3	1.625	4.0	.16	1.5	.060	17 300	26.8	190 000	42 700	290 000	65 200

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

²⁾ Listed values are for pressed steel or polyamide cage, ABEC-1.

For phenolic composition cage, multiply by 1.66 for grease and 2.00 for oil. For machined bronze cage, multiply by 1.25 for grease and 1.50 for oil. For phenolic composition cage, ABEC-5 or 7, multiply by 2.30 for grease and 2.80 for oil. The speed rating adjustment factors have been determined through historical application and practice. For a more complete explanation, see page 276.

³⁾ Rating for one million revolutions or 500 hours at 33¹/₃ RPM.

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

Dynamic equivalent radial load

$P = XF_R + YF_A$ P = Dynamic equivalent radial load
 F_R = Radial load
 F_A = Thrust load
 Z = Number of balls
 D = Ball diameter
 X = Radial load factor
 Y = Thrust load factor
 e = Limiting factor for F_A/F_R

Contact Angle	F_A/ZD^2		$F_A/F_R > e$		e
	Units N, mm	Units lb, in	X	Y	
15°	0.172	25	0.44	1.47	0.38
	0.345	50		1.40	0.40
	0.689	100		1.30	0.43
	1.03	150		1.23	0.46
	1.38	200		1.19	0.47
	2.07	300		1.12	0.50
	3.45	500		1.02	0.55
	5.17	750		1.00	0.56
	6.89	1 000		1.00	0.56

When $F_A/F_R \leq e$, use $X = 1.0$, $Y = 0$.
 Values of Y for loads not shown are obtained from chart to the right.

Life rating

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

or

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

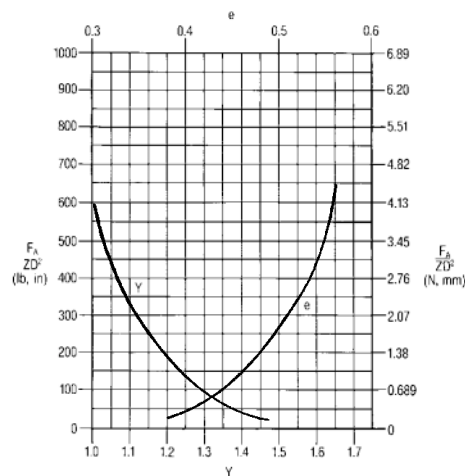
C = Basic dynamic load rating
 P = Dynamic equivalent radial load
 n = Speed in RPM

Static equivalent radial load

$$P_0 = 0.6 F_R + 0.5 F_A$$

P_0 is always $\geq F_R$

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



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

Bearing size: 309R

Speed = 2000 RPM

Basic dynamic load rating (C) = 13200 lbf

ZD² = 4.69

Case 1Radial load (F_R) = 1890Equivalent load (P) = X F_R + Y F_AP = F_R = 1890

$$\text{Life (L}_{10}\text{)} = \left(\frac{C}{P}\right)^3 = \left(\frac{13200}{1890}\right)^3 = 341 \times 10^6 \text{ Rev.}$$

or

$$\begin{aligned}\text{Life (L}_{10}\text{h)} &= \frac{10^6}{60n} \left(\frac{C}{P}\right)^3 = \frac{10^6}{60 \times 2000} \left(\frac{13200}{1890}\right)^3 \\ &= 2839 \text{ Hrs}\end{aligned}$$

Case 2Radial load (F_R) = 1890Thrust load (F_A) = 1250Equivalent load (P) = X F_R + Y F_AF_A/ZD² = 1250/4.69 = 267

X = 0.44

Y = 1.15

P = 0.44 × 1890 + 1.15 × 1250 = 2269

$$\text{Life (L}_{10}\text{)} = \left(\frac{C}{P}\right)^3 = \left(\frac{13200}{2269}\right)^3 = 197 \times 10^6 \text{ Rev.}$$

or

$$\begin{aligned}\text{Life (L}_{10}\text{h)} &= \frac{10^6}{60n} \left(\frac{C}{P}\right)^3 = \frac{10^6}{60 \times 2000} \left(\frac{13200}{2269}\right)^3 \\ &= 1641 \text{ Hrs}\end{aligned}$$

Case 3Thrust load (F_A) = 1250Equivalent load (P) = Y F_AF_A/ZD² = 1250/4.69 = 267

Y = 1.15

P = 1.15 × 1250 = 1438

$$\text{Life (L}_{10}\text{)} = \left(\frac{C}{P}\right)^3 = \left(\frac{13200}{1438}\right)^3 = 773 \times 10^6 \text{ Rev.}$$

or

$$\begin{aligned}\text{Life (L}_{10}\text{h)} &= \frac{10^6}{60n} \left(\frac{C}{P}\right)^3 = \frac{10^6}{60 \times 2000} \left(\frac{13200}{1438}\right)^3 \\ &= 6646 \text{ Hrs}\end{aligned}$$

Dynamic equivalent radial load

$P = X F_R + Y F_A$ P = Dynamic equivalent radial load
 F_R = Radial load
 F_A = Thrust load
 X = Radial load factor
 Y = Thrust load factor
 Z = Number of balls
 D = Ball diameter
 e = Limiting factor for F_A/F_R

Contact Angle	$\frac{F_A}{ZD^2}$		Tandem DT Mounting		DB or DF Mounting				e
	Units N, mm	Units lb, in	$F_N/F_R > e$		$F_N/F_R \leq e$		$F_N/F_R > e$		
			X	Y	X	Y	X	Y	
15°	0.172	25	0.44	1.47	1	1.65	0.72	2.39	0.38
	0.345	50		1.40		1.57		2.28	0.40
	0.689	100		1.30		1.46		2.11	0.43
	1.03	150		1.23		1.38		2.00	0.46
	1.38	200		1.19		1.34		1.93	0.47
	2.07	300		1.12		1.26		1.82	0.50
	3.45	500		1.02		1.14		1.66	0.55
	5.17	750		1.00		1.12		1.63	0.56
	6.89	1 000		1.00		1.12		1.63	0.56

For tandem DT, when $F_A/F_R < e$, use $X = 1.0$, $Y = 0$
 Values of Y for loads not shown are obtained from chart below

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)

For DB or DF Mounting:

C = Duplex pair dynamic radial load rating (from duplex bearing tables)
 or

C = Single-row dynamic radial load rating times $(i)^{0.7}$, where $i = 2$

For tandem mounting:

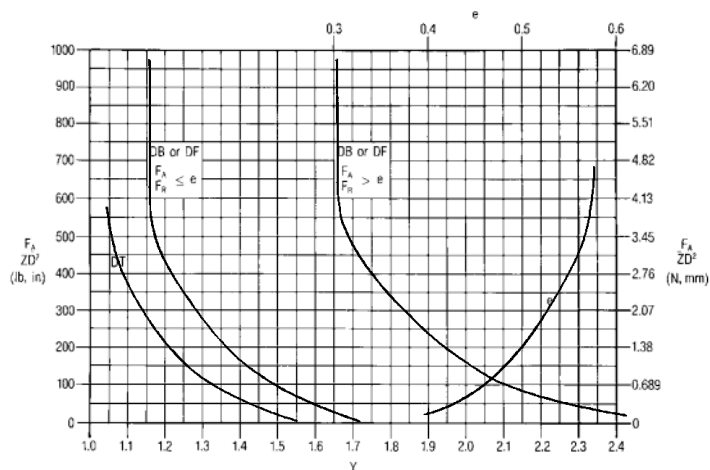
C = Single-row dynamic radial load rating times $(i)^{0.7}$, where i = number of bearings in set

P = Dynamic equivalent radial load

n = Speed in RPM

Static equivalent radial load

$P_0 = 1.0 F_R + 0.94 F_A$
 P_0 = Static equivalent radial load
 F_R = Radial load
 F_A = Thrust load



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

Bearing size: 309 RDU (DB or DF Pair)
 Speed: 2000 RPM
 Duplex pair basic dynamic radial load
 Rating (C) = 21500 lbf
 $ZD^2 = 4.69$

Case 1

Radial load (F_R) = 1890
 Thrust load (F_A) = 1250
 Equivalent load (P) = $X F_R + Y F_A$
 $F_A/F_R = 1250/1890 = 0.66$
 $F_A/ZD^2 = 1250/4.69 = 267$
 Since $F_A/F_R > e$, $X = 0.72$, $Y = 1.86$
 $P = 0.72 \times 1890 + 1.86 \times 1250 = 3686$
 $\text{Life (L10)} = \left(\frac{C}{P}\right)^3 = \left(\frac{21500}{3686}\right)^3 = 198 \times 10^6 \text{ Rev.}$
 or
 $\text{Life (L10h)} = \frac{10^6}{60n} \left(\frac{C}{P}\right)^3 = \frac{10^6}{60 \times 2000} \left(\frac{21500}{3686}\right)^3$
 $= 1654 \text{ Hrs}$

Case 2

Radial load (F_R) = 1890
 Thrust load (F_A) = 450
 Equivalent load (P) = $X F_R + Y F_A$
 $F_A/F_R = 450/1890 = 0.24$
 $F_A/ZD^2 = 450/4.69 = 96$
 Since $F_A/F_R < e$, $X = 1.0$, $Y = 1.46$
 $P = 1.0 \times 1890 + 1.46 \times 450 = 2547$
 $\text{Life (L10)} = \left(\frac{C}{P}\right)^3 = \left(\frac{21500}{2547}\right)^3 = 601 \times 10^6 \text{ Rev.}$
 or
 $\text{Life (L10h)} = \frac{10^6}{60n} \left(\frac{C}{P}\right)^3 = \frac{10^6}{60 \times 2000} \left(\frac{21500}{2547}\right)^3$
 $= 5012 \text{ Hrs}$

Case 3

Thrust load (F_A) = 1250
 Equivalent load (P) = $X F_R + Y F_A$
 $F_A/F_R = 1250/0 = \infty$
 $F_A/ZD^2 = 1250/4.69 = 267$
 Since $F_A/F_R > e$, $Y = 1.86$
 $P = 1.86 \times 1250 = 2325$
 $\text{Life (L10)} = \left(\frac{C}{P}\right)^3 = \left(\frac{21500}{2325}\right)^3 = 791 \times 10^6 \text{ Rev.}$
 or
 $\text{Life (L10h)} = \frac{10^6}{60n} \left(\frac{C}{P}\right)^3 = \frac{10^6}{60 \times 2000} \left(\frac{21500}{2325}\right)^3$
 $= 6590 \text{ Hrs}$

Bearing size: 309 RDT
 3 bearings in tandem
 Speed: 2000 RPM
 Single-row basic dynamic radial
 Load Rating (C) = 13200 lbf
 $ZD^2 = 4.69$

Case 1

Thrust load (F_A) = 2500
 Equivalent load (P) = $X F_R + Y F_A$
 $F_A/F_R = 2500/0 = \infty$
 $F_A/ZD^2 = 2500/4.69 = 533$
 Since $F_A/F_R > e$, $X = 0.44$, $Y = 1.02$
 $P = 1.02 \times 2500 = 2550$
 Load rating = $(i)^{0.7} \times 13200$
 $= (3)^{0.7} \times 13200 = 28510$
 $\text{Life (L10)} = \left(\frac{C}{P}\right)^3 = \left(\frac{28510}{2550}\right)^3 = 1398 \times 10^6 \text{ Rev.}$
 or
 $\text{Life (L10h)} = \frac{10^6}{60n} \left(\frac{C}{P}\right)^3 = \frac{10^6}{60 \times 2000} \left(\frac{28510}{2550}\right)^3$
 $= 11650 \text{ Hrs}$

Case 2

Radial load (F_R) = 1890
 Thrust load (F_A) = 2500
 Equivalent load (P) = $X F_R + Y F_A$
 $F_A/F_R = 2500/1890 = 1.32$
 $F_A/ZD^2 = 2500/4.69 = 533$
 Since $F_A/F_R > e$, $X = 0.44$, $Y = 1.02$
 $P = 0.44 \times 1890 + 1.02 \times 2550 = 3382$
 Load rating = $(i)^{0.7} \times 13200$
 $= (3)^{0.7} \times 13200 = 28510$
 $\text{Life (L10)} = \left(\frac{C}{P}\right)^3 = \left(\frac{28510}{3382}\right)^3 = 599 \times 10^6 \text{ Rev.}$
 or
 $\text{Life (L10h)} = \frac{10^6}{60n} \left(\frac{C}{P}\right)^3 = \frac{10^6}{60 \times 2000} \left(\frac{28510}{3382}\right)^3$
 $= 4992 \text{ Hrs}$